Company	Trade	Address	Phone	E-mail
Mike Lahey Plumbing & Heating	Plumbing & Heating	22 Grandview Terrace, Adams, MA 01220	413-743-5004	Lahey5004@aol.com
Homer Contracting Inc.	General Contractor (full service con	195 Broadway, Arlington, MA 02474	781-648-3383	george@homercontracting.com
Homer Contracting Inc.				zorzis.bouboulis@gmail.com
Northern Contracting Corp.	General Contractor	68 Jackson Street, P.O. Box 96, Canton, MA 02021	781-821-4200 x.101	gparikh@northerncontractingcorp.com
Sanibel Electrical Corporation	Electrician/Electrical Contractor?	325 New Boston Street – Unit #2, Woburn, MA 018	781-938-1006	Frank@sanibelcorp.com
Richard T. Losordo Electrical Services Inc	Electrician/Electrical Contractor	244 Liberty St. Unit 8A, Brockton, Ma 02301	508-436-4848 x 201	akron@losordoelectric.com
United Power Corporation	Electrical Contractor (full-service el	145A Summit Street, Suite 204, Peabody, MA 0196	978-532-7300	joanne@unitedpwrcorp.com
CUBE Electrical Construction	Electrical		617-869-5808	ajtabrizi@cubeelectric.com
Webster Construction	General Contractor	53 Clapp Street, Boston, MA 02125	617-436-7944	pcaruso@wcboston.com
WCI Corp	General Contractor	3815 Washington Street, Boston, MA 02130	617-524-9300	acamerano@wci-corp.com
Contracting Specialists Inc.	General Contractor (structural stabil	453 S. Main Street, Attleboro, MA 02703	508-222-2377	anguyen@contractingspecialists.com
Contracting Specialists Inc.	General Contractor		508-222-2377	sophie@contractingspecialists.com
Systems Electrical Services Co., Inc.	Electrical Contractor	5 Wesley Street, Chelsea, MA 02150	617-466-0920 ext: 102	ASantana@systemselectricalservices.com
Dagle Electrical Construction Corp.	Electrical Contractor			dec@deccorp.com
Baystate Building & Remodeling Inc.	General Contractor	PO Box 725, Salem , MA 01970	978-815-3712	tommy@baystatebuilding.com
CAM HVAC	HVAC	116 Lydia Ann Road, Smithfield, RI 02917	401-232-7230	diane@camhvac.com
Brothers Electrical Corporation	Electrical	18 Graf Road, Unit #31, Newburyport, MA 01950	978-462-1111 ext. 203	jjbrotherselectric@comcast.net
John F. Shea Company, Inc.	General Contractor	41 Hollingsworth Street, PO Box 365, Mattapan, M	617-298-0356	mfrank@johnfshea.com
WES Construction Corp.	General Contractor	650 Industrial Drive, Halifax, MA 02338	781-294-1080; 508-328-3908	jvogel@wesconstructioncorp.com
Projectdog	Plan House	18 Graf Road Suite 8, Newburyport, MA 01950	978-499-9014	addenda@projectdog.com
Drizos Contracting	Contractor Painting	101 Middlesex Turnpike, Ste 6 #353, Burlington, M	978 - 460 - 2241	spiros@drizoscontracting.com
Murphy Specialty	HVAC, restoration, sheet metal, roo	158 Arlington St., Boston, MA 02136	617-719-0400	paulh@murphyspecialty.com
Apex HVAC	HVAC	Abington, MA	781-871-2622	apex@apexhvac.com
Apex HVAC		Abington, MA	(781) 871-6227	philip@apexhvac.com
ERP				eastregionpublic@reedbusiness.com
Construction Journal				J.Harner@thecj.com
Southern Middlesex Industries, Inc.	Demolition/Hazmat Abatement	823 Pleasant Street, Norwood, MA 02062	781-769-9310	jbulens@smienvironmental.com
White House Construction	General Contractor	7 Craigre Str. Somerville, MA 02143	781-698-9848	gio@whitehouseconstruction.com
Jason Industries	Stage Equipment	1200 Garfield Ave. S,W, Canton, Ohio 44706	800.548.8982	lawhitt@jansonindustries.com

SHS Repairs to Auditorium Filed Sub Bids

Bid No. IFB #14-71
Date: 3/19/14
Time: 11:00 a.m.

Bidders - HVAC	Base Bid
CAM HVAC	634,000.00
Snowden	450,000.00

Bidders - Electrical	Base Bid
Sanibel Electric	737,000.00
Richard T. Losordo Electric	713,000.00
Brothers Electrical Corp.	640,000.00
YES Electric	597,000.00

Bidders - Painter	
Homer Contracting	84,300.00

Bidders - Acoustical Tile	
No bids received.	

Bidders - Misc Metals	
No bids received.	

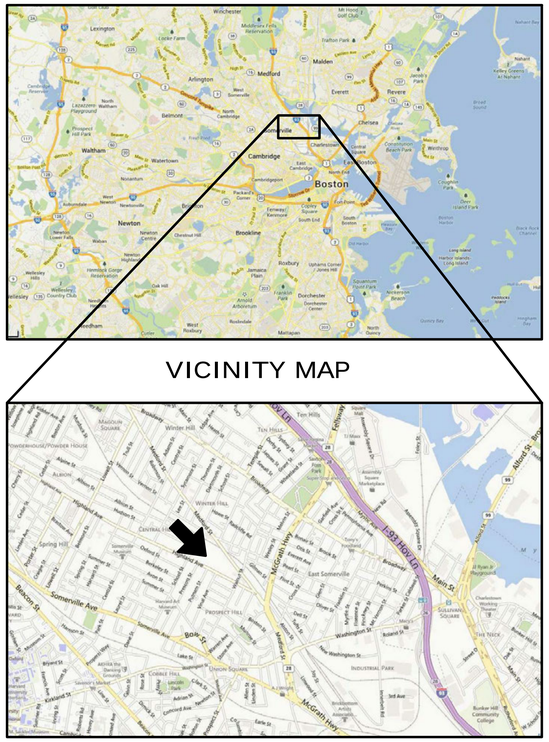
Bidders - Waterproofing	
No bids received.	

Bidders - Elevators	
No bids received.	

City of Somerville

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143



VICINITY MAP

LOCUS MAP



OVERVIEW

OWNER

City of Somerville
Skip Bandini, Director
Capital Projects and Planning
1 Franey Road
Somerville, MA 02145
Tel - 617-625-6600
Fax - 617-625-0999

SOMERVILLE PUBLIC SCHOOLS

Tony Pierantozzi - Superintendent
181 Washington Street
Somerville, MA 02143
Tel - 617-625-6600
Fax - 617-591-7902

CDR MAGUIRE

Architects / Engineers / Planners

211 Congress Street, 11th Floor
Boston, Massachusetts 02110

CONSTRUCTION DOCUMENTS

March 03, 2014

Somerville Public Schools
Education · Inspiration · Excellence

ISSUED FOR BID

LIST OF DRAWINGS

GENERAL
---- COVERSHEET

ARCHITECTURAL DEMOLITION
AD101 CAFETERIA/ KITCHEN DEMO FLOOR PLAN
AD102 AUDITORIUM DEMO FLOOR PLAN
AD103 AUDITORIUM BALCONY DEMO FLOOR PLAN
AD104 CAFETERIA/ KITCHEN DEMO RCP
AD105 AUDITORIUM DEMO RCP
AD106 INTERIOR DEMO ELEVATIONS
AD107 PHOTO REFERENCES FOR DEMO
AD108 PHOTO REFERENCES FOR DEMO

ARCHITECTURAL
A001 SYMBOLS AND ABBREVIATIONS
A010 CODE DATA SHEET
A101 CAFETERIA/ KITCHEN FLOOR PLAN
A102 AUDITORIUM FLOOR PLAN
A103 AUDITORIUM BALCONY FLOOR PLAN
A121 CAFETERIA/ KITCHEN RCP
A122 AUDITORIUM RCP
A123 AUDITORIUM BALCONY RCP
A401 STAIR AND RAILING DETAILS
A511 INTERIOR DETAILS
A512 STRUCTURAL DETAILS
A602 FINISH SCHEDULE AND OPENINGS
A630 CAFETERIA/ KITCHEN FLOOR FINISH PLAN
A631 AUDITORIUM FLOOR FINISH PLAN
A632 AUDITORIUM BALCONY FLOOR FINISH PLAN
A701 INTERIOR ELEVATIONS

MECHANICAL DEMO
HD201 HVAC CAFETERIA/ KITCHEN DEMO FLOOR PLAN
HD202 HVAC AUDITORIUM DEMO FLOOR PLAN
HD203 HVAC AUDTIORIUM BALCONY DEMO FLOOR PLAN
HD204 HVAC ROOF DEMO FLOOR PLAN

MECHANICAL
H000 HVAC LEGEND, NOTES AND ABBREVIATIONS
H201 HVAC CAFETERIA/ KITCHEN FLOOR PLAN
H202 HVAC AUDITORIUM FLOOR PLAN
H203 HVAC AUDITORIUM BALCONY FLOOR PLAN
H204 HVAC ROOF PLAN
H500 HVAC CONTROLS SEQUENCES
H501 HVAC CONTROLS SEQUENCES
H700 HVAC DETAILS
H701 HVAC DETAILS
H702 HVAC DETAILS
H800 HVAC SCHEDULES

ELECTRICAL DEMO
ED201 FIRE ALARM CAFETERIA/ KITCHEN FLOOR PLAN
ED202 FIRE ALARM AUDITORIUM FLOOR PLAN
ED203 FIRE ALARM AUDITORIUM BALCONY FLOOR PLAN

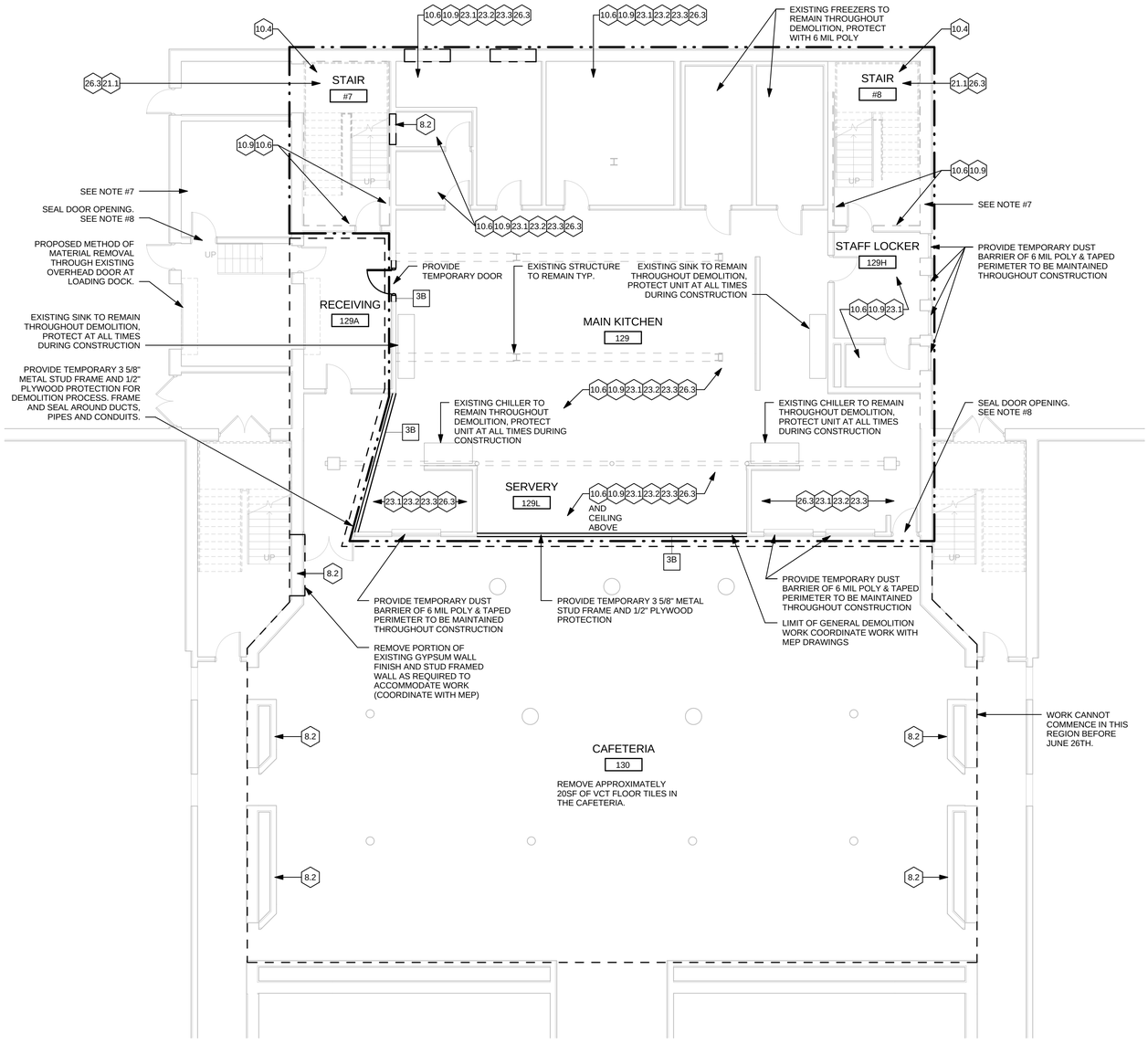
ELECTRICAL
E000 ELECTRICAL LEGEND, NOTES AND ABBREVIATIONS
E100 ELECTRICAL KITCHEN AND AUDITORIUM ROUTING PLANS
E201 ELECTRICAL LIGHTING CAFETERIA/ KITCHEN FLOOR PLAN
E202 ELECTRICAL LIGHTING AUDITORIUM FLOOR PLAN
E203 ELECTRICAL LIGHTING AUDITORIUM BALCONY FLOOR PLAN
E301 ELECTRICAL POWER CAFETERIA/ KITCHEN FLOOR PLAN
E302 ELECTRICAL POWER AUDITORIUM FLOOR PLAN
E303 ELECTRICAL POWER AUDITORIUM BALCONY FLOOR PLAN
E401 ELECTRICAL FIRE ALARM CAFETERIA/ KITCHEN FLOOR PLAN
E402 ELECTRICAL FIRE ALARM AUDITORIUM FLOOR PLAN
E403 ELECTRICAL FIRE ALARM AUDITORIUM BALCONY FLOOR PLAN
E500 ELECTRICAL SCHEDULES AND DETAILS

AUDIO VISUAL DEMO
AVD201 AUDIO VISUAL CAFETERIA/ KITCHEN DEMO FLOOR PLAN
AVD202 AUDIO VISUAL AUDITORIUM DEMO FLOOR PLAN
AVD203 AUDIO VISUAL AUDITORIUM BALCONY DEMO FLOOR PLAN

AUDIO VISUAL
AV000 AUDIO VISUAL LEGEND, NOTES AND ABBREVIATIONS
AV201 AUDIO VISUAL CAFETERIA/ KITCHEN FLOOR PLAN
AV202 AUDIO VISUAL AUDITORIUM FLOOR PLAN
AV203 AUDIO VISUAL AUDITORIUM BALCONY FLOOR PLAN

19431.01

CAFETERIA/KITCHEN DEMO PLAN WORK NOTES	
DEMO NOTE #	DEMO NOTE
8.2	REMOVE PORTION OF EXISTING GYP. FINISH AND STUD FRAMED WALL FINISH AS REQUIRED TO ACCOMODATE WORK. PROVIDE INFILL AS REQUIRED(COORDINATE WITH MEP)
10.4	REMOVE WALL FINISHES BACK TO BRICK INCLUDING CEMENT PLASTER, METAL LATHE AND ALL RELATED ATTACHMENT THROUGHOUT STAIRS
10.6	REMOVE GYPSUM/PLASTER CEILING, METAL LATHE, FURRING AND RELATED ATTACHMENTS.
10.9	REMOVE GYPSUM AND/OR PLASTER WALL AND SOFFITS WHERE EXIST
21.1	REFER TO ELECTRICAL DRAWINGS FOR DEMOLITION OF EXISTING FIRE ALARM SYSTEM
23.1	REFER TO MECHANICAL DRAWINGS FOR REMOVAL OF HVAC UNITS, DUCTS, WIRING AND CONTROLS
23.2	REFER TO MECHANICAL DRAWINGS FOR DEMOLITION OF EXISTING PIPING INSULATION
23.3	REFER TO MECHANICAL DRAWINGS FOR REMOVAL OF HVAC CONTROLS AND WIRING
26.3	REFER TO ELECTRICAL DRAWINGS FOR REMOVAL OF LIGHT FIXTURES, WIRING AND CONTROLS

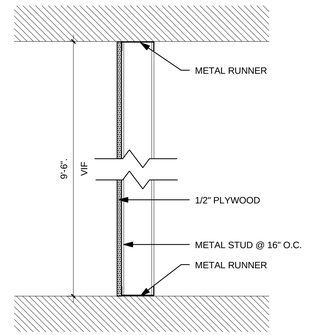


1 CAFETERIA/KITCHEN DEMO FLOOR PLAN

SCALE: 1/8" = 1'-0"

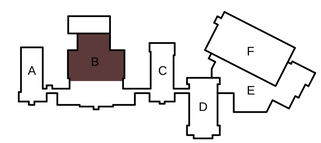
GENERAL DEMO NOTES

1. REMOVAL OF ANY WORK OR ITEM SHALL INCLUDE LEGAL DISPOSAL OF SAME UNLESS INDICATED TO BE SALVAGED. ALL REMOVAL AND DISPOSAL WORK SHALL BE PERFORMED IN A SAFE AND LEGAL MANNER. DOCUMENTATION OF RECYCLED WASTE IS REQUIRED.
2. CONTRACTOR SHALL VERIFY ALL CONDITIONS IN THE FIELD PRIOR TO COMMENCEMENT OF DEMOLITION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF ARCHITECT IN WRITING IMMEDIATELY UPON DISCOVERY.
3. DRAWINGS MAY NOT FULLY SHOW EVERY DETAIL PROVIDE UNIT PRICES FOR WORK AS REQUIRED.
4. CONTRACTOR SHALL FIELD VERIFY THE LOCATIONS OF ALL STRUCTURAL MEMBERS PRIOR TO DEMOLITION AND SHALL PROVIDE ALL NECESSARY SHORING, BRACING AND TEMPORARY SUPPORTS REQUIRED TO ENSURE STRUCTURAL STABILITY AND PREVENT COLLAPSE OF EXISTING STRUCTURE AND CONSTRUCTION TO REMAIN.
5. CONTRACTOR SHALL PROTECT ALL ADJACENT CONSTRUCTION THAT IS TO REMAIN.
6. REFER TO THE MECHANICAL AND ELECTRICAL NOTES FOR REMOVAL AND DISPOSAL OF EQUIPMENT, PIPES, CONDUITS, WIRING INSULATION OR OTHER ITEMS THAT ARE INCLUDED AS PART OF THE SCOPE OF DEMOLITION WORK IN THIS CONTRACT.
7. ALL FINISHES ON WALLS AND THE UNDERSIDE OF STAIRS 7 & 8 ALONG WITH THE STAIR CEILINGS SHALL BE REMOVED ENTIRELY. EXISTING RUBBER FLOORING AND METAL RAILING TO REMAIN. DEMOLISH ALL LIGHTING AND FIRE ALARM DEVICES ENTIRELY. (REFER TO MEP)
8. DOORS AND OPENINGS WILL BE SEALED WITH 6 MIL POLYETHYLENE SHEETING TAPED TO CREATE AN AIRTIGHT DUST BARRIER BETWEEN THE CONTROLLED AREA AND THE AREA ACCCESSIBLE TO BUILDING OCCUPANTS. LARGER OPENINGS SUCH AS THE SERVERY IN THE CAFETERIA AND THE MAIN ENTRANCE TO THE AUDITORIUM WILL BE SEALED WITH A SOLID BARRIER PRIOR TO SEALING WITH 8 MIL POLYETHYLENE PLASTIC SHEETING. BARRIERS WILL BE SEALED FROM INSIDE THE CONTROLLED AREA. ADDTIONAL BARRIERS MAY BE SEALED ON THE OUTSIDE.



TEMPORARY WALL TYPE 3B

1 1/2" = 1'-0"



KEY PLAN

CDR MAGUIRE
Architects / Engineers / Planners
211 Congress Street, 11th Floor
Boston, Massachusetts 02110
TEL. (617) 778-1440
www.cdrmaguire.com

REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools
Education · Inspiration · Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

CAFETERIA/ KITCHEN DEMO FLOOR PLAN

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

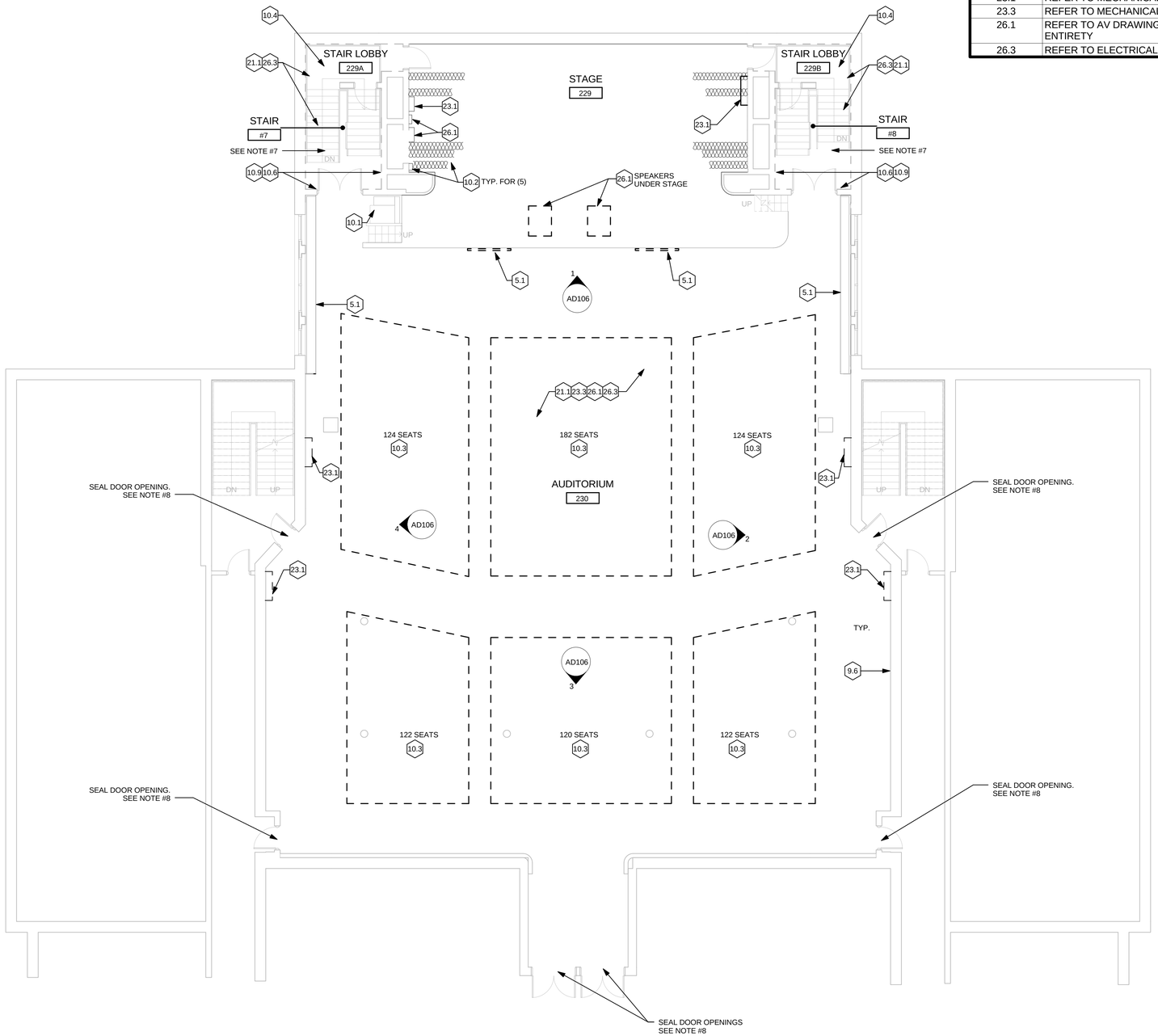
AD101

SHEET 1 **OF** 61

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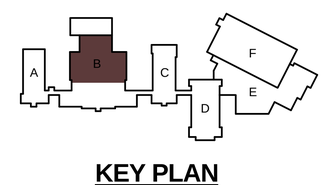


1 **AUDITORIUM DEMO FLOOR PLAN**
SCALE: 1/8" = 1'-0"

AUDITORIUM DEMO PLAN WORK NOTES	
DEMO NOTE #	DEMO NOTE
5.1	REMOVE METAL SCREENS
9.6	WOOD PANELING IS EXISTING TO REMAIN. PROTECT THROUGHOUT DEMOLITION
10.1	REMOVE HANDICAP LIFT AND RELATED ATTACHMENTS
10.2	REMOVE SMOKE AND FIRE CURTAINS, MOTORS, WIRING AND CONTROLS
10.3	REMOVE ALL SEATING
10.4	REMOVE WALL FINISHES BACK TO BRICK INCLUDING CEMENT PLASTER, METAL LATHE AND ALL RELATED ATTACHMENT THROUGHOUT STAIRS
10.6	REMOVE GYPSUM/PLASTER CEILING, METAL LATHE, FURRING AND RELATED ATTACHMENTS
10.9	REMOVE GYPSUM AND/ OR PLASTER WALL AND SOFFITS WHERE EXIST
21.1	REFER TO ELECTRICAL DRAWINGS FOR DEMOLITION OF EXISTING FIRE ALARM SYSTEM
23.1	REFER TO MECHANICAL DRAWINGS FOR REMOVAL OF HVAC UNITS, DUCTS, WIRING AND CONTROLS
23.3	REFER TO MECHANICAL DRAWINGS FOR REMOVAL OF HVAC CONTROLS AND WIRING
26.1	REFER TO AV DRAWINGS FOR REMOVAL OF SOUND SYSTEM, XLR AND SPEAKER WIRING IN ITS ENTIRETY
26.3	REFER TO ELECTRICAL DRAWINGS FOR REMOVAL OF LIGHT FIXTURES, WIRING AND CONTROLS

GENERAL DEMO NOTES

1. REMOVAL OF ANY WORK OR ITEM SHALL INCLUDE LEGAL DISPOSAL OF SAME UNLESS INDICATED TO BE SALVAGED. ALL REMOVAL AND DISPOSAL WORK SHALL BE PERFORMED IN A SAFE AND LEGAL MANNER. DOCUMENTATION OF RECYCLED WASTE IS REQUIRED.
2. CONTRACTOR SHALL VERIFY ALL CONDITIONS IN THE FIELD PRIOR TO COMMENCEMENT OF DEMOLITION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF ARCHITECT IN WRITING IMMEDIATELY UPON DISCOVERY.
3. DRAWINGS MAY NOT FULLY SHOW EVERY DETAIL PROVIDE UNIT PRICES FOR WORK AS REQUIRED.
4. CONTRACTOR SHALL FIELD VERIFY THE LOCATIONS OF ALL STRUCTURAL MEMBERS PRIOR TO DEMOLITION AND SHALL PROVIDE ALL NECESSARY SHORING, BRACING AND TEMPORARY SUPPORTS REQUIRED TO ENSURE STRUCTURAL STABILITY AND PREVENT COLLAPSE OF EXISTING STRUCTURE AND CONSTRUCTION TO REMAIN.
5. CONTRACTOR SHALL PROTECT ALL ADJACENT CONSTRUCTION THAT IS TO REMAIN.
6. REFER TO THE MECHANICAL AND ELECTRICAL NOTES FOR REMOVAL AND DISPOSAL OF EQUIPMENT, PIPES, CONDUITS, WIRING INSULATION OR OTHER ITEMS THAT ARE INCLUDED AS PART OF THE SCOPE OF DEMOLITION WORK IN THIS CONTRACT.
7. ALL FINISHES ON WALLS AND THE UNDERSIDE OF STAIRS 7 & 8 ALONG WITH THE STAIR CEILINGS SHALL BE REMOVED ENTIRELY. EXISTING RUBBER FLOORING AND METAIL RAILING TO REMAIN. DEMOLISH ALL LIGHTING AND FIRE ALARM DEVICES ENTIRELY. (REFER TO MEP)
8. DOORS AND OPENINGS WILL BE SEALED WITH 6 MIL POLYETHYLENE SHEETING TAPED TO CREATE AN AIRTIGHT DUST BARRIER BETWEEN THE CONTROLLED AREA AND THE AREA ACCCESSIBLE TO BUILDING OCCUPANTS. LARGER OPENINGS SUCH AS THE SERVERY IN THE CAFETERIA AND THE MAIN ENTRANCE TO THE AUDITORIUM WILL BE SEALED WITH A SOLID BARRIER PRIOR TO SEALING WITH 8 MIL POLYETHYLENE PLASTIC SHEETING. BARRIERS WILL BE SEALED FROM INSIDE THE CONTROLLED AREA. ADDTIONAL BARRIERS MAY BE SEALED ON THE OUTSIDE.



KEY PLAN

CDR MAGUIRE
Architects / Engineers / Planners
211 Congress Street, 11th Floor
Boston, Massachusetts 02110
TEL. (617) 778-1440
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REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools
Education - Inspiration - Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

AUDITORIUM DEMO FLOOR PLAN

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

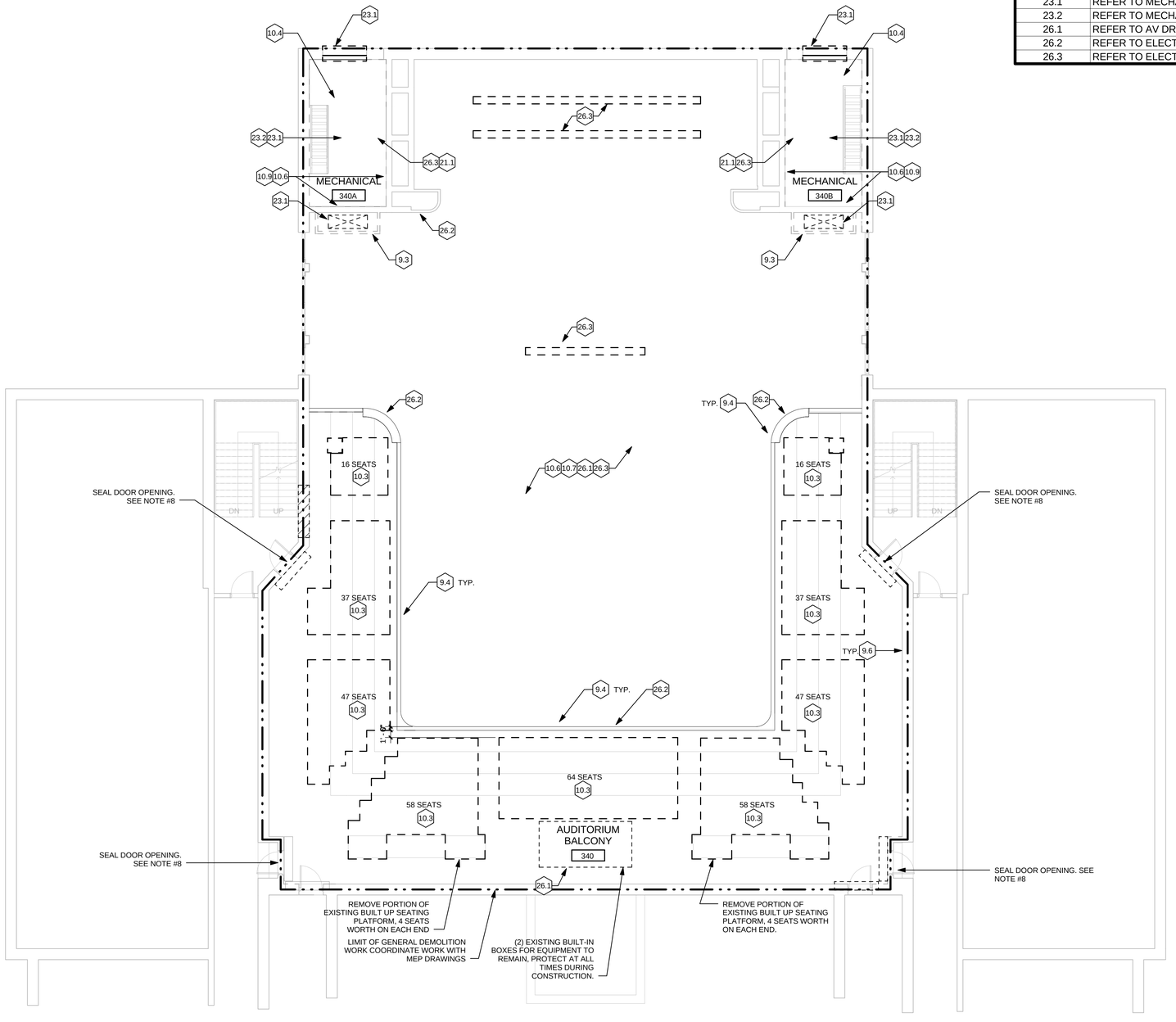
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AD102

SHEET 2 **OF** 61

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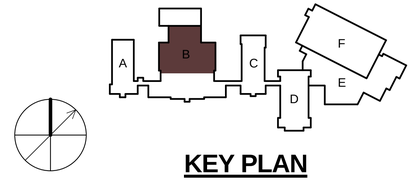
AUDITORIUM BALCONY DEMO PLAN WORK NOTES	
DEMO NOTE #	DEMO NOTE
9.3	REMOVE GYPSUM WALL BOARD FINISH AND FRAMING
9.4	REMOVE WOOD CAP
9.6	WOOD PANELING IS EXISTING TO REMAIN. PROTECT THROUGHOUT DEMOLITION
10.3	REMOVE ALL SEATING
10.4	REMOVE WALL FINISHES BACK TO BRICK INCLUDING CEMENT PLASTER, METAL LATHE AND ALL RELATED ATTACHMENT THROUGHOUT STAIRS
10.6	REMOVE GYPSUM/PLASTER CEILING, METAL LATHE, FURRING AND RELATED ATTACHMENTS
10.7	REMOVE ACT CEILING ENTIRELY
10.9	REMOVE GYPSUM AND/ OR PLASTER WALL AND SOFFITS WHERE EXIST
21.1	REFER TO ELECTRICAL DRAWINGS FOR DEMOLITION OF EXISTING FIRE ALARM SYSTEM
23.1	REFER TO MECHANICAL DRAWINGS FOR REMOVAL OF HVAC UNITS, DUCTS, WIRING AND CONTROLS
23.2	REFER TO MECHANICAL DRAWINGS FOR DEMOLITION OF EXISTING PIPING INSULATION
26.1	REFER TO AV DRAWINGS FOR REMOVAL OF SOUND SYSTEM, XLR AND SPEAKER WIRING IN ITS ENTIRETY
26.2	REFER TO ELECTRICAL DRAWINGS FOR REMOVAL OF LOW VOLTAGE CAMERA DEVICES, WIRING AND CONTROLS
26.3	REFER TO ELECTRICAL DRAWINGS FOR REMOVAL OF LIGHT FIXTURES, WIRING AND CONTROLS



1 **AUDITORIUM BALCONY DEMO FLOOR PLAN**
SCALE: 1/8" = 1'-0"

GENERAL DEMO NOTES

1. REMOVAL OF ANY WORK OR ITEM SHALL INCLUDE LEGAL DISPOSAL OF SAME UNLESS INDICATED TO BE SALVAGED. ALL REMOVAL AND DISPOSAL WORK SHALL BE PERFORMED IN A SAFE AND LEGAL MANNER. DOCUMENTATION OF RECYCLED WASTE IS REQUIRED.
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5. CONTRACTOR SHALL PROTECT ALL ADJACENT CONSTRUCTION THAT IS TO REMAIN.
6. REFER TO THE MECHANICAL AND ELECTRICAL NOTES FOR REMOVAL AND DISPOSAL OF EQUIPMENT, PIPES, CONDUITS, WIRING INSULATION OR OTHER ITEMS THAT ARE INCLUDED AS PART OF THE SCOPE OF DEMOLITION WORK IN THIS CONTRACT.
7. ALL FINISHES ON WALLS AND THE UNDERSIDE OF STAIRS 7 & 8 ALONG WITH THE STAIR CEILINGS SHALL BE REMOVED ENTIRELY. EXISTING RUBBER FLOORING AND METAIL RAILING TO REMAIN. DEMOLISH ALL LIGHTING AND FIRE ALARM DEVICES ENTIRELY. (REFER TO MEP)
8. DOORS AND OPENINGS WILL BE SEALED WITH 6 MIL POLYETHYLENE SHEETING TAPED TO CREATE AN AIRTIGHT DUST BARRIER BETWEEN THE CONTROLLED AREA AND THE AREA ACCCESSIBLE TO BUILDING OCCUPANTS. LARGER OPENINGS SUCH AS THE SERVERY IN THE CAFETERIA AND THE MAIN ENTRANCE TO THE AUDITORIUM WILL BE SEALED WITH A SOLID BARRIER PRIOR TO SEALING WITH 8 MIL POLYETHYLENE PLASTIC SHEETING. BARRIERS WILL BE SEALED FROM INSIDE THE CONTROLLED AREA, ADDTIONAL BARRIERS MAY BE SEALED ON THE OUTSIDE.



KEY PLAN

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REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools
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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

AUDITORIUM BALCONY DEMO FLOOR PLAN

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

AD103

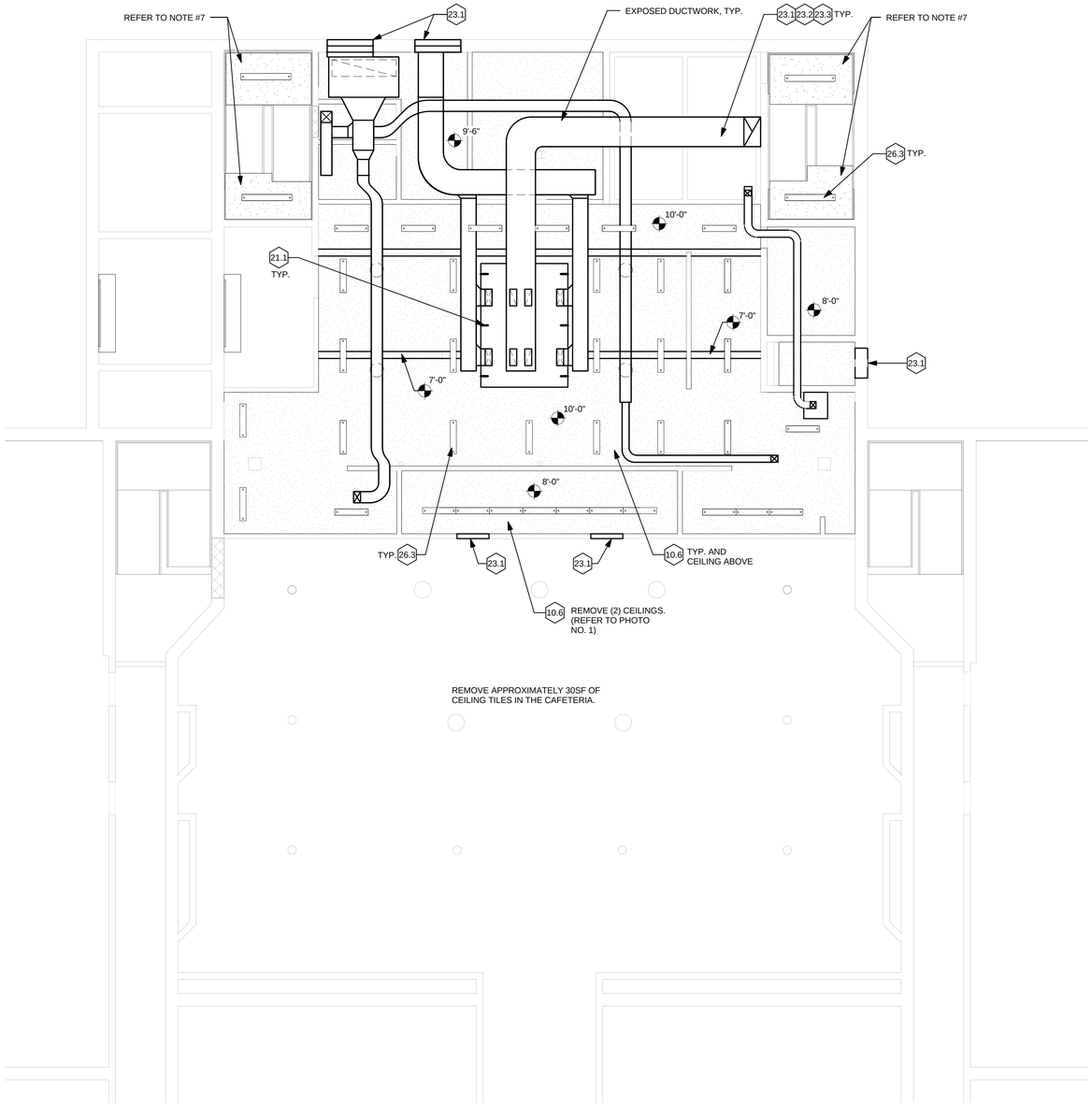
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DEMO RCP WORK NOTES - CAFETERIA/KITCHEN	
DEMO NOTE #	DEMO NOTE
10.6	REMOVE GYPSUM/PLASTER CEILING, METAL LATHE, FURRING AND RELATED ATTACHMENTS
21.1	REFER TO ELECTRICAL DRAWINGS FOR DEMOLITION OF EXISTING FIRE ALARM SYSTEM
23.1	REFER TO MECHANICAL DRAWINGS FOR REMOVAL OF HVAC UNITS, DUCTS, WIRING AND CONTROLS
23.2	REFER TO MECHANICAL DRAWINGS FOR DEMOLITION OF EXISTING PIPING INSULATION
23.3	REFER TO MECHANICAL DRAWINGS FOR REMOVAL OF HVAC CONTROLS AND WIRING
26.3	REFER TO ELECTRICAL DRAWINGS FOR REMOVAL OF LIGHT FIXTURES, WIRING AND CONTROLS



GENERAL DEMO NOTES

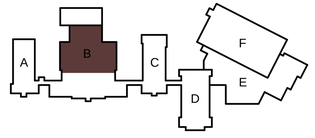
1. REMOVAL OF ANY WORK OR ITEM SHALL INCLUDE LEGAL DISPOSAL OF SAME UNLESS INDICATED TO BE SALVAGED. ALL REMOVAL AND DISPOSAL WORK SHALL BE PERFORMED IN A SAFE AND LEGAL MANNER. DOCUMENTATION OF RECYCLED WASTE IS REQUIRED.
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5. CONTRACTOR SHALL PROTECT ALL ADJACENT CONSTRUCTION THAT IS TO REMAIN.
6. REFER TO THE MECHANICAL AND ELECTRICAL NOTES FOR REMOVAL AND DISPOSAL OF EQUIPMENT, PIPES, CONDUITS, WIRING INSULATION OR OTHER ITEMS THAT ARE INCLUDED AS PART OF THE SCOPE OF DEMOLITION WORK IN THIS CONTRACT.
7. ALL FINISHES ON WALLS AND THE UNDERSIDE OF STAIRS 7 & 8 ALONG WITH THE STAIR CEILINGS SHALL BE REMOVED ENTIRELY. EXISTING RUBBER FLOORING AND METAIL RAILING TO REMAIN. DEMOLISH ALL LIGHTING AND FIRE ALARM DEVICES ENTIRELY. (REFER TO MEP)
8. DOORS AND OPENINGS WILL BE SEALED WITH 6 MIL POLYETHYLENE SHEETING TAPED TO CREATE AN AIRTIGHT DUST BARRIER BETWEEN THE CONTROLLED AREA AND THE AREA ACCCESSIBLE TO BUILDING OCCUPANTS. LARGER OPENINGS SUCH AS THE SERVERY IN THE CAFETERIA AND THE MAIN ENTRANCE TO THE AUDITORIUM WILL BE SEALED WITH A SOLID BARRIER PRIOR TO SEALING WITH 8 MIL POLYETHYLENE PLASTIC SHEETING. BARRIERS WILL BE SEALED FROM INSIDE THE CONTROLLED AREA, ADDTIONAL BARRIERS MAY BE SEALED ON THE OUTSIDE.



PHOTO NO. 1

SERVERY SOFFIT CAVITY

1 **CAFETERIA/KITCHEN DEMO RCP**
SCALE: 1/8" = 1'-0"



KEY PLAN

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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

CAFETERIA/ KITCHEN DEMO RCP

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

AD104

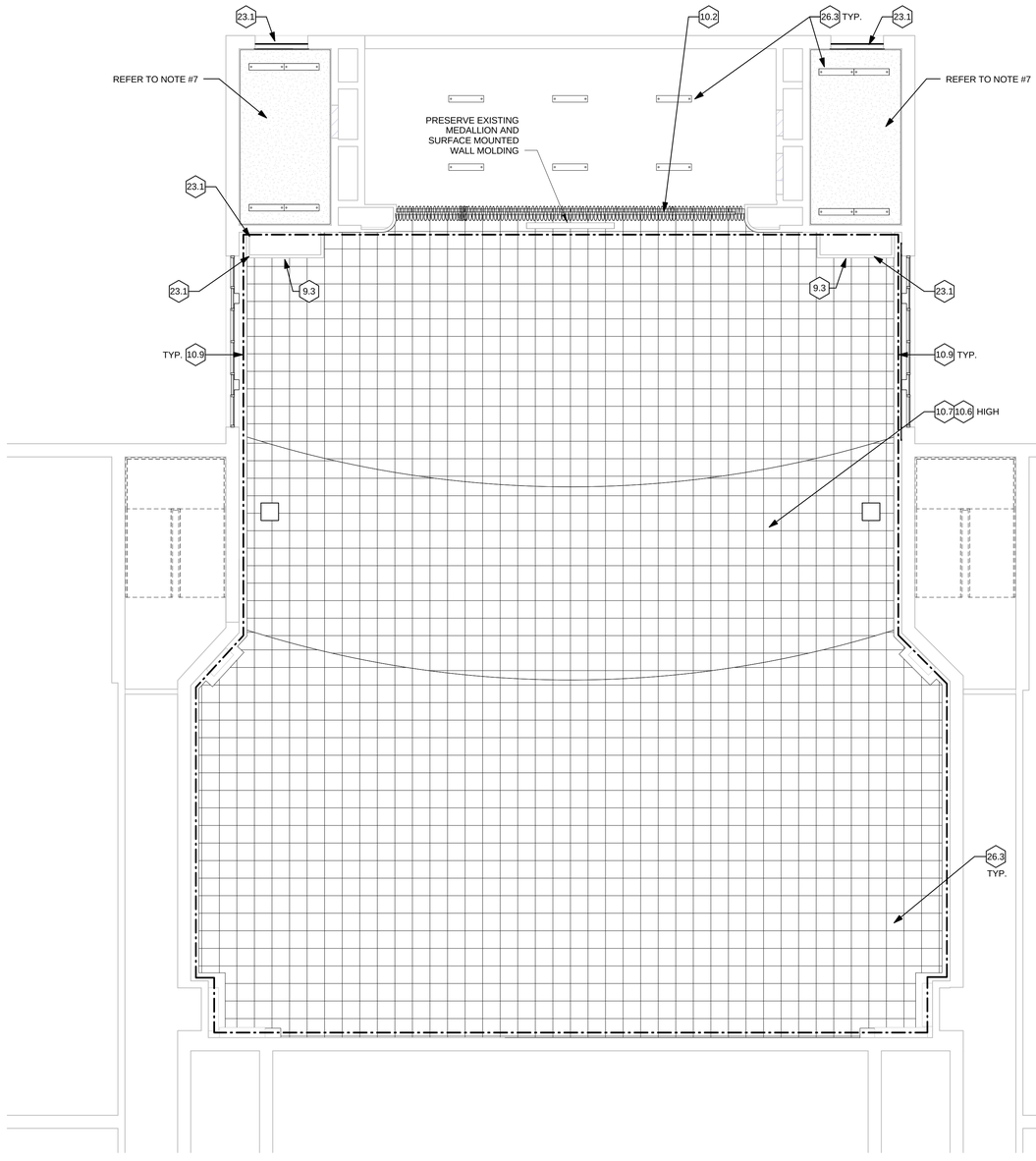
SHEET 4 **OF** 61

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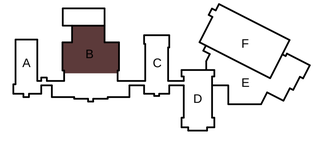
DEMO RCP WORK NOTES - AUDITORIUM	
DEMO NOTE #	DEMO NOTE
9.3	REMOVE GYPSUM WALL BOARD FINISH AND FRAMING
10.2	REMOVE SMOKE AND FIRE CURTAINS, MOTORS, WIRING AND CONTROLS
10.6	REMOVE GYPSUM PLASTER CEILING, METAL LATHE, FURRING AND RELATED ATTACHMENTS
10.7	REMOVE ACT CEILING ENTIRELY
10.9	REMOVE PLASTER MOLDING AT PLASTER CEILING EDGE AROUND ENTIRE AUDITORIUM CEILING EDGE
23.1	REFER TO MECHANICAL DRAWINGS FOR REMOVAL OF HVAC UNITS, DUCTS, WIRING AND CONTROLS
26.3	REFER TO ELECTRICAL DRAWINGS FOR REMOVAL OF LIGHT FIXTURES, WIRING AND CONTROLS



1 **AUDITORIUM DEMO RCP**
SCALE: 1/8" = 1'-0"

GENERAL DEMO NOTES

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7. ALL FINISHES ON WALLS AND THE UNDERSIDE OF STAIRS 7 & 8 ALONG WITH THE STAIR CEILINGS SHALL BE REMOVED ENTIRELY. EXISTING RUBBER FLOORING AND METAL RAILING TO REMAIN. DEMOLISH ALL LIGHTING AND FIRE ALARM DEVICES ENTIRELY. (REFER TO MEP)
8. DOORS AND OPENINGS WILL BE SEALED WITH 6 MIL POLYETHYLENE SHEETING TAPED TO CREATE AN AIRTIGHT DUST BARRIER BETWEEN THE CONTROLLED AREA AND THE AREA ACCCESSIBLE TO BUILDING OCCUPANTS. LARGER OPENINGS SUCH AS THE SERVERY IN THE CAFETERIA AND THE MAIN ENTRANCE TO THE AUDITORIUM WILL BE SEALED WITH A SOLID BARRIER PRIOR TO SEALING WITH 8 MIL POLYETHYLENE PLASTIC SHEETING. BARRIERS WILL BE SEALED FROM INSIDE THE CONTROLLED AREA, ADDTIONAL BARRIERS MAY BE SEALED ON THE OUTSIDE.



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Somerville Public Schools
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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

AUDITORIUM DEMO RCP

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

AD105

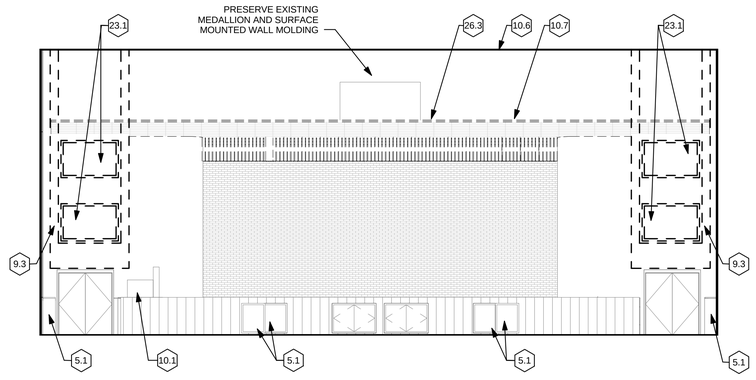
SHEET 5 **OF** 61

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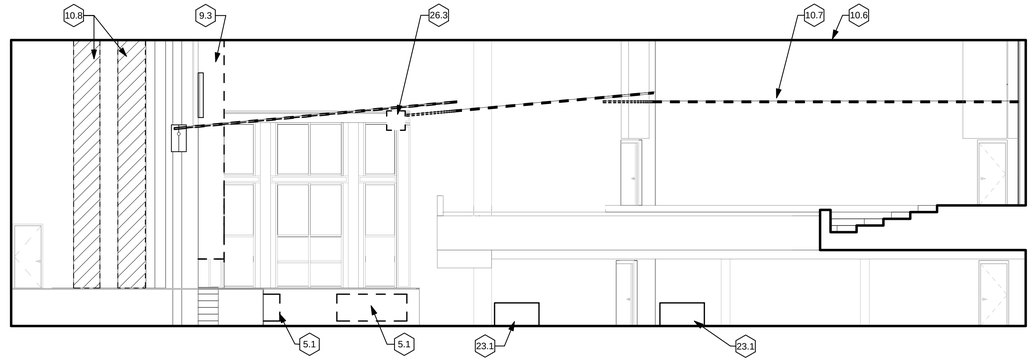
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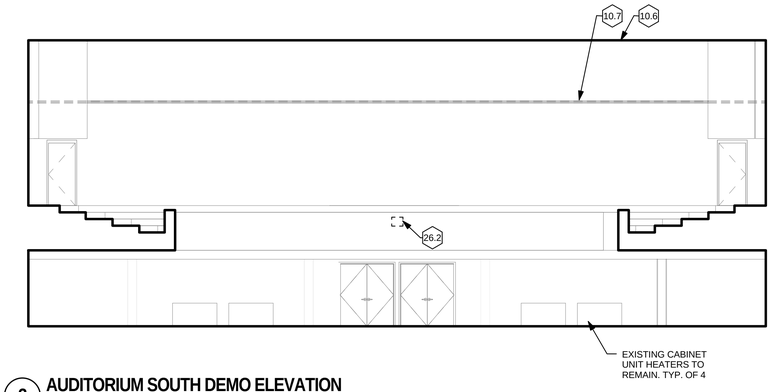
DEMO ELEVATION WORK NOTES	
DEMO NOTE #	DEMO NOTE
5.1	REMOVE METAL SCREEN
9.3	REMOVE GYPSUM WALL BOARD FINISH AND FRAMING
10.1	REMOVE HANDICAP LIFT AND RELATED ATTACHMENTS
10.6	REMOVE GYPSUM PLASTER CEILING, METAL LATHE, FURRING AND RELATED ATTACHMENTS
10.7	REMOVE ACT CEILING ENTIRELY
10.8	REMOVE PORTION OF EXISTING GYPSUM WALL FINISH AND STUD FRAMED WALL AS REQUIRED TO ACCOMMODATE WORK. PROVIDE INFILL AS REQUIRED. COORDINATE WITH MEP DRAWINGS.
23.1	REFER TO MECHANICAL DRAWINGS FOR REMOVAL OF HVAC UNITS, DUCTS, WIRING AND CONTROLS.
26.2	REFER TO ELECTRICAL DRAWINGS FOR REMOVAL OF LOW VOLTAGE CAMERA DEVICES, WIRING AND CONTROLS.
26.3	REFER TO ELECTRICAL DRAWINGS FOR REMOVAL OF LIGHT FIXTURES, WIRING AND CONTROLS.



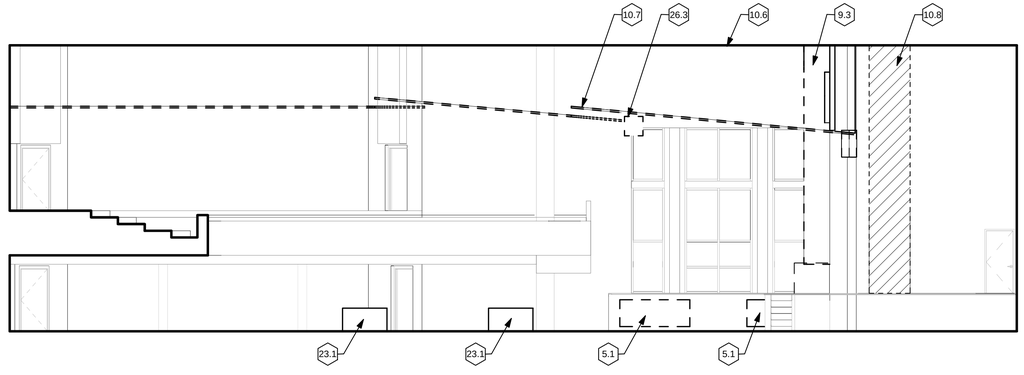
1 **AUDITORIUM NORTH DEMO ELEVATION**
SCALE: 1/8" = 1'-0"



2 **AUDITORIUM EAST DEMO ELEVATION**
SCALE: 1/8" = 1'-0"



3 **AUDITORIUM SOUTH DEMO ELEVATION**
SCALE: 1/8" = 1'-0"



4 **AUDITORIUM WEST DEMO ELEVATION**
SCALE: 1/8" = 1'-0"

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Somerville, MA 02143

INTERIOR DEMO ELEVATIONS

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: 1/8" = 1'-0"

SHEET NUMBER:

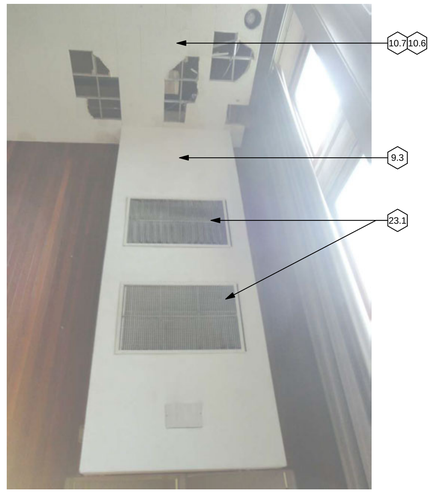
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SHEET 6 **OF** 61

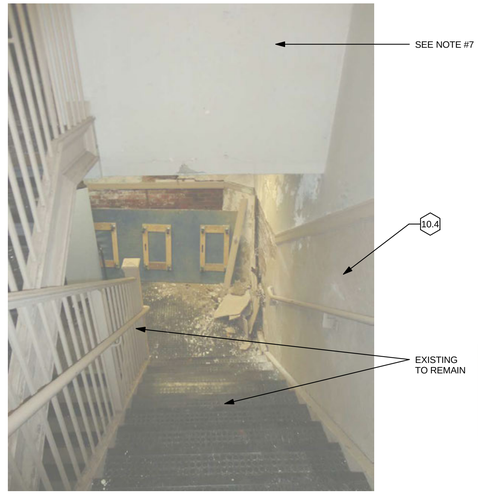
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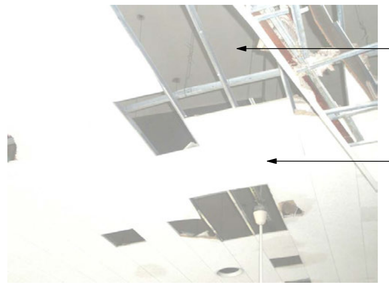
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1 AUDITORIUM NORTH WALL



4 STAIR 8



7 BALCONY END STAIR & EDGE

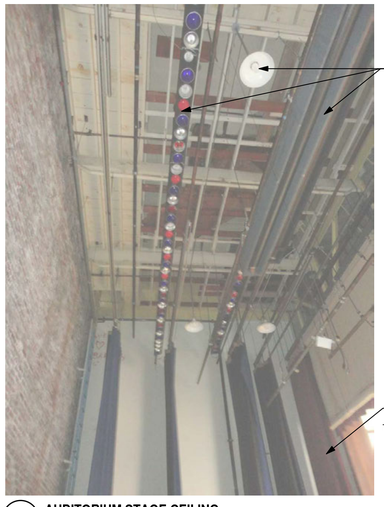
DEMO PHOTO WORK NOTES	
DEMO NOTE #	DEMO NOTE
5.1	REMOVE METAL SCREENS
9.3	REMOVE GYPSUM WALL BOARD FINISH AND FRAMING
9.4	REMOVE WOOD CAP
9.6	WOOD PANELING IS EXISTING TO REMAIN. PROTECT THROUGHOUT DEMOLITION
10.2	REMOVE SMOKE AND FIRE CURTAINS, MOTORS, WIRING AND CONTROLS
10.3	REMOVE ALL SEATING
10.4	REMOVE WALL FINISHES BACK TO BRICK INCLUDING CEMENT PLASTER, METAL LATHE AND ALL RELATED ATTACHMENT THROUGHOUT STAIRS
10.6	REMOVE GYPSUM PLASTER CEILING, METAL LATHE, FURRING AND RELATED ATTACHMENTS
10.7	REMOVE ACT CEILING ENTIRELY
23.1	REFER TO MECHANICAL DRAWINGS FOR REMOVAL OF HVAC UNITS, DUCTS, WIRING AND CONTROLS
26.3	REFER TO ELECTRICAL DRAWINGS FOR REMOVAL OF LIGHT FIXTURES, WIRING AND CONTROLS

GENERAL DEMO NOTES

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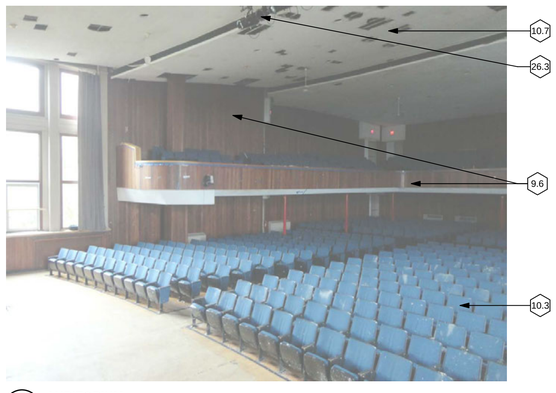
8 MAIN ENTRANCE



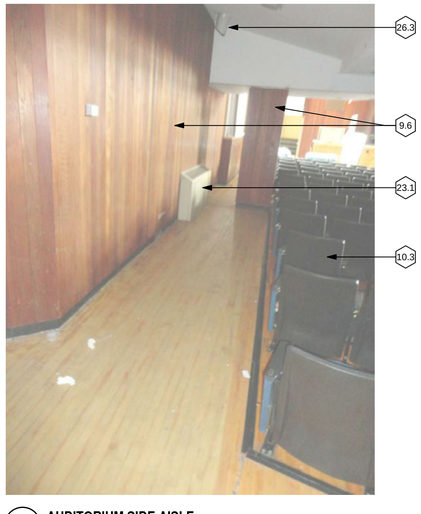
2 AUDITORIUM STAGE CEILING



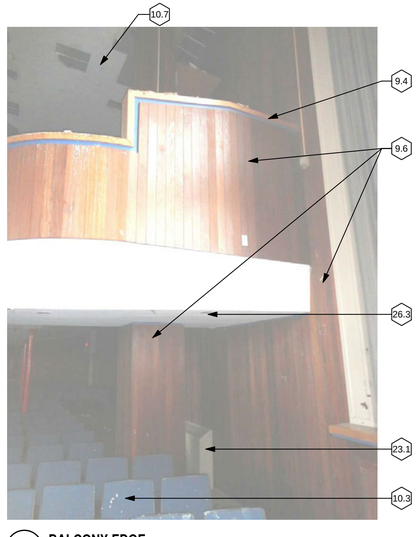
5 BALCONY END STAIR & EDGE



9 AUDITORIUM



3 AUDITORIUM SIDE AISLE



6 BALCONY EDGE



11 STAGE APRON



12 RADIATOR SCREENS

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PHOTO REFERENCES FOR DEMO

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: 12" = 1'-0"

SHEET NUMBER:

AD107

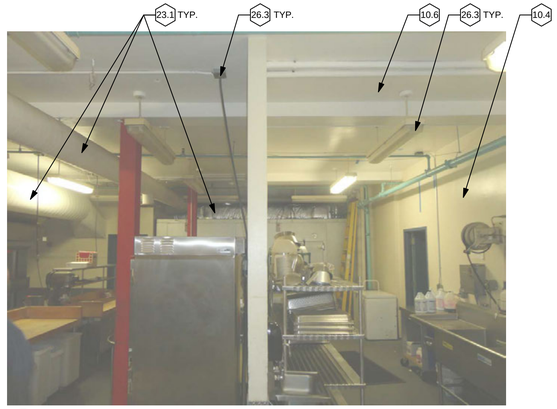
SHEET 7 OF 61

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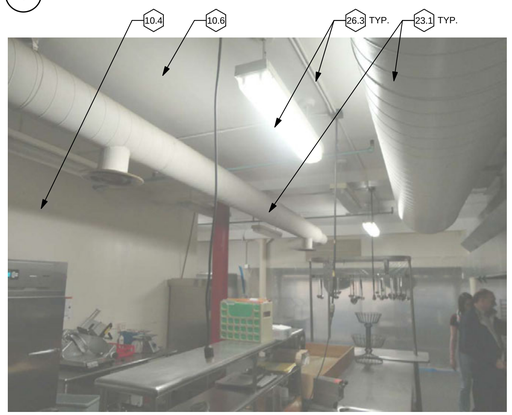
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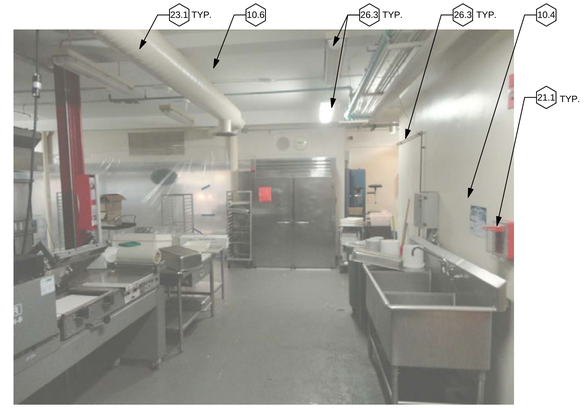
DEMO PHOTO WORK NOTES.	
DEMO NOTE #	DEMO NOTE
10.4	REMOVE WALL FINISHES BACK TO BRICK INCLUDING CEMENT PLASTER, METAL LATHE AND ALL RELATED ATTACHMENT THROUGHOUT STAIRS
10.6	REMOVE GYPSUM PLASTER CEILING, METAL LATHE, FURRING AND RELATED ATTACHMENTS.
21.1	REFER TO ELECTRICAL DRAWINGS FOR DEMOLITION OF EXISTING FIRE ALARM SYSTEM
23.1	REFER TO MECHANICAL DRAWINGS FOR REMOVAL OF HVAC UNITS, DUCTS, WIRING AND CONTROLS
26.3	REFER TO ELECTRICAL DRAWINGS FOR REMOVAL OF LIGHT FIXTURES, WIRING AND CONTROLS



1 KITCHEN



2 KITCHEN



3 KITCHEN



4 KITCHEN

EXISTING FREEZERS TO REMAIN THROUGHOUT DEMOLITION. PROTECT WITH 6 MIL POLY.

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Somerville, MA 02143

PHOTO REFERENCES FOR DEMO

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: 12" = 1'-0"

SHEET NUMBER:

AD108

SHEET 8 **OF** 61

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

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PROJECT FILE: C:\Users\EMorril\Documents\19431-Somerville_HS-Sandy_Repairs_EMorril.rvt

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

PLOTTED: 3/5/2014 5:35:38 PM

PROJECT FILE: C:\Users\EMorin\Documents\19431-Somerville_HS-Sandy_Repairs_EMorin.rvt

ABBREVIATIONS LIST

&,	AND
∠,	ANGLE
@	AT
℄, C.L.	CENTERLINE
⌷ , C	CHANNEL
◊	DIAMETER OR ROUND
≍	PENNY (NAIL)
ℙ, PL, PL'S	PLATE(S)
#, NO, NO'S	NUMBER(S)

A

A.B.	ANCHOR BOLT
ABV.	ABOVE
A/C	AIR CONDITIONING
A.C.	ASPHALTIC CONCRETE
ACOUS.	ACOUSTICAL
ACT	ACOUSTICAL CEILING TILE
A.D.	AREA DRAIN
ADDM	ADDENDUM
ADJ.	ADJUSTABLE
ADJA.	ADJACENT
AGGR.	AGGREGATE
A.F.F.	ABOVE FINISH FLOOR
AL.	ALUMINUM
ALT.	ALTERNATE
ANOD.	ANODIZED
A.P.	ACCESS PANEL
APPROX.	APPROXIMATE
ARCH.	ARCHITECT(URAL)
ASPH.	ASPHALT
A.T.	ACOUSTICAL TILE

B

B.C.	BOTTOM OF CURB
BD.	BOARD
BIT.	BITUMINOUS
BLDG.	BUILDING
BLK.	BLOCK
BLKG.	BLOCKING
B.M.	BENCHMARK
BM	BEAM
BOT.	BOTTOM
B.R.	BEDROOM
BRKT.	BRACKET
BRNZ.	BRONZE
B.S.	BOTTOM OF STAIR
BSMT.	BASEMENT
BTWN.	BETWEEN
B.U.R.	BUILT-UP ROOF(ING)
B.W.	BOTTOM OF WALL

C

CAB.	CABINET
CPT.	CARPET
C.B.	CATCH BASIN
C.B.B.	CEMENT BACKER BOARD
CEM.	CEMENT
CER.	CERAMIC
CF.	CUBIC FOOT/FEET
CHAM.	CHAMFER
C.I.	CAST IRON
C.J.	CONTROL JOINT
CLF	CHAIN LINK FENCE
CLG.	CEILING
CLKG.	CAULKING
CLO.	CLOSET
CLR.	CLEAR(ANCE)
C.M.U.	CONCRETE MASONRY UNIT(S)
CNTR.	COUNTER
C.O.	CLEAN OUT
COL.	COLUMN
COMB.	COMBINATION
COMP.	COMPRESS(ED), (ION), (IBLE)
CONC.	CONCRETE
COND.	CONDITION
CONN.	CONNECTION
CONST.	CONSTRUCTION
CONT.	CONTINUOUS
CONTR.	CONTRACTOR
CORR.	CORRIDOR, CORRUGATED
C.R.M.	CONCRETE RUBBLE MASONRY
CSMT.	CASEMENT
C.T.	CERAMIC TILE
CTR.	CENTER
CTSK.	COUNTERSUNK, (SINK)
CY	CUBIC YARD(S)

D

D.	DEEP,DEPTH
DBL.	DOUBLE
DEMO.	DEMOLISH, DEMOLITION
DEP.	DEPRESSED
DEPT.	DEPARTMENT
DET.	DETAIL
D.F.	DRINKING FOUNTAIN
DIA.	DIAMETER
DIM.	DIMENSION
DISP.	DISPENSER
D.M.H.	DRAIN MANHOLE
DN.	DOWN
DR.	DOOR
DS.	DOWNSPOUT
D.S.P.	DRY STANDPIPE
DWG.	DRAWING
DWR.	DRAWER

E

E.	EAST
EA.	EACH
E.B.	EXPANSION BOLT
E.F.	EACH FACE
E.J.	EXPANSION JOINT
EL.	ELEVATION
ELEC.	ELECTRICAL
ELEV.	ELEVATOR
EMER.	EMERGENCY
ENCL.	ENCLOSURE
E.P.	ELEC. PANELBOARD
EQ.,	EQUAL
EQPT.	EQUIPMENT
E.S.	ELECTRIC STRIKE
E.T.R	EXISTING TO REMAIN
E.W.	EACH WAY
E.W.C.	ELEC. WATER COOLER
EXH.	EXHAUST
EXP.	EXPOSED, EXPANSION
EXIST.	EXISTING
EXT.	EXTERIOR

F

F.	FEMALE
F.A.	FIRE ALARM, FRESH AIR
F.A.E.M.	FLUID APPLIED ELASTOMERIC MEMBRANE
F.B.	FLAT BAR
F.B.O.	FURNISHED BY OTHERS
F.D.	FLOOR DRAIN
FDN.	FOUNDATION
F.E.	FIRE EXTINGUISHER
F.E.C.	FIRE EXTINGUISHER CABINET
F.F.	FACTORY FINISH
F.H.	FIRE HYDRANT
F.H.C.	FIRE HOSE CABINET
FIN. FL.	FINISH(ED) FLOOR
FL.	FLOOR
FLASH.	FLASHING
FLDG.	FOLDING
FLUOR.	FLUORESCENT
F.O.C.	FACE OF CONCRETE
F.O.S.	FACE OF STUD(S)
FPRF.	FIREPROOF
FR.	FRAME
F.R.P.	FIBERGLASS REINFORCED PANEL
F.S.	FULL SIZE, FLOOR SINK
FT.	FOOT, FEET
F.T.	FIRE TREATED
FTG.	FOOTING
FURR.	FURRED, (ING)
FUT.	FUTURE

G

GA.	GAUGE
GALV.	GALVANIZED
G.B.	GRAB BAR
G.C.	GENERAL CONTRACT(OR)
G.C.M.U.	GLAZED CEMENT MASONRY UNIT
G.F.R.C.	GLASS FIBER REINFORCED CONCRETE
G.I.	GALVANIZED IRON/STEEL
GL.	GLASS
GLB.	GLASS BLOCK
GLU.LAM.	GLUE LAMINATED
GND.	GROUND
GR.	GRADE
G.W.B.	GYPSUM WALL BOARD
GYP. BD.	GYPSUM BOARD

H

H.	HIGH
H.B.	HOSE BIBB
H.C.	HOLLOW CORE
H.D.	HEAVY DUTY, HOT DIPPED
HDBD	HARDBOARD
HDNR	HARDENER
HDR.	HEADER
HDWD.	HARDWOOD
HDWE.	HARDWARE
HGT.	HEIGHT
H.M.	HOLLOW METAL
HORIZ.	HORIZONTAL
H.P.	HIGH POINT
HR.	HOUR
H.V.A.C.	HEATING/VENTILATING AIR CONDITIONING

I

I.D.	INSIDE DIAMETER/DIMENSION
INCL.	INCLUD(ED), (ING), (SIVE)
INSUL.	INSULATION
INT.	INTERIOR
INV.	INVERT

J

JAN.	JANITOR
JST.	JOIST
JT.	JOINT

K

KIT.	KITCHEN
K.J.	KEYED JOINT
K.O.	KNOCK-OUT

L

LAB.	LABORATORY
LAM.	LAMINATE
LAV.	LAVATORY
LKR.	LOCKER
L.P.	LOW POINT
L.R.	LIVING ROOM
LT.	LIGHT
LVR.	LOUVER
LWT.	LIGHTWEIGHT

M

M.	MALE
MAX.	MAXIMUM
M.C.	MEDICINE CABINET
MECH.	MECHANICAL
MEMB.	MEMBRANE
MET.	METAL
MFR.	MANUFACTURER
MH.	MANHOLE
MIN.	MINIMUM
MIR.	MIRROR
MISC.	MISCELLANEOUS
M.O.	MASONRY OPENING
MTD.	MOUNTED
MTG.	MOUNTING
MUL.	MULLION

N

N.	NORTH
N.C.	NONCOMBUSTIBLE
N.I.C.	NOT IN CONTRACT
NO., #	NUMBER
NOM.	NOMINAL
N.T.S.	NOT TO SCALE

O

O.A.	OVERALL
OBS.	OBSCURE
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER/DIMENSION
OFF.	OFFICE
OPNG.	OPENING
OPP.	OPPOSITE

P

PC.	PIECE
PFND.	PREFINISHED
P.L.	PROPERTY LINE
P.LAM.	PLASTIC LAMINATE
PLAS.	PLASTER
PLBG.	PLUMBING
PL.GL.	PLATE GLASS
PLYWD.	PLYWOOD
PNL.	PANEL
POL.	POLISHED
P.P.	PORCELAIN PAVERS
PR.	PAIR
PRCST.	PRECAST
P.T.	PRESSURE TREATED
PT.	POINT
PTD.,P.	PAINTED
P.T.D.	PAPER TOWEL DISPENSER
P.T.D./R.	COMBINATION PAPER TOWEL DISPENSER AND RECEPTACLE
PTN.	PARTITION
P.T.R.	PAPER TOWEL RECEPTACLE
P.V.C.	POLYVINYL CHLORIDE
PVMT.	PAVEMENT

Q

Q.T.	QUARRY TILE

R

R.	RISER, RADIUS
RAD.	RADIUS
R.A.F.	RAISED ACCESS FLOORING
R.A.R.	RETURN AIR REGISTER
R.B.	REINFORCING BAR(S)
R.D.	ROOF DRAIN
REF.	REFERENCE
REFR.	REFRIGERATOR
REINF.	REINFORCES, REINFORCING
REQD.	REQUIRED
RESIL.	RESILIENT
R.F.	RUBBER FLOORING
R.H.	ROBE HOOK
RM.	ROOM
R.O.	ROUGH OPENING
RUB	RUBBER
RWD.	REDWOOD

S

S.	SOUTH
S.A.R.	SUPPLY AIR REGISTER
S.A.T.	SUSPENDED ACOUSTICAL TILE
S.C.	SOLID CORE
SC.	SCALE
S.C.D.	SEAT COVER DISPENSER
SCHED.	SCHEDULE
SCR.	SCREEN
S.D.	SOAP DISPENSER
SECT.	SECTION
SF., SQ.FT.	SQUARE FOOT (FEET)
S.G.B.	SUSPENDED GYPSUM BOARD
SHR.	SHOWER
SHT.	SHEET
SIM.	SIMILAR
SL.	SLOPE
SLDG.	SLIDING
S.N.D.	SANITARY NAPKIN DISPENSER
S.N.R.	SANITARY NAPKIN RECEPTACLE
S.P.	SUSPENDED PLASTER
SQ.	SQUARE
S.S.	STAINLESS STEEL
S.SK.	SERVICE SINK
STA.	STATION
STD.	STANDARD
STL.	STEEL
STOR.	STORAGE
STRUC	STRUCTURAL
SURR.	SURROUND
SUSP.	SUSPEND(ED)
S.W.C.	SOLID WOOD CORE
SYM.	SYMMETRICAL

T

T.B.	TOWEL BAR
T.C.	TOP OF CURB
TEL.	TELEPHONE
TEMP.	TEMPERED
TER.	TERRAZZO
T.& G.	TONGUE AND GROOVE
T.O.S.	TOP OF STAIR (TOP OF STEEL)
THR.	THRESHOLD
T.P.	TOP OF PAVEMENT
T.P.D.	TOILET PAPER DISPENSER
T.P.H.	TOILET PAPER HOLDER
TRD., T.	TREAD
T.V.	TELEVISION
T.O.W.	TOP OF WALL
TYP.	TYPICAL

U

UNF.	UNFINISHED
U.O.N.	UNLESS OTHERWISE NOTED
UR.	URINAL
U.P.	UTILITY POLE

V

VB	VINYL BASE
V.C.T.	VINYL COMPOSITION TILE
VERT.	VERTICAL
V.I.F.	VERIFY IN FIELD
V.W.C.	VINYL WALL COVERING
VNR.PLAS.	VENEER PLASTER

W

W.	WEST, WIDE, WIDTH
W/	WITH
W.C.	WATER CLOSET,
WD.	WOOD
WDW.	WINDOW
W.F.	WIDE FLANGE
WG	WATER GATE
W.H.	WATER HEATER
W/O	WITHOUT
WP.	WATERPROOF (ING)
W.R.	WATER RESISTANT
WSCT.	WAINSCOT
W.S.P.	WET STAND PIPE
WGT.	WEIGHT
W.W.M.	WELDED WIRE MESH

GENERAL FINISH LEGEND

PAINTED CONCRETE

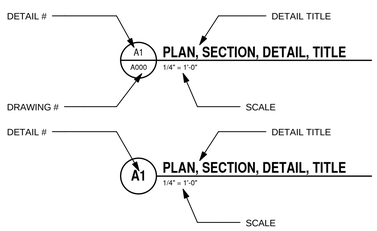
CARPET

HARD WOOD FLOORING

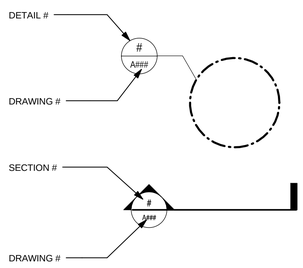
EXISTING RUBBER FLOORING

ARCHITECTURAL SYMBOLS LEGEND

TITLE MARKS

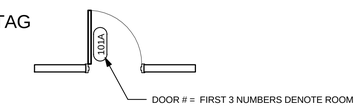


DETAIL BOUNDARY

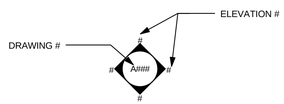


SECTION MARK

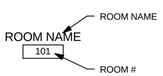
DOOR TAG



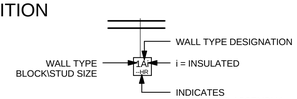
INTERIOR ELEVATION



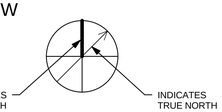
ROOM TAG



INTERIOR PARTITION TAG



NORTH ARROW



FF&E TAG



KEYED NOTE



DEMO NOTE



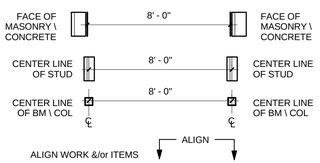
REVISION TAG



ELEVATION MARK



DIMENSIONS



CDR MAGUIRE

Architects / Engineers / Planners
211 Congress Street, 11th Floor
Boston, Massachusetts 02110
TEL. (617) 778-1440
www.cdrmaguire.com

REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools
Education · Inspiration · Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

SYMBOLS AND ABBREVIATIONS

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

A001

SHEET 9 **OF** 61

CODE DATA

I. PROJECT AREA

LEVEL B - KITCHEN	4,683 sf
LEVEL 1 - AUDITORIUM	9,710 sf
LEVEL 2 - MEZZANINE	3,573 sf
TOTAL PROJECT AREA	17,966 sf

II. BUILDING CODE DATA

BUILDING CODE
780 CMR: Massachusetts Building Code (8th Edition)
(2009 International Building Code, amended)
(2009 International Existing Building Code, amended)

STRUCTURAL CODE
780 CMR: Massachusetts Building Code (8th Edition)
(2009 International Building Code, amended)
(2009 International Existing Building Code, amended)

FIRE PREVENTION / LIFE SAFTY
527 CMR: Massachusetts Fire Prevention Regulations
IFC 2009 MA AMENDMENT 101.4.5

ENERGY CODE
780 CMR: Massachusetts Building Code (8th Edition)
Chapter 13 - Energy Conservation
(2009 International Energy Code, amended)

PLUMBING CODE
248 CMR: Massachusetts Fuel, Gas & Plumbing Code

MECHANICAL CODE
2009 International Mechanical Code

ELECTRICAL CODE
527 CMR 12.00: Massachusetts Electrical Code
(2011 National Electrical Code)

ELEVATOR CODE
524 CMR: Massachusetts Elevator Code
(2004 ASME A17.1)

ACCESSABILITY CODE
521 CMR: Massachusetts Architectural Access Board Regulations
ADA Standards for Accessible Design

A. CONSTRUCTION TYPES

CONSTRUCTION TYPE = IIIB non-sprinkerled

THESE CONSTRUCTION TYPES EQUATE TO THE FOLOWING FIRE RATINGS:

Table 601 - Fire-Resistance Rating Requirements for Building Elements (hours)

BUILDING ELEMENT	FIRE RATING IN HOURS
1. PRIMARY STRUCTURAL FRAME	0
2. BEARING WALLS	
EXTERIOR	2
INTERIOR	0
3. NON-BEARING WALLS AND PARTITIONS	
EXTERIOR	0
4. NON-BEARING WALLS AND PARTITIONS	
INTERIOR	0
5. FLOOR CONSTRUCTION AND SECONDARY MEMBERS	0
6. ROOF CONSTRUCTION AND SECONDARY MEMBERS	0

B. ALLOWABLE AREA AND HEIGHT

Existing Areas

Height and Area Limitations
Construction Type IIIB

Code Reference	Use Group A-1		
	Height		Area ft²/ Story
	Stories	ft	
Table 503	2 Stories	55 FT	8,500 SF
Code Reference	**Use Group A-2**		
	Height		Area ft²/ Story
	Stories	ft	
Table 503	2 Stories	55 FT	9,500 SF

E. 803.6 INTERIOR FINISHES

Group	Exit Enclosures and Exit Passageways	Corridors	Rooms and Enclosed Spaces
A-1 and A-2	A	A	B

1. OCCUPANCY

1. OCCUPANCY LOAD TYPES

STORAGE	300sf / PERSON GROSS
ASSEMBLY- STANDING SPACE	5sf / PERSON NET
BUSINESS AREAS	100sf / PERSON NET
KITCHENS - COMMERCIAL	200sf / PERSON GROSS
LOCKER ROOMS	50sf / PERSON GROSS
STAGES AND PLATFORMS	15sf / PERSON NET

2. FIXED SEATING

Current Seating:

LEVEL 1	794
LEVEL 2	380
TOTAL SEATS	1174

Proposed Seating:

LEVEL 1	858+8 ADA spaces=866 (+72)
LEVEL 2	285+4 ADA spaces=289 (-91)
TOTAL SEATS	1155 (-19)

3. OCCUPANCY LOAD PER FLOOR

TOTAL OCCUPANCY IN AREA OF WORK: 1,347

Occupant Load (780 CMR 1004.0)

Level	Area	Floor Area (ft²)	Occupant Load Factor (ft²/occ)	Allowable Occupant Load	Actual Occupant Load (DaytimeUse)	Actual Occupant Load (Event Use)	Actual Occupant Load (Staff Use)
B	Main Kitchen	2,397	200 gross	11	11	11	11
	Servery	205	5 net	41	0	41	0
	Storage	49	300 gross	1	0	0	0
	Office	61	100 net	1	1	1	1
	Receiving	244	300 gross	1	0	0	0
	Non-Food Storage	238	300 gross	1	0	0	0
	Dry Food Storage	325	300 gross	1	0	0	0
	Cooler	175	300 gross	1	0	0	0
	Freezer	175	300 gross	1	0	0	0
	Staff Locker	240	50 gross	4	0	4	0
			Floor Total =	**63**	**12**	**57**	**12**
1	Auditorium	7,766	1 per seat	866	0	866	0
	Stage	1,341	15 net	89	0	89	0
	Stair Lobby	100	5 net	20	0	20	0
	Stair Lobby	100	5 net	20	0	20	0
			Floor Total =	**995**	**0**	**995**	**0**
2	Mezzanine	3,573	1 per seat	289	0	289	0
			Floor Total =	**289**	**0**	**289**	**0**

2. MEANS OF EGRESS

Number of Exits (780 CMR 1018.0)

Level	Occupant Load	Required Number of Exits	Number of Exits Provided
B	63	2	5
1	995	3	7
2	285	2	6

Exit Capacity (780 CMR 1005.0)

Level	Occupant Load	Exit Allowance (in/person)	Total Exit Capacity Provided (persons)		Status
B	63	0.20 (STAIR) 0.15 (DOOR)	**Stair 5** 34"dr / 0.15=226 36"st / 0.20=180 **Total = 406**	**Stair 6** 34"dr / 0.15=226 36"st / 0.20=180 **Total = 406**	Compliant
			Stair 7 34"dr / 0.15=226 36"st / 0.20=180 **Total = 406**	**Stair 8** 34"dr / 0.15=226 36"st / 0.20=180 **Total = 406**	
			Stair Total = 1,624		
1	995	0.20 (STAIR) 0.15 (DOOR)	Exit Doors (2 double 6 single doors total) 68"dr / 0.15= 453 x 2 Total = 966 34"dr / 0.15= 226 x 6 Total = 1,356		Compliant
			Total = 2,322		
2	285	0.20 (STAIR) 0.15 (DOOR)	**Stair 3** 34"dr / 0.15=226 36"st / 0.20=180 **Total = 406**	**Stair 4** 34"dr / 0.15=226 36"st / 0.20=180 **Total = 406**	Compliant
			Stair 5 34"dr / 0.15=226 36"st / 0.20=180 **Total = 406**	**Stair 6** 34"dr / 0.15=226 36"st / 0.20=180 **Total = 406**	
			Stair Total = 1,624		

RELEVANT CODE SECTIONS AND EXCEPTIONS

Chapter 11 - Historic Buildings

SECTION 1101 GENERAL

1101.1 Scope. It is the intent of this chapter to provide means for the preservation of historic buildings as certified by the Massachusetts Historical Commission. There is no obligation for owners of historic buildings to use the provisions of this chapter. This chapter shall preempt all other regulations of 780 CMR governing the reconstruction, renovation, alteration, change of use and occupancy, repair, maintenance and additions for the conformity of historic buildings and structures to 780 CMR, with the exception of section 113 of the International Building Code 2009 with Massachusetts Amendments (780 CMR 113) for appeals, or unless otherwise specified.

Somerville High School (1895), 81 Highland Avenue, Somerville, Massachusetts; Hartwell, Richardson & Driver. NRHP-listed."National Register Information System". National Register of Historic Places. National Park Service. 2010-07-09.

Chapter 4 - Classification of Work
SECTION 403 ALTERATION-LEVEL 1

403.1 Scope. Level 1 alterations include the removal and replacement or the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose.

Chapter 6 - Alterations - Level 1
SECTION 601 GENERAL

601.2 Conformance. An existing building or portion thereof shall not be altered such that the building becomes less safe than its existing condition.

SECTION 602 BUILDING ELEMENTS AND MATERIALS

602.1 Interior finishes. All newly installed interior wall and ceiling finishes shall comply with Chapter 8 of the International Building Code.

602.2 Interior floor finish. New interior floor finish, including new carpeting used as an interior floor finish material, shall comply with Section 804 of the International Building Code.

602.3 Interior trim. All newly installed interior trim materials shall comply with Section 806 of the International Building Code.

602.4 Materials and methods. All new work shall comply with materials and methods requirements in the International Building Code, International Energy Conservation Code, International Mechanical Code, and International Plumbing Code, as applicable, that specify material standards, detail of installation and connection, joints, penetrations, and continuity of any element, component, or system in the building.

SECTION 603 FIRE PROTECTION

603.1 General. Alterations shall be done in a manner that maintains the level of fire protection provided.

RELEVANT CODE SECTIONS AND EXCEPTIONS

SECTION 604 MEANS OF EGRESS

604.1 General. Alterations shall be done in a manner that maintains the level of protection provided for the means of egress, and in accordance with section 102.2.2.1.

SECTION 605 ACCESSIBILITY

605.1 General. Accessibility requirements shall be in accordance with 521 CMR. Elevator and platform lift installation requirements are per 524 CMR.

Exceptions:

605.1.6 Performance areas. Where it is technically infeasible to alter performance areas to be on an accessible route, at least one of each type of performance area shall be made accessible.

SECTION 607 ENERGY CONSERVATION

607.1 Minimum requirements. Level 1 alterations to existing buildings or structures are permitted without requiring the entire building or structure to comply with the energy requirements of the International Energy Conservation Code or International Residential Code. The alterations shall conform to the energy requirements of the International Energy Conservation Code or International Residential Code as they relate to new construction only.

SECTION 1102 REPAIRS

1102.1 General. Repairs to any portion of an historic building or structure shall be permitted with original or like materials and original methods of construction, subject to the provisions of this chapter.

1102.5 Replacement. Replacement of existing or missing features using original materials shall be permitted. Partial replacement for repairs that match the original in configuration, height, and size shall be permitted. Such replacements shall not be required to meet the materials and methods requirements of section 501.2. Individual components of an existing building system may be repaired or replaced in kind without requiring the system to comply with the code for new construction.

1103.3 Means of egress. Existing door openings and corridor and stairway widths less than those specified elsewhere in this code may be approved, provided that, in the opinion of the code official, there is sufficient width and height for a person to pass through the opening or traverse the means of egress. When approved by the code official, the front or main exit doors need not swing in the direction of the path of exit travel, provided that other approved means of egress having sufficient capacity to serve the total occupant load are provided.

1103.5 Interior finishes. The existing finishes of walls and ceilings shall be accepted when it is demonstrated that they are the historic finishes.

1103.6 Stairway enclosure. In buildings of three stories or less, exit enclosure construction shall limit the spread of smoke by the use of tight-fitting doors and solid elements. Such elements are not required to have a fire-resistance rating.

1103.10 Guards. Guards shall comply with Sections 1103.10.1 and 1103.10.2.

1103.10.1 Height. Existing guards shall comply with the requirements of Section 505. 1103.10.2 Guard openings. The spacing between existing intermediate railings or openings in existing ornamental patterns shall be accepted. Missing elements or members of a guard may be replaced in a manner that will preserve the historic appearance of the building or structure.

1103.11 Exit signs. Where exit sign or egress path marking location would damage the historic character of the building, alternative exit signs are permitted with approval of the code official. Alternative signs shall identify the exits and egress path.

International Building Code 2009
780 CMR: MASSACHUSETTS AMENDMENTS TO THE INTERNATIONAL BUILDING CODE 2009
CHAPTER 1: SCOPE AND ADMINISTRATION

102.6 Existing Structures. The legal occupancy of any structure existing on the date of adoption of this code shall be permitted to continue without change, except as is specifically covered in this code or as deemed necessary by the building official for the general safety and welfare of the public.

Chapter 4 - Special Detailed Requirements Based on Use and Occupancy

SECTION 410 STAGES AND PLATFORMS

410.3.1 Stage construction. Stages shall be constructed of materials as required for floors for the type of construction of the building in which such stages are located.

410.3.3 Exterior stage doors. Where protection of openings is required, exterior exit doors shall be protected with fire door assemblies that comply with Section 715. Exterior openings that are located on the stage for means of egress or loading and unloading purposes, and that are likely to be open during occupancy of the theater, shall be constructed with vestibules to prevent air drafts into the auditorium.

410.3.4 Proscenium wall. Where the stage height is greater than 50 feet (15 240 mm), all portions of the stage shall be completely separated from the seating area by a proscenium wall with not less than a 2-hour fire-resistance rating extending continuously from the foundation to the roof.

Exception: Stage height of 27 ft < 50 ft

410.3.5 Proscenium curtain. Where a proscenium wall is required to have a fire-resistance rating, the stage opening shall be provided with a fire curtain complying with NFPA 80 or an approved water curtain complying with Section 903.3.1.1 or, in facilities not utilizing the provisions of smoke-protected assembly seating in accordance with Section 1028.6.2, a smoke control system complying with Section 909 or natural ventilation designed to maintain the smoke level at least 6 feet (1829 mm) above the floor of the means of egress.

410.3.6 Scenery. Combustible materials used in sets and scenery shall meet the fire propagation performance criteria of NFPA 701, in accordance with Section 806 and the International Fire Code. Foam plastics and materials containing foam plastics shall comply with Section 2603 and the International Fire Code.

410.3.7 Stage ventilation. Emergency ventilation shall be provided for stages larger than 1,000 square feet (93 m2) in floor area, or with a stage height greater than 50 feet (15 240 mm). Such ventilation shall comply with Section 410.3.7.1 or 410.3.7.2.

Shall comply per 102.2.2.5 Unsafe Lighting and/or Ventilation - Stage area 1,341 SF > 1,000

410.3.7.1 Roof vents. Two or more vents constructed to open automatically by approved heat-activated devices and with an aggregate clear opening area of not less than 5 percent of the area of the stage shall be located near the center and above the highest part of the stage area. Supplemental means shall be provided for manual operation of the ventilator. Curbs shall be provided as required for skylights in Section 2610.2. Vents shall be labeled.

410.4 Platform construction. Permanent platforms shall be constructed of materials as required for the type of construction of the building in which the permanent platform is located. Permanent platforms are permitted to be constructed of fire-retardant-treated wood for Types I, II and IV construction where the platforms are not more than 30 inches (762 mm) above the main floor, and not more than one-third of the room floor area and not more than 3,000 square feet (279 m2) in area. Where the space beneath the permanent platform is used for storage or any purpose other than equipment, wiring or plumbing, the floor assembly shall not be less than 1-hour fire-resistance-rated construction. Where the space beneath the permanent platform is used only for equipment, wiring or plumbing, the underside of the permanent platform need not be protected.

410.5.3 Stage exits. At least one approved means of egress shall be provided from each side of the stage and from each side of the space under the stage. At least one means of escape shall be provided from each fly gallery and from the gridiron. A steel ladder, alternating tread device or spiral stairway is permitted to be provided from the gridiron to a scuttle in the stage roof.

410.7 Standpipes. Standpipe systems shall be provided in accordance with Section 905. [F]

Chapter 8 - Interior Finishes
SECTION 806 DECORATIVE MATERIALS AND TRIM [F]

806.1 General requirements. In occupancies in Groups A, E, I and R-1 and dormitories in Group R-2, curtains, draperies, hangings and other decorative materials suspended from walls or ceilings shall meet the flame propagation performance criteria of NFPA 701 in accordance with Section 806.2 or be noncombustible. [F]

806.1.2 Combustible decorative materials. The permissible amount of decorative materials meeting the flame propagation performance criteria of NFPA 701 shall not exceed 10 percent of the specific wall or ceiling area to which it is attached. [F]

Exceptions:

1. In auditoriums in Group A, the permissible amount of decorative material meeting the flame propagation performance criteria of NFPA 701 shall not exceed 75 percent of the aggregate wall area where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 and where the material is installed in accordance with Section 803.11

Chapter 10 - Means of Egress
SECTION 1003 GENERAL MEANS OF EGRESS

1003.6 Means of egress continuity. The path of egress travel along a means of egress shall not be interrupted by any building element other than a means of egress component as specified in this chapter. Obstructions shall not be placed in the required width of a means of egress except projections permitted by this chapter. The required capacity of a means of egress system shall not be diminished along the path of egress travel.

SECTION 1005 EGRESS WIDTH

1005.1 Minimum required egress width. The means of egress width shall not be less than required by this section. The total width of means of egress in inches (mm) shall not be less than the total occupant load served by the means of egress multiplied by 0.3 inch (7.62 mm) per occupant for stairways and by 0.2 inch (5.08 mm) per occupant for other egress components. The width shall not be less than specified elsewhere in this code. Multiple means of egress shall be sized such that the loss of any one means of egress shall not reduce the available capacity to less than 50 percent of the required capacity. The maximum capacity required from any story of a building shall be maintained to the termination of the means of egress.

Exception: Means of egress complying with Section 1028.

SECTION 1008 DOORS, GATES AND TURNSTILES

1008.1.4.4 Access-controlled egress doors. The entrance doors in a means of egress in buildings with an occupancy in Group A, B, E, I-2, M, R-1 or R-2 and entrance doors to tenant spaces in occupancies in Groups A, B, E, I-2, M, R-1 and R-2 are permitted to be equipped with an approved entrance and egress access control system which shall be installed in accordance with all of the following criteria:
1. A sensor shall be provided on the egress side arranged to detect an occupant approaching the doors. The doors shall be arranged to unlock by a signal from or loss of power to the sensor.
2. Loss of power to that part of the access control system which locks the doors shall automatically unlock the doors.
3. The doors shall be arranged to unlock from a manual unlocking device located 40 inches to 48 inches (1016 mm to 1219 mm) vertically above the floor and within 5 feet (1524 mm) of the secured doors. Ready access shall be provided to the manual unlocking device and the device shall be clearly identified by a sign that reads "PUSH TO EXIT." When operated, the manual unlocking device shall result in direct interruption of power to the lock-independent of the access control system electronics-and the doors shall remain unlocked for a minimum of 30 seconds.
4. Activation of the building fire alarm system, if provided, shall automatically unlock the doors, and the doors shall remain unlocked until the fire alarm system has been reset.
5. Activation of the building automatic sprinkler or fire detection system, if provided, shall automatically unlock the doors. The doors shall remain unlocked until the fire alarm system has been reset.
6. Entrance doors in buildings with an occupancy in Group A, B, E or M shall not be secured from the egress side during periods that the building is open to the general public.

SECTION 1022 EXIT ENCLOSURES

1022.1 Enclosures required. Interior exit stairways and interior exit ramps shall be enclosed with fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. Exit enclosures shall have a fire-resistance rating of not less than 2 hours where connecting four stories or more and not less than 1 hour where connecting less than four stories. The number of stories connected by the exit enclosure shall include any basements but not any mezzanines. Exit enclosures shall have a fire-resistance rating not less than the floor assembly penetrated, but need not exceed 2 hours. Exit enclosures shall lead directly to the exterior of the building or shall be extended to the exterior of the building with an exit passageway conforming to the requirements of Section 1023, except as permitted in Section 1027.1. An exit enclosure shall not be used for any purpose other than means of egress.

SECTION 1028 ASSEMBLY

1028.2 Assembly main exit. Group A occupancies and assembly occupancies accessory to Group E occupancies that have an occupant load of greater than 300 shall be provided with a main exit. The main exit shall be of sufficient width to accommodate not less than one-half of the occupant load, but such width shall not be less than the total required width of all means of egress leading to the exit. Where the building is classified as a Group A occupancy, the main exit shall front on at least one street or an unoccupied space of not less than 10 feet (3048 mm) in width that adjoins a street or public way.

1028.3 Assembly other exits. In addition to having access to a main exit, each level in Group A occupancies or assembly occupancies accessory to Group E occupancies having an occupant load greater than 300, shall be provided with additional means of egress that shall provide an egress capacity for at least one-half of the total occupant load served by that level and comply with Section 1015.2.

1028.5 Interior balcony and gallery means of egress. For balconies, galleries or press boxes having a seating capacity of 50 or more located in Group A occupancies, at least two means of egress shall be provided, with one from each side of every balcony, gallery or press box and at least one leading directly to an exit.

1028.6.
1 Without smoke protection. The clear width of the means of egress shall provide sufficient capacity in accordance with all of the following, as applicable:
1. At least 0.3 inch (7.6 mm) of width for each occupant served shall be provided on stairs having riser heights 7 inches (178 mm) or less and tread depths 11 inches (279 mm) or greater, measured horizontally between tread nosings.

1028.7 Travel distance. Exits and aisles shall be so located that the travel distance to an exit door shall not be greater than 200 feet (60 960 mm) measured along the line of travel in nonsprinklered buildings. Travel distance shall not be more than 250 feet (76 200 mm) in sprinklered buildings. Where aisles are provided for seating, the distance shall be measured along the aisles and aisle accessway without travel over or on the seats.

1028.8 Common path of egress travel. The common path of egress travel shall not exceed 30 feet (9144 mm) from any seat to a point where an occupant has a choice of two paths of egress travel to two exits.

1028.9 Assembly aisles are required. Every occupied portion of any occupancy in Group A or assembly occupancies accessory to Group E that contains seats, tables, displays, similar fixtures or equipment shall be provided with aisles leading to exits or exit access doorways in accordance with this section. Aisle accessways for tables and seating shall comply with Section 1017.4.

1028.9.1 Minimum aisle width. The minimum clear width for aisles shall be as shown:
1. Forty-eight inches (1219 mm) for aisle stairs having seating on each side.
Exception: Thirty-six inches (914 mm) where the aisle serves less than 50 seats.
2. Thirty-six inches (914 mm) for aisle stairs having seating on only one side.
3. Twenty-three inches (584 mm) between an aisle stair handrail or guard and seating where the aisle is subdivided by a handrail.
4. Forty-two inches (1067 mm) for level or ramped aisles having seating on both sides.
Exceptions:
1. Thirty-six inches (914 mm) where the aisle serves less that 50 seats.
2. Thirty inches (762 mm) where the aisle does not serve more than 14 seats.
5. Thirty-six inches (914 mm) for level or ramped aisles having seating on only one side.
Exceptions:
1. Thirty inches (762 mm) where the aisle does not serve more than 14 seats.
2. Twenty-three inches (584 mm) between an aisle stair handrail and seating where an aisle does not serve more than five rows on one side.

1028.9.2 Aisle width. The aisle width shall provide sufficient egress capacity for the number of persons accommodated by the catchment area served by the aisle. The catchment area served by an aisle is that portion of the total space that is served by that section of the aisle. In establishing catchment areas, the assumption shall be made that there is a balanced use of all means of egress, with the number of persons in proportion to egress capacity.

1028.9.3 Converging aisles. Where aisles converge to form a single path of egress travel, the required egress capacity of that path shall not be less than the combined required capacity of the converging aisles.

1028.9.4 Uniform width. Those portions of aisles, where egress is possible in either of two directions, shall be uniform in required width.

1028.9.5 Assembly aisle termination. Each end of an aisle shall terminate at cross aisle, foyer, doorway, vomitory or concourse having access to an exit.

Exceptions:
1. Dead-end aisles shall not be greater than 20 feet (6096 mm) in length.
2. Dead-end aisles longer than 20 feet (6096 mm) are permitted where seats beyond the 20-foot (6096 mm) dead-end aisle are no more than 24 seats from another aisle, measured along a row of seats having a minimum clear width of 12 inches (305 mm) plus 0.6 inch (15.2 mm) for each additional seat above seven in the row.
3. For smoke-protected assembly seating, the dead-end aisle length of vertical aisles shall not exceed a distance of 21 rows.
4. For smoke-protected assembly seating, a longer dead-end aisle is permitted where seats beyond the 21-row dead-end aisle are not more than 40 seats from another aisle, measured along a row of seats having an aisle accessway with a minimum clear width of 12 inches (305 mm) plus 0.3 inch (7.6 mm) for each additional seat above seven in the row.

1028.9.6 Assembly aisle obstructions. There shall be no obstructions in the required width of aisles except for handrails as provided in Section 1028.13.

1028.10 Clear width of aisle accessways serving seating. Where seating rows have 14 or fewer seats, the minimum clear aisle accessway width shall not be less than 12 inches (305 mm) measured as the clear horizontal distance from the back of the row ahead and the nearest projection of the row behind. Where chairs have automatic or self-rising seats, the measurement shall be made with seats in the raised position. Where any chair in the row does not have an automatic or self-rising seat, the measurements shall be made with the seat in the down position. For seats with folding tablet arms, row spacing shall be determined with the tablet arm in the used position.

1028.11.1 Treads. Tread depths shall be a minimum of 11 inches (279 mm) and shall have dimensional uniformity.

1028.11.2 Risers. Where the gradient of aisle stairs is to be the same as the gradient of adjoining seating areas, the riser height shall not be less than 4 inches (102 mm) nor more than 8 inches (203 mm) and shall be uniform within each flight.

1028.11.3 Tread contrasting marking stripe. A contrasting marking stripe shall be provided on each tread at the nosing or leading edge such that the location of each tread is readily apparent when viewed in descent. Such stripe shall be a minimum of 1 inch (25 mm), and a maximum of 2 inches (51 mm), wide.

1028.12 Seat stability. In places of assembly, the seats shall be securely fastened to the floor.

1028.14.1 Cross aisles. Cross aisles located more than 30 inches (762 mm) above the floor or grade below shall have guards in accordance with Section 1013.

Where an elevation change of 30 inches (762 mm) or less occurs between a cross aisle and the adjacent floor or grade below, guards not less than 26 inches (660 mm) above the aisle floor shall be provided.

1028.14.2 Sightline-constrained guard heights. Unless subject to the requirements of Section 1028.14.3, a fascia or railing system in accordance with the guard requirements of Section 1013 and having a minimum height of 26 inches (660 mm) shall be provided where the floor or footboard elevation is more than 30 inches (762 mm) above the floor or grade below and the fascia or railing would otherwise interfere with the sightlines of immediately adjacent seating. At bleachers, a guard must be provided where required by ICC 300.
1028.14.3 Guards at the end of aisles. A fascia or railing system complying with the guard requirements of Section 1013 shall be provided for the full width of the aisle where the foot of the aisle is more than 30 inches (762 mm) above the floor or grade below. The fascia or railing shall be a minimum of 36 inches (914 mm) high and shall provide a minimum 42 inches (1067 mm) measured diagonally between the top of the rail and the nosing of the nearest tread.

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REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools
Education · Inspiration · Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

CODE DATA SHEET

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: CS
CHECKED BY: FC
DATE: March 03, 2014
SCALE: 12" = 1'-0"

SHEET NUMBER:

A010

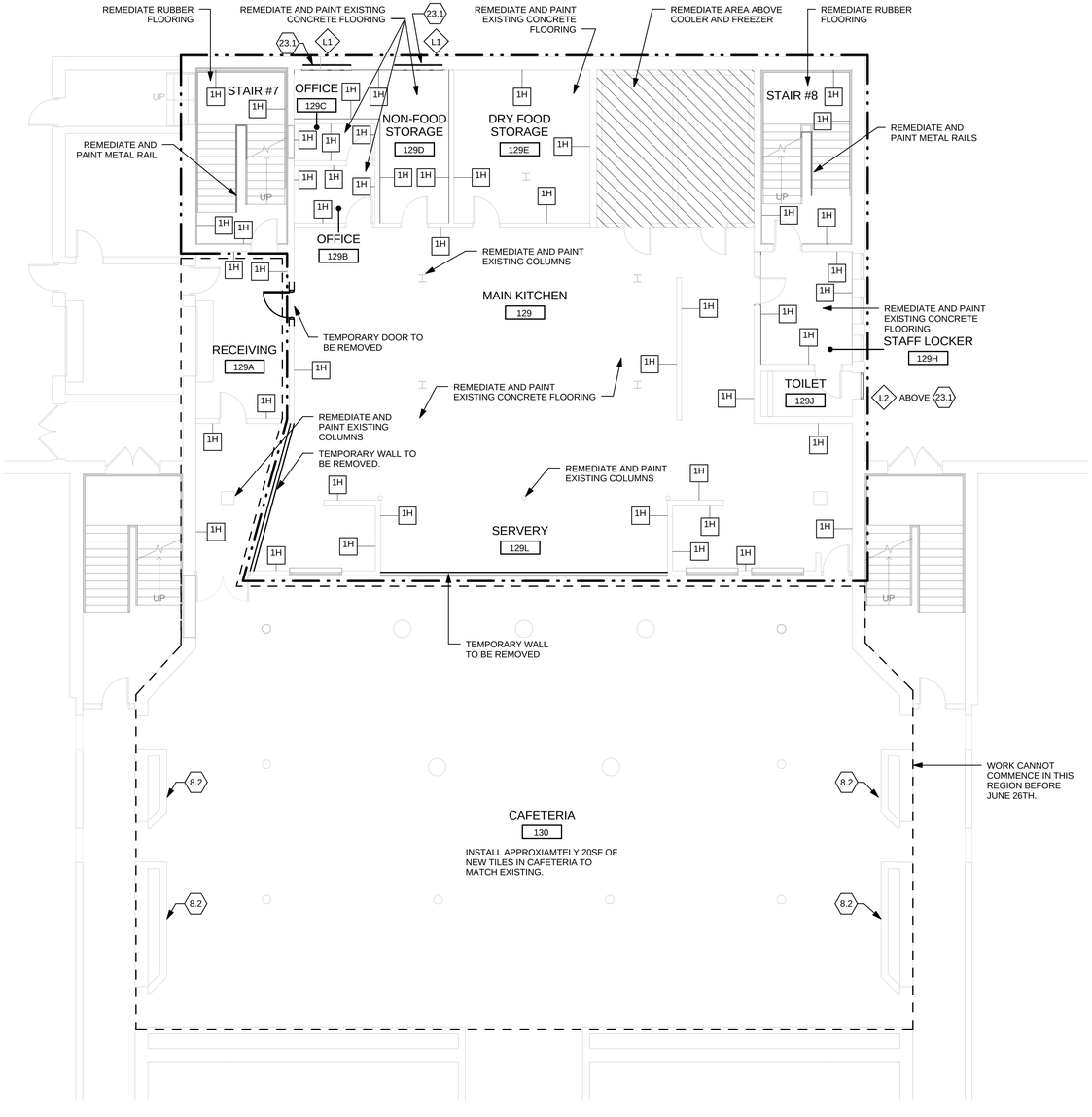
SHEET 10 **OF** 61

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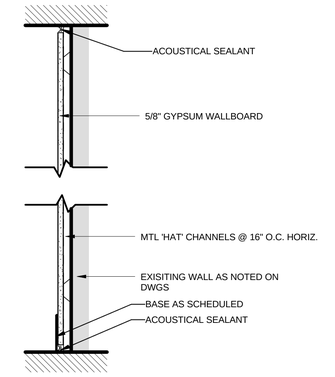
CAFETERIA/ KITCHEN PLAN WORK NOTES	
WORK NOTE #	WORK NOTE
8.2	REMOVE PORTION OF EXISTING GYP. FINISH AND STUD FRAMED WALL FINISH AS REQUIRED TO ACCOMODATE WORK. INFILL AS REQUIRED (COORDINATE WITH MEP)
23.1	INSTALL HVAC UNITS, WIRING AND CONTROLS (REFER TO MECHANICAL DRAWINGS).



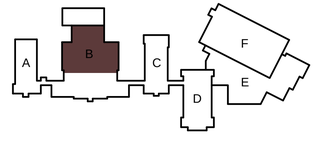
1 CAFETERIA/ KITCHEN FLOOR PLAN
SCALE: 1/8" = 1'-0"

GENERAL PLAN NOTES

1. COORDINATE ALL WORK WITH MECHANICAL AND ELECTRICAL DRAWINGS. NOTIFY ARCHITECT OF ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK.
2. ALL DIMENSIONS TO ARE TO FACE OF STUD AND FACE OF MASONRY UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS TO EXISTING CONSTRUCTION ARE TO FACE OF FINISH UNLESS OTHERWISE NOTED.
4. PATCH (AS NECESSARY), SAND, PRIME AND PAINT ALL EXISTING DOORS AND FRAMES, WINDOWS, WINDOW TRIMS, GYPSUM BOARD SOFFITS, GYPSUM BOARD WALLS (BACK STAGE) AND PLASTER WALLS ABOVE WOOD PANELING.
5. REFER TO SPECIFICATION SECTION 024120 FOR REMEDIATION OF MATERIALS.
6. REMOVE ALL PIPING INSULATION AND REPLACE WITH NEW WITHIN SCOPE OF WORK.
7. ⌜ ⌝ ⌞ ⌟ = SIGNIFIES AREAS THAT HAVE BEEN CUT TO EXPOSE EXISTING CONDITIONS TO BE PATCHED AND MATCHED TO ADJACENT SURFACES.



TYP. INTERIOR PARTITION TYPES
1 1/2" = 1'-0"



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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

CAFETERIA/ KITCHEN FLOOR PLAN

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

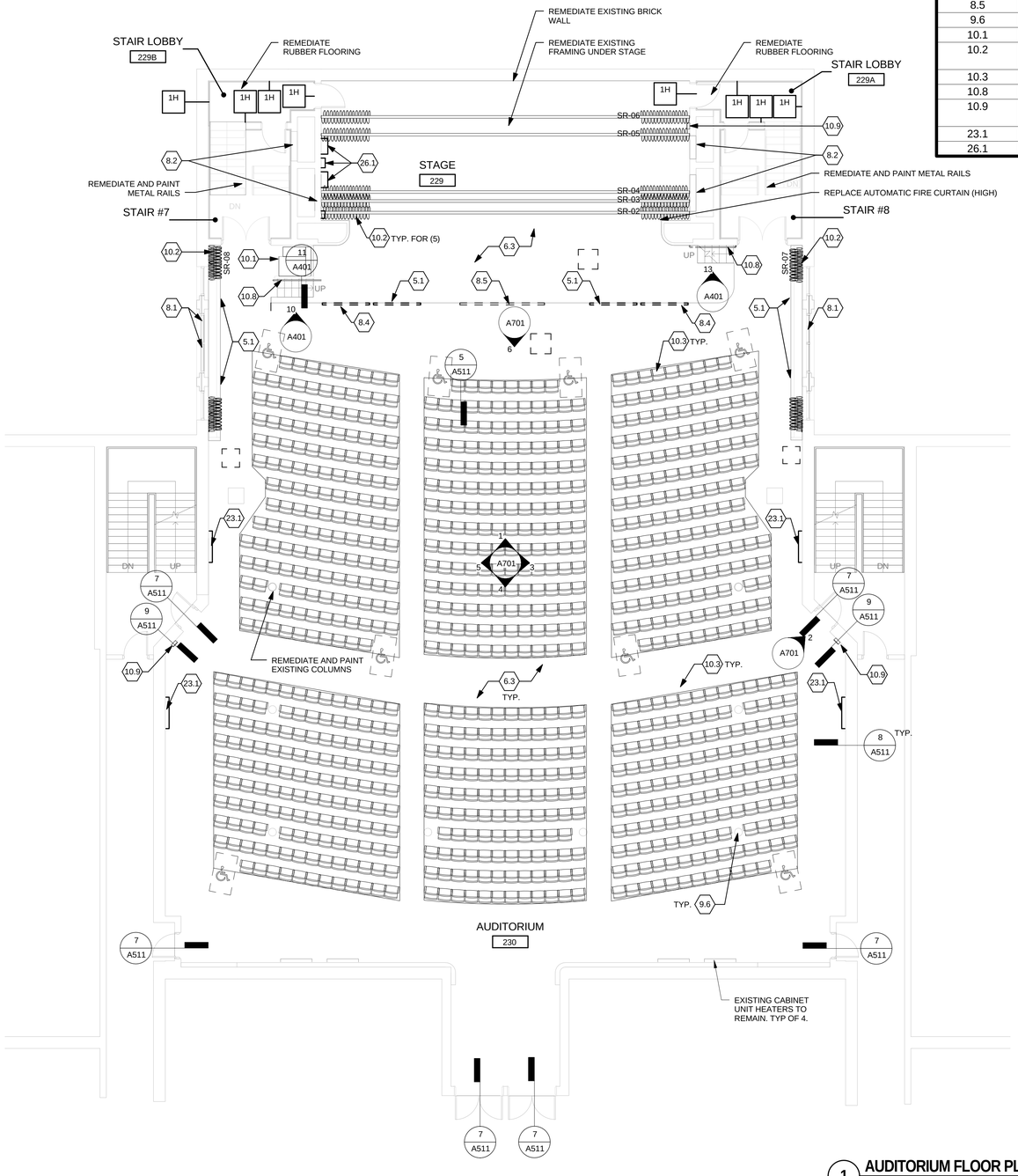
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SHEET 11 **OF** 61

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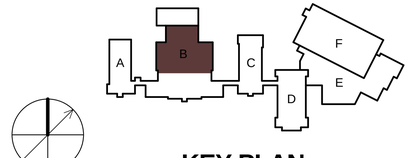


1 **AUDITORIUM FLOOR PLAN**
SCALE: 1/8" = 1'-0"

AUDITORIUM PLAN WORK NOTES	
WORK NOTE #	WORK NOTE
5.1	INSTALL METAL GRILLE
6.3	SAND, REFINISH, POLISH WOOD FLOOR AT STAGE AND AUDITORIUM FLOOR AND INSTALL CARPET FLOORING AT AUDITORIUM FLOOR, SEE DETAILS 5, 6, 7, 8/A511 AND SHEET A631 & 632 FOR LOCATIONS
8.1	REINSTALL EXISTING OPERABLE SASH AND INSULATED GLASS
8.2	REMOVE PORTION OF EXISTING GYP. FINISH AND STUD FRAMED WALL FINISH AS REQUIRED TO ACCOMODATE WORK. PROVIDE INFILL AS REQUIRED (COORDINATE WITH MEP).
8.4	CUT OPENING IN EXISTING STAGE APRON AND INSTALL METAL GRILLE. SEE EAST AND WEST ELEV. ON A701
8.5	CUT OPENING IN EXISTING STAGE APRON DOORS AND INSTALL MTL GRILLE. SEE NORTH ELEV. ON A701
9.6	REMEDIATE AND PAINT (6) EXISTING STEEL COLUMNS
10.1	INSTALL VERTICAL PLATFORM WHEELCHAIR LIFT. (REFER TO ELECTRICAL)
10.2	INSTALL SMOKE AND FIRE CURTAINS, MOTORS, WIRING AND CONTROLS AT STAGE AND WINDOW CURTAINS. (REFER TO ELECTRICAL)
10.3	SEATING WILL BE PROVIDED BY THE CITY OF SOMERVILLE AND INSTALLED BY MANUFACTURER BY G.C.
10.8	INSTALL HANDRAILS AT STAGE STAIRS. SEE DETAIL 10, 11, 12, 13/A401
10.9	MOUNT FIRE EXTINGUISHER. TO BE SEMI-RECESSED WALL MOUNTED IN AUDITORIUM AND WALL MOUNTED ON STAGE. SEE DETAIL 9/A511.
23.1	INSTALL HVAC UNITS, WIRING AND CONTROLS (REFER TO MECHANICAL)
26.1	INSTALL SOUND SYSTEM, XLR AND SPEAKER WIRING (REFER TO ELECTRICAL)

GENERAL PLAN NOTES

1. COORDINATE ALL WORK WITH MECHANICAL AND ELECTRICAL DRAWINGS. NOTIFY ARCHITECT OF ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK.
2. ALL DIMENSIONS TO ARE TO FACE OF STUD AND FACE OF MASONRY UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS TO EXISTING CONSTRUCTION ARE TO FACE OF FINISH UNLESS OTHERWISE NOTED.
4. PATCH (AS NECESSARY), SAND, PRIME AND PAINT ALL EXISTING DOORS AND FRAMES, WINDOWS, WINDOW TRIMS, GYPSUM BOARD SOFFITS, GYPSUM BOARD WALLS (BACK STAGE) AND PLASTER WALLS ABOVE WOOD PANELING.
5. REFER TO SPECIFICATION SECTION 024120 FOR REMEDIATION OF MATERIALS.
6. REMOVE ALL PIPING INSULATION AND REPLACE WITH NEW WITHIN SCOPE OF WORK.
7. ⌜ ⌝ ⌞ ⌟ = SIGNIFIES AREAS THAT HAVE BEEN CUT TO EXPOSE EXISTING CONDITIONS TO BE PATCHED AND MATCHED TO ADJACENT SURFACES.



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REVISIONS		
Number	Description	Date

ISSUED FOR BID

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

AUDITORIUM FLOOR PLAN

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

A102

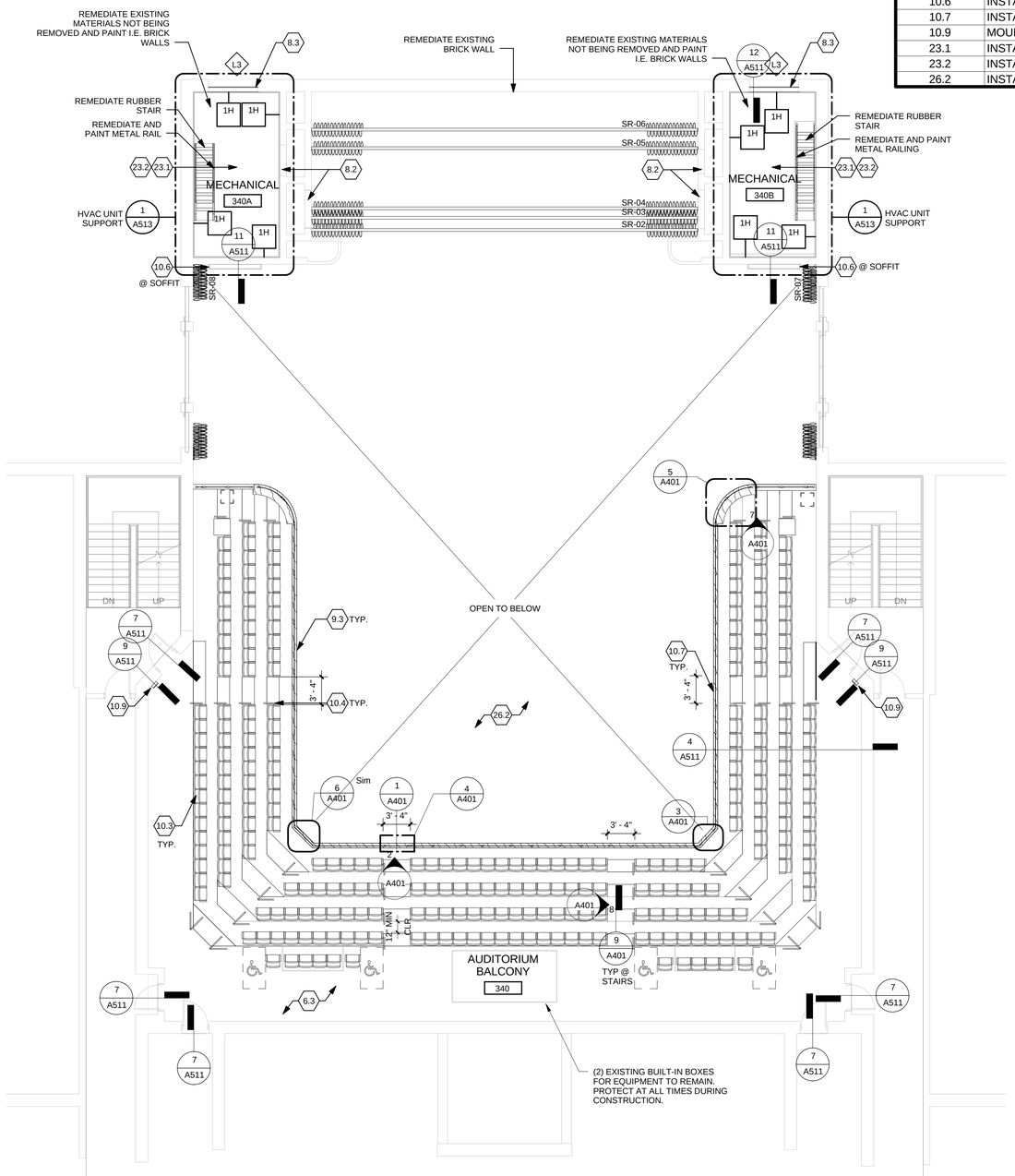
SHEET 12 OF 61

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AUDITORIUM BALCONY PLAN WORK NOTES	
WORK NOTE #	WORK NOTE
6.3	SAND, REFINISH, POLISH WOOD FLOOR AND INSTALL CARPET FLOORING, SEE DETAILS 5, 6, 7, 8/A511 AND SHEET A631 & A632 FOR LOCATIONS
8.2	REMOVE PORTION OF EXISTING GYP. FINISH AND STUD FRAMED WALL FINISH AS REQUIRED TO ACCOMODATE WORK. PROVIDE INFILL AS REQUIRED (COORDINATE WITH MEP)
8.3	ENLARGE OPENING TO ACCOMMODATE NEW LOUVER. SEE DRAWING A512
9.3	INSTALL WOOD FINISH AND CAP
10.3	SEATING WILL BE PROVIDED BY THE CITY OF SOMERVILLE AND INSTALLED BY G.C.
10.4	INSTALL STAINLESS STEEL HANDRAILS ALONG AISLES AT STAIRS, SEE DETAILS 7, 8, 9/A401
10.6	INSTALL AND BUILD OUT GYP WALL BOARD SOFFIT. SEE DETAIL 11/A511
10.7	INSTALL GUARDRAIL ON BALCONY PARAPET, SEE DETAILS 1, 2, 3, 4, 5/A401
10.9	MOUNT FIRE EXTINGUISHER. TO BE WALL MOUNTED IN AUDITORIUM AND ON STAGE. SEE DETAIL 9/A511
23.1	INSTALL HVAC UNITS, WIRING AND CONTROLS (REFER TO MECHANICAL)
23.2	INSTALL PIPING INSULATION (REFER TO MECHANICAL)
26.2	INSTALL LOW VOLTAGE CAMERA DEVICES, WIRING AND CONTROLS (REFER TO ELECTRICAL)

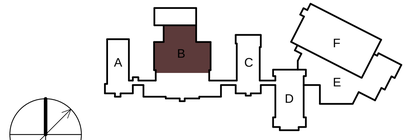


1 AUDITORIUM BALCONY FLOOR PLAN

SCALE: 1/8" = 1'-0"

GENERAL PLAN NOTES

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4. PATCH (AS NECESSARY), SAND, PRIME AND PAINT ALL EXISTING DOORS AND FRAMES, WINDOWS, WINDOW TRIMS, GYPSUM BOARD SOFFITS, GYPSUM BOARD WALLS (BACK STAGE) AND PLASTER WALLS ABOVE WOOD PANELING.
5. REFER TO SPECIFICATION SECTION 024120 FOR REMEDIATION OF MATERIALS.
6. REMOVE ALL PIPING INSULATION AND REPLACE WITH NEW WITHIN SCOPE OF WORK.
7. ⌜ ⌝ ⌞ ⌟ = SIGNIFIES AREAS THAT HAVE BEEN CUT TO EXPOSE EXISTING CONDITIONS TO BE PATCHED AND MATCHED TO ADJACENT SURFACES.



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AUDITORIUM BALCONY FLOOR PLAN

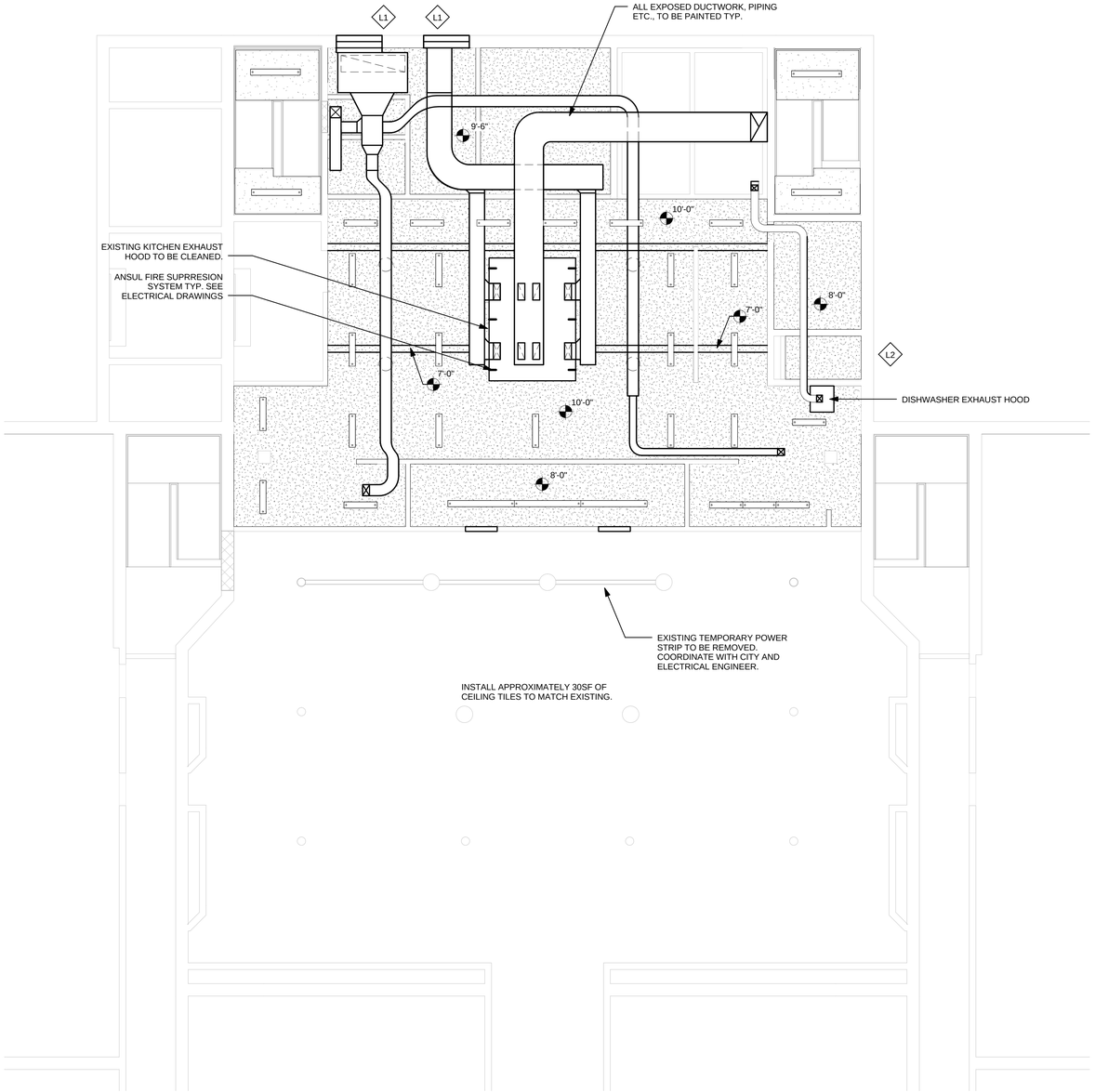
PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

A103

SHEET 13 **OF** 61

PROJECT FILE: C:\Users\EMorin\Documents\19431-Somerville, HS-Sandy_Repairs_EMorin.rvt
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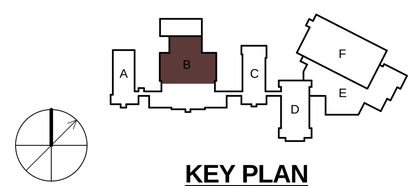
RCP FINISH LEGEND

	2'x2' SUSPENDED ACT CEILING. SEE FINISH SCHEDULE FOR TYPES.
	PAINTED GYPSUM BOARD CEILING / SOFFIT ON 7/8" METAL FURRING @16"O.C.
	TUBE STRIP SURFACE MOUNTED LIGHT FIXTURE (SEE ELEC.)
⊘	RECESSED CAN LIGHT
S	SPEAKERS (SEE TD DRAWINGS.)
	MECHANICAL DIFFUSER

GENERAL RCP NOTES

1. NOT ALL CEILING MOUNTED ITEMS MAY BE SHOWN. CONTRACTOR TO COORDINATE W/ STRUCTURAL, PLUMBING, MECHANICAL, ELECTRICAL AND AV DRAWINGS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES BEFORE STARTING WORK.
2. PROVIDE WHITE GROMMET TRIM AT ALL SUPPORT CABLE PENETRATIONS FOR SUSPENDED ELEMENTS.
3. SEE FLOOR PLAN FOR WORK NOTES.

1 **CAFETERIA/ KITCHEN RCP**
SCALE: 1/8" = 1'-0"



KEY PLAN

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TEL. (617) 778-1440
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Number	Description	Date

ISSUED FOR BID

Somerville Public Schools
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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

CAFETERIA/ KITCHEN RCP

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

A121

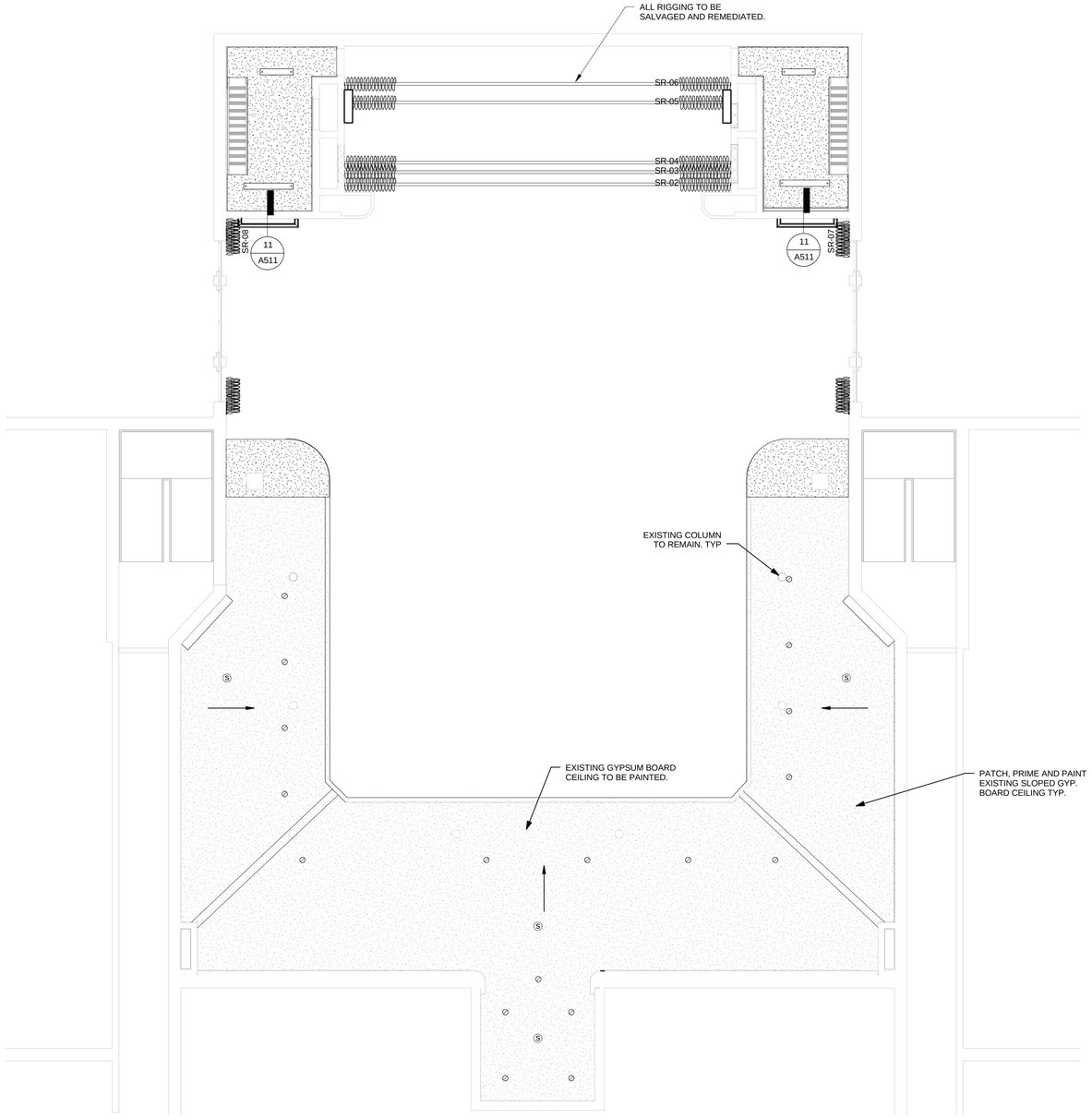
SHEET 14 **OF** 61

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

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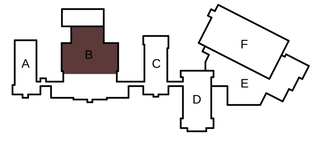
RCP FINISH LEGEND

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	TUBE STRIP SURFACE MOUNTED LIGHT FIXTURE (SEE ELEC.)
⊘	RECESSED CAN LIGHT
(S)	SPEAKERS (SEE TD DRAWINGS.)
	MECHANICAL DIFFUSER

GENERAL RCP NOTES

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2. PROVIDE WHITE GROMMET TRIM AT ALL SUPPORT CABLE PENETRATIONS FOR SUSPENDED ELEMENTS.
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1 **AUDITORIUM RCP**
SCALE: 1/8" = 1'-0"



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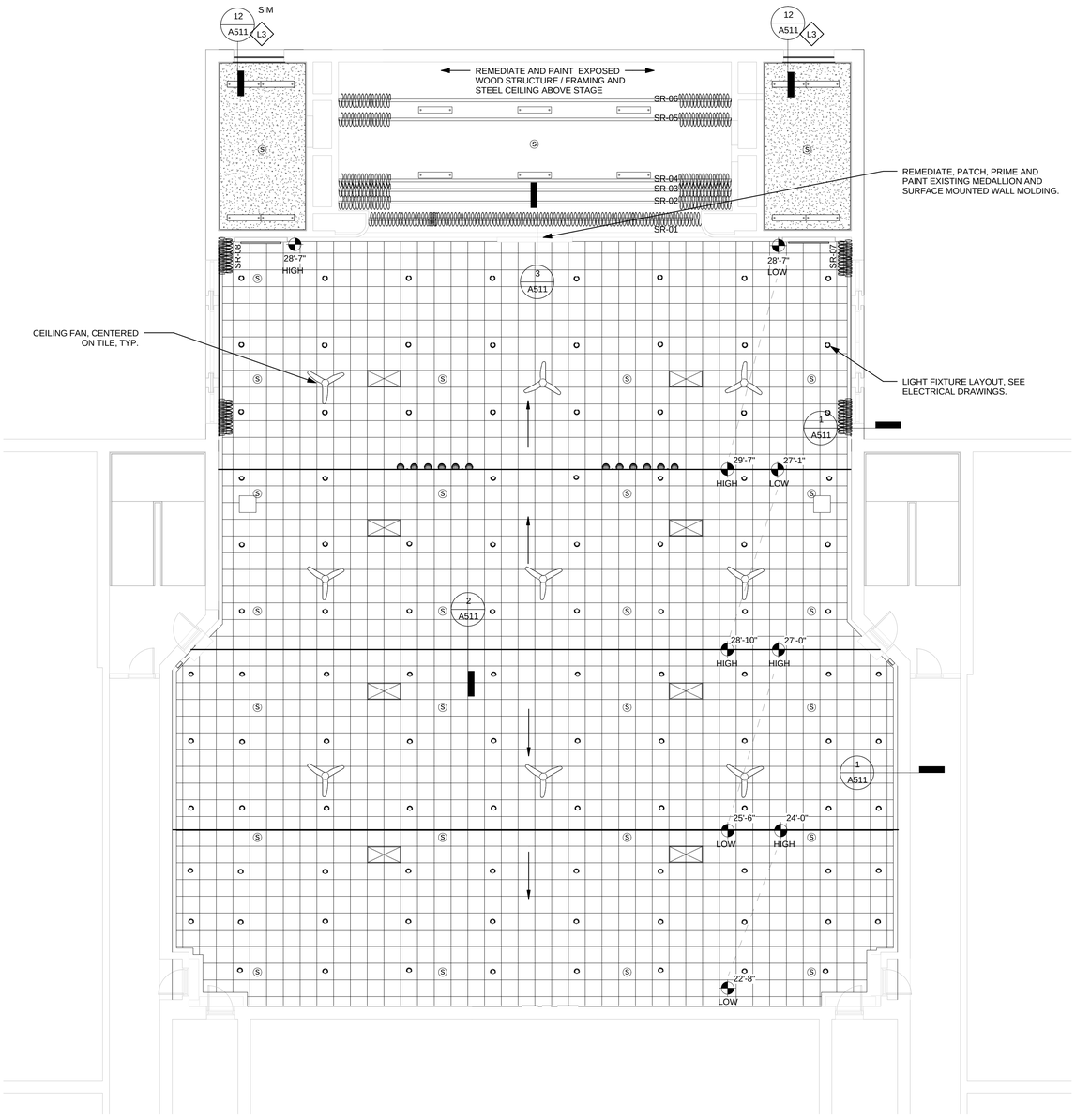
81 Highland Avenue, Somerville, MA 02143

AUDITORIUM RCP

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

A122



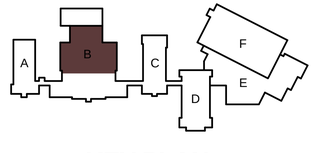
1 **AUDITORIUM BALCONY RCP**
SCALE: 1/8" = 1'-0"

RCP FINISH LEGEND

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	PAINTED GYPSUM BOARD CEILING / SOFFIT ON 7/8" METAL FURRING @16"O.C.
	TUBE STRIP SURFACE MOUNTED LIGHT FIXTURE (SEE ELEC.)
⊘	RECESSED CAN LIGHT
S	SPEAKERS (SEE TD DRAWINGS.)
	MECHANICAL DIFFUSER

GENERAL RCP NOTES

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Somerville, MA 02143

AUDITORIUM BALCONY RCP

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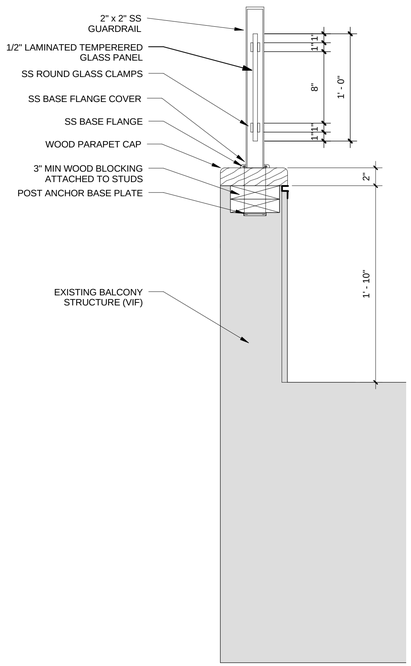
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SHEET 16 **OF** 61

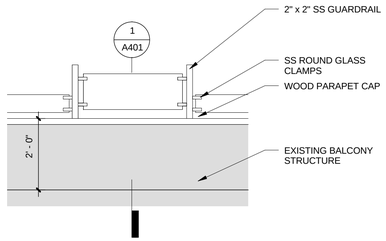
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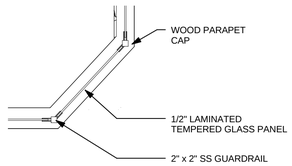
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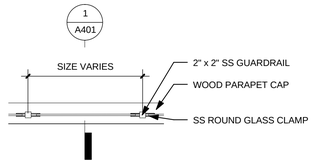
1 GUARDRAIL DETAIL AT BALCONY PARAPET
SCALE: 1 1/2" = 1'-0"



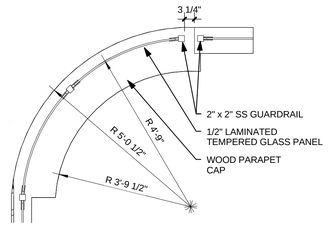
2 GUARDRAIL ELEVATION AT BALCONY END OF AISLE
SCALE: 1/2" = 1'-0"



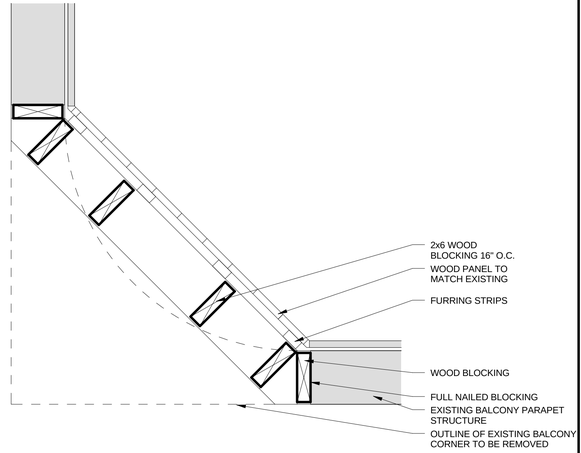
3 GUARDRAIL PLAN DETAIL AT BALCONY INSIDE CORNER
SCALE: 1/2" = 1'-0"



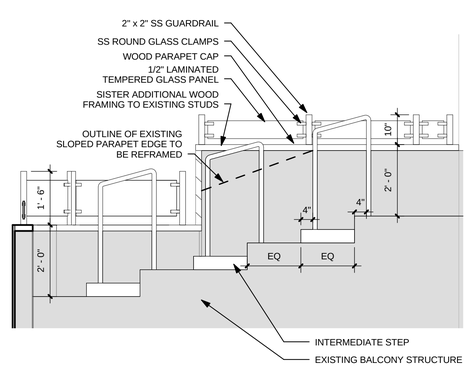
4 GUARDRAIL PLAN DETAIL AT BALCONY END OF AISLE
SCALE: 1/2" = 1'-0"



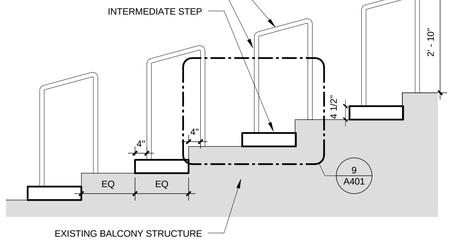
5 GUARDRAIL PLAN DETAIL AT BALCONY RADIUSED CORNER
SCALE: 1/2" = 1'-0"



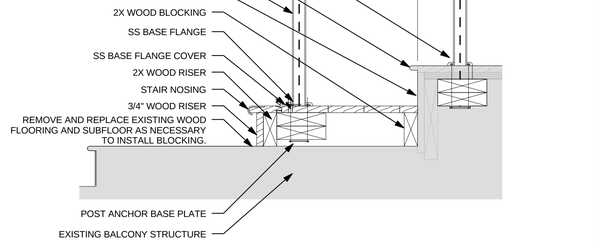
6 BALCONY PARAPET INSIDE CORNER
SCALE: 1 1/2" = 1'-0"



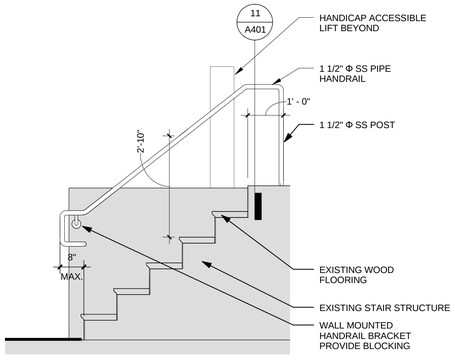
7 GUARDRAIL ELEVATION AT BALCONY CROSS AISLE
SCALE: 1/2" = 1'-0"



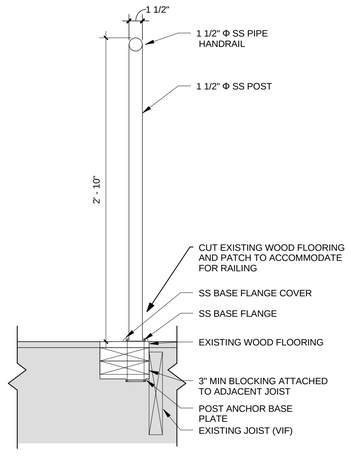
8 HANDRAIL ELEVATION AT AISLE
SCALE: 1/2" = 1'-0"



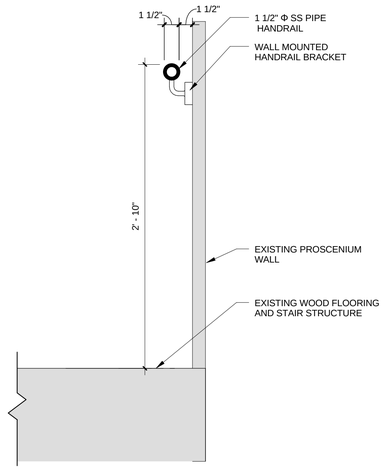
9 HANDRAIL MOUNTING AND STEP DETAIL AT AISLE
SCALE: 1 1/2" = 1'-0"



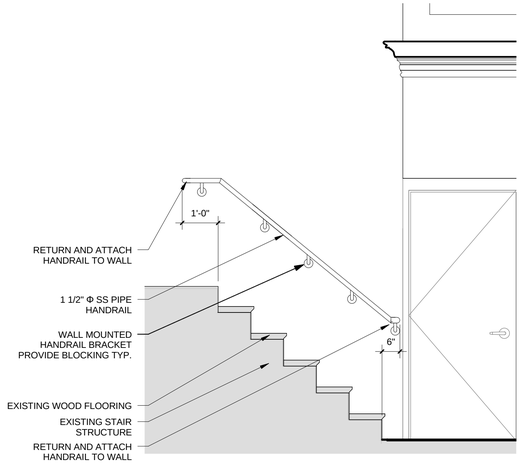
10 HANDRAIL ELEVATION AT STAGE RIGHT
SCALE: 1/2" = 1'-0"



11 RAILING DETAIL AT STAGE RIGHT
SCALE: 1 1/2" = 1'-0"



12 HANDRAIL DETAIL AT STAGE LEFT
SCALE: 1 1/2" = 1'-0"



13 HANDRAIL ELEVATION AT STAGE LEFT
SCALE: 1/2" = 1'-0"

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ISSUED FOR BID

Somerville Public Schools
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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

STAIR AND RAILING DETAILS

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

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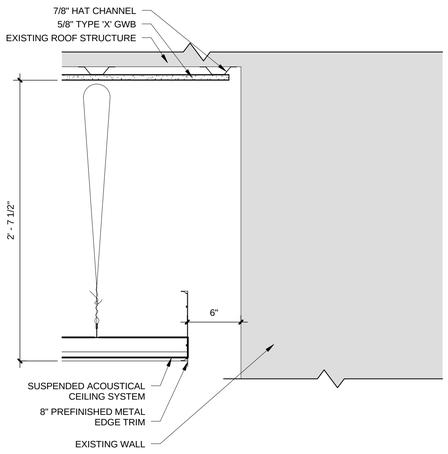
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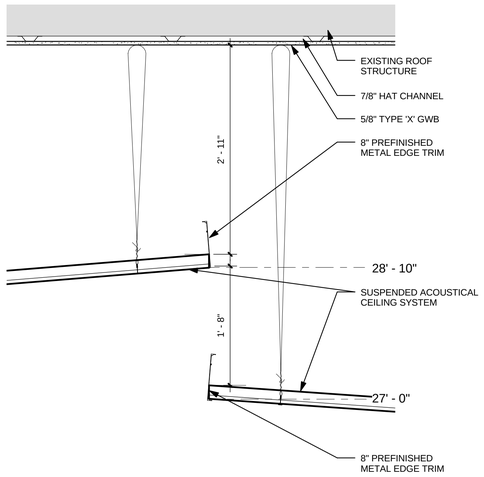
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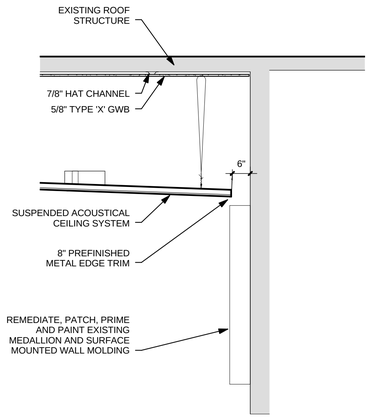
1 CEILING COVE DETAIL AT WALL

SCALE: 1 1/2" = 1'-0"



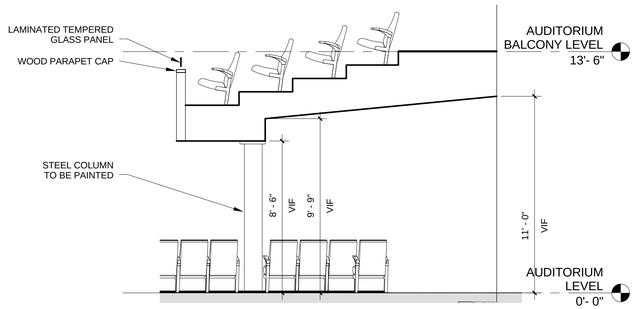
2 CEILING HEIGHT TRANSITION DETAIL

SCALE: 1" = 1'-0"



3 PROSCENIUM/ CEILING SECTION

SCALE: 1/2" = 1'-0"

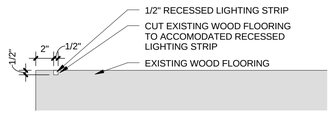


4 BALCONY SOFFIT SECTION

SCALE: 1/4" = 1'-0"

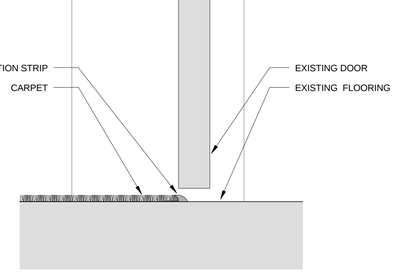
5 FLOOR TRANSITION AT AISLE SEATING

SCALE: 1 1/2" = 1'-0"



6 RECESSED LIGHTING AT BALCONY STAIR

SCALE: 1 1/2" = 1'-0"

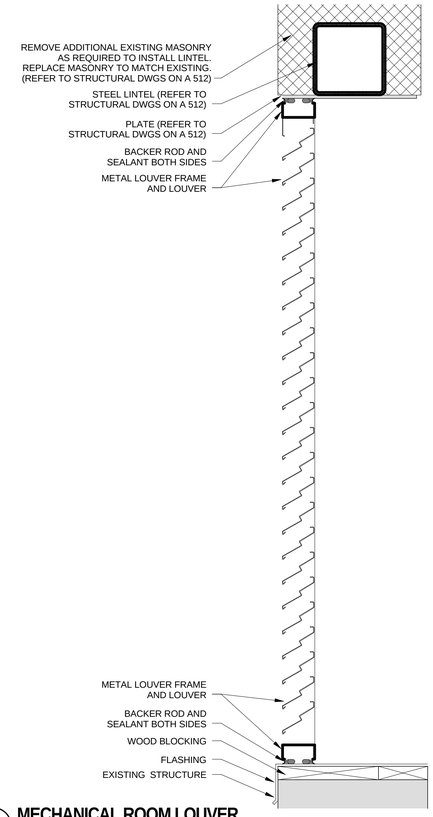


7 FLOOR TRANSITION AT DOOR

SCALE: 3" = 1'-0"

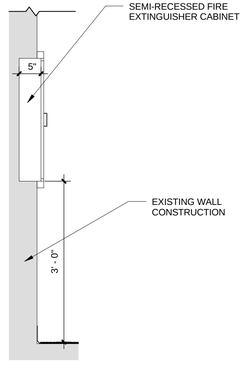
8 AUDITORIUM FLOOR TO WALL TRANSITION

SCALE: 1" = 1'-0"



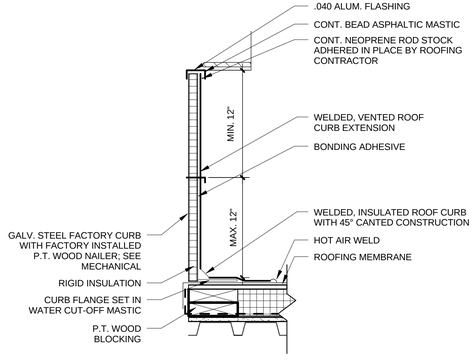
12 MECHANICAL ROOM LOUVER

SCALE: 1 1/2" = 1'-0"



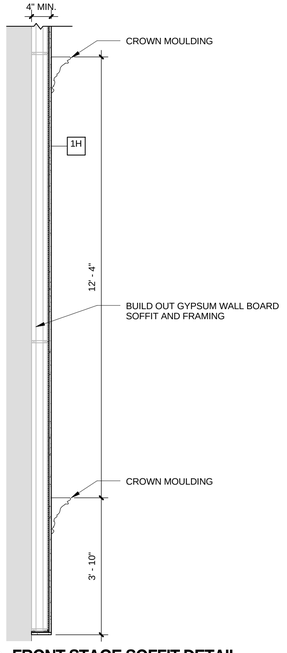
9 SURFACE MOUNTED FIRE EXTINGUISHER DETAIL

SCALE: 3/4" = 1'-0"



10 ROOF MOUNTED KITCHEN EXHAUST FAN CURB

SCALE: 1 1/2" = 1'-0"



11 FRONT STAGE SOFFIT DETAIL

SCALE: 1/2" = 1'-0"

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INTERIOR DETAILS

PROJECT NUMBER: 19431.01
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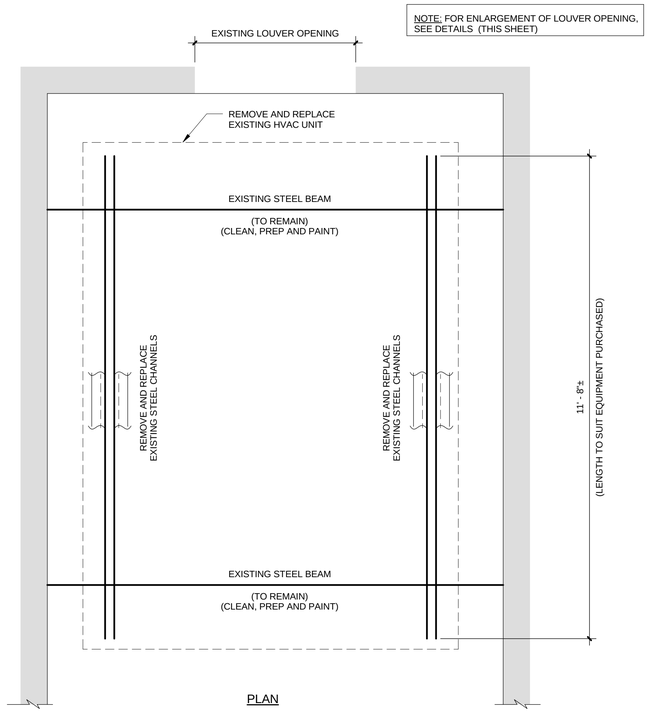
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SHEET 18 **OF** 61

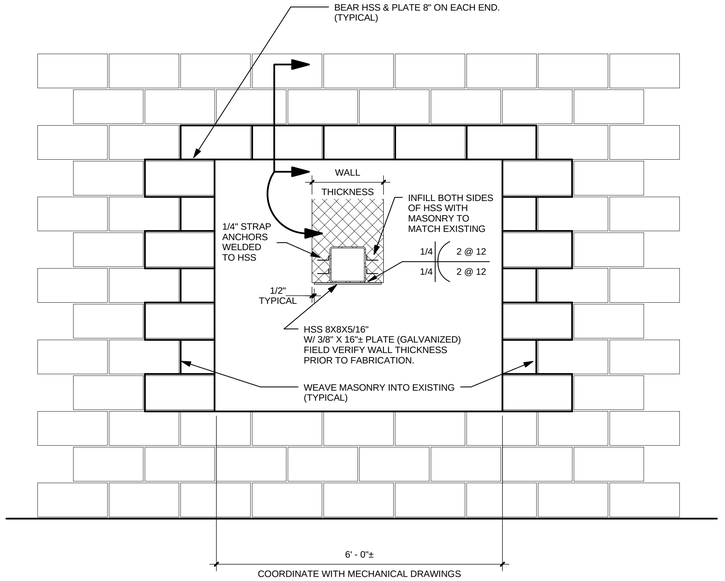
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PLOTTED: 3/5/2014 5:36:41 PM

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PLAN



NOTES:

1. ENLARGE EXISTING LOUVER OPENING 47"W x 57"H TO 72"W x 72"H. SEE DRAWING HD203 FOR LOUVER LOCATIONS.
2. PROVIDE SHORING AS REQUIRED FOR EXISTING WALL DURING ENLARGEMENT OF NEW OPENING AND LINTEL INSTALLATION.

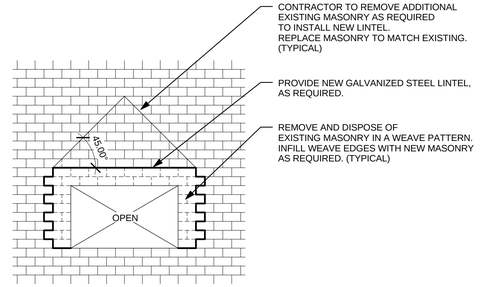
ENLARGEMENT OF MASONRY OPENING IN EXISTING MASONRY WALL

3/4" = 1'-0"

(FOR LOUVERS IN MECHANICAL ROOMS)

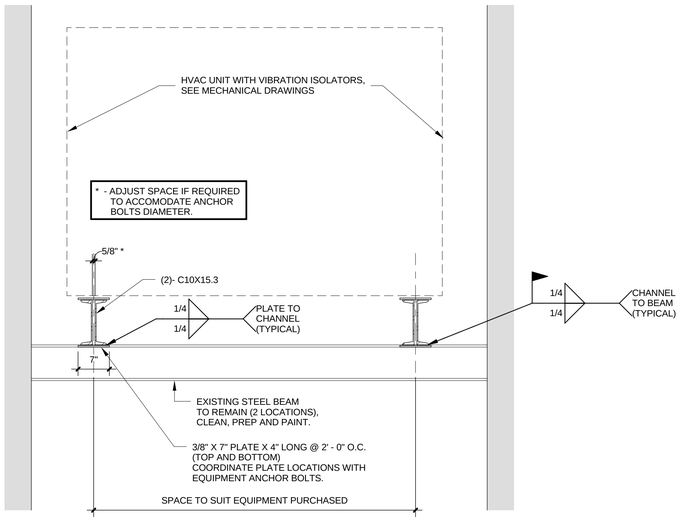
SHEET NOTES

1. STRUCTURAL STEEL SHALL CONFORM TO "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS" (AISC); "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS" (AISC); AND "STRUCTURAL WELDING CODE - STEEL" (AWS D1.1).
2. STRUCTURAL STEEL SHALL BE DETAILED IN ACCORDANCE WITH "DETAILING FOR STEEL CONSTRUCTION" (AISC).
3. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING:
   (A) ROLLED BEAM SHAPES.....ASTM A992 GRADE 50.
   (B) PLATES.....ASTM A36 (Fy = 36 KSI)
   (C) THREADED ROD.....ASTM A449 GRADE 81 FOR 1"Ø AND UNDER
   ASTM A449 GRADE 92 FOR OVER 1"Ø
4. WELDED CONNECTIONS SHALL BE MADE BY AWS CERTIFIED WELDERS USING FILLER METAL CONFORMING TO E70XX WITH LOW HYDROGEN.
5. PRIME AND PAINT ALL STEEL.



MASONRY REMOVAL FOR OPENING IN EXISTING WALL

3/4" = 1'-0"



ELEVATION

1 HVAC UNIT SUPPORT DETAIL

SCALE: 3/4" = 1'-0"

(HV-22 AND HV-23)

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TEL. (617) 778-1440
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REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools
Education - Inspiration - Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

STRUCTURAL DETAILS

PROJECT NUMBER: 19431.01
DESIGNED BY: JS
DRAWN BY: KC
CHECKED BY: JS
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

A512

SHEET 19 **OF** 61

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

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SCOPE OF WORK

THE ITEMS IDENTIFIED BELOW ARE A PERSPACE SUMMARY OF THE PROJECT SCOPE OF WORK. THIS SUMMARY IS NOT MEANT TO REPLACE THE WORK IDENTIFIED WITHIN THE CONTRACT DOCUMENTS. PLEASE REFER TO THE DRAWINGS AND SPECIFICATION FOR THE ACTUAL WORK REQUIRED.

FOR REMEDIATION GUIDELINES, REFER TO SPECIFICATION SECTION 024120

STAIRWAYS (ALL LEVELS):

WALLS - EXISTING GYPSUM/PLASTER WALLS AND RELATED ATTACHMENTS TO BE REMOVED BACK TO BRICK, REMEDIATE BRICK WALL AND INSTALL GYPSUM WAlBOARD ON METAL FURRING. ALL ANCILLARY WALL ATTACHED ITEMS TO BE CLEANED AND RE-INSTALLED. INTERIOR WALL SURFACES SHALL BE PAINTED.

FLOORS - EXISTING RUBBER FLOORING TO BE REMEDIATED, WASHED AND SEALED.

CEILINGS - EXISTING PLASTER CEILING AND RELATED CEILING MOUNTED FIXTURES TO BE REMOVED AND REPLACED WITH GYPSUM BOARD AND METAL FURRING. ALL ANCILLARY CEILING ATTACHED ITEMS TO BE CLEANED AND RE-INSTALLED. INTERIOR CEILING SURFACED SHALL BE PAINTED.

UNDERSIDE OF STAIR - TO BE REMEDIATED, SCRAPED, PRIMED AND PAINTED.

RAILINGS - TO BE REMEDIATED, SCRAPED, PRIMED AND PAINTED.

METAL DOORS AND FRAMES - EXISTING DOORS AND DOOR FRAMES TO BE SCRAPED, PRIMED AND PAINTED.

WOOD DOORS AND FRAMES - EXISTING DOORS AND DOOR FRAMES TO BE SANDED, PRIMED AND PAINTED/SEALED TO MATCH EXISTING.

MECHANICAL/ELECTRICAL - REFER TO MEP DRAWINGS AND SPECIFICATIONS FOR SCOPE OF WORK.

KITCHEN AND ADJACENT ROOMS:

WALLS - REMOVE GYPSUM AND/OR PLASTER WALL TO EXISTING STUDS. REMEDIATE STUDS AND INSTALL GYPSUM WALL BOARD ON EXISTING FRAMINTERIOR WALL SURFACES SHALL BE PAINTED,

FLOORS - EXISTING CONCRETE FLOORS TO BE REMEDIATED AND PAINTED.

CEILINGS AND SOFFITS - REMOVE EXISTING GYPSUM AND/OR PLASTER CEILING AND INSTALL GYPSUM BOARD ON EXISTING FRAMING. ALL EXPOSED GYPSUM SURFACES SHALL BE PAINTED. SOFFIT IN SERVERY AREA HAS AN INTERNAL HIGHER GYPSUM CEILING WHICH NEEDS TO BE REMOVED. ALL EXPOSEDSTRUCTURE AND MEP TO BE PAINTED.

METAL DOORS AND FRAMES - EXISTING DOORS AND DOOR FRAMES TO BE SCRAPED, PRIMED AND PAINTED.

WOOD DOORS AND FRAMES - EXISTING DOORS AND DOOR FRAMES TO BE SANDED, PRIMED AND PAINTED/SEALED TO MATCH EXISTING.

MECHANICAL/ELECTRICAL - REFER TO MEP DRAWINGS AND SPECIFICATIONS FOR SCOPE OF WORK.

CAFETERIA:

WALLS - PORTIONS OF EXISTING WALLS AND STUD FRAME TO BE REMOVED AND INFILLED AS REQUIRED TO ACCOMMODATE MEP WORK.

FLOORS - REMOVE AND REPLACE TO MATCH EXISTING APPROXIMATELY 20SF OF DAMAGED VCT FLOOR TILES.

METAL DOORS AND FRAMES - EXISTING DOORS AND DOOR FRAMES TO BE SCRAPED, PRIMED AND PAINTED.

WOOD DOORS AND FRAMES - EXISTING DOORS AND DOOR FRAMES TO BE SANDED, PRIMED AND PAINTED/SEALED TO MATCH EXISTING.

CEILINGS - REMOVE AND REPLACE TO MATCH EXISTING APPROXIMATELY 30SF OF DAMAGED CEILING TILES.

MECHANICAL/ELECTRICAL - REFER TO MEP DRAWINGS AND SPECIFICATIONS FOR SCOPE OF WORK.

AUDITORIUM:

WALLS - EXISTING WOOD PANELS AT PERIMETER OF AUDITORIUM AND FRONT OF STAGE SHALL BE REMEDIATED, SANDED, STAINED AND SEALED. AREAS THAT HAVE BEEN EITHER DAMAGED OR CUT TO EXPOSE EXISTING CONDITIONS SHALL BE PATCHED TO MATCH ADJACENT SURFACES. G.C. TO PROVIDE A 6"X6" SAMPE AREA FOR OWNER/ARCHITECT REVIEW AND APPROVALAT CEILING/WALL INTERFACE, SAW CUT EXISTING WOOD PANELING TO A CONSTANT HEIGHT. EXISTING GYPSUM AND/OR PLASTER ABOVE PANELING TO BE PATCHED, PRIMED AND PAINTED. REMOVE AND REPLACE VINYL BASE.

FLOORS - REMEDIATE, SAND SEAL AND POLISH EXISTING WOOD FLOOR. INSTALL CARPET FLOORING AND TRANSITION STRIPS ALONG AISLE EDGES AND AT DOOTHRESHOLDS.

CEILING - EXISTING BUILT-OUT SOFFIT UNDERNEATH BALCONY TO REMAIN AND TO BE REMEDIATED, PATCHED, PRIMED AND PAINTED. EXISTING PLASTER AND ACOUSTICAL CEILING SHALL BE REMOVED IN THEIR ENTIRETY. INSTALL RATIGYPSUM BOARD CEILING ON EXISTING WOOD FRAMIN AND PROVIDE SLOPED ACOUSTICAL CEILING AS INDICATED ON PLANS.

WINDOWS - REPLACE OWNER PROVIDED WINDOWS SASHES. EXISTING FRAMES AND TRIM SHALL BE SANDED, PRIMED AND PAINTED.

STAGE - REMEDIATE, SAND, SEAL AND POLISH EXISTING WOOD FLOORING AREA UNDER THE STAGE SHALL BE CLEARED AND SUB-FRAMING TO BE REMEDIATED.

METAL DOORS AND FRAMES - EXISTING DOORS AND DOOR FRAMES TO BE SCRAPED, PRIMED AND PAINTED.

WOOD DOORS AND FRAMES - EXISTING DOORS AND DOOR FRAMES TO BE SANDED, PRIMED AND PAINTED/SEALED TO MATCH EXISTING.

SEATING - EXISTING SEATING TO BE REMOVED. CONTRACTOR TO COORDINATE INSTALLATION OF OWNER FURNISHED SEATING. SEATING INSTALLATION SHALL BE PERFORMED BY SEATING MANUFACTURER AUTHORIZED INSTALLER.

MECHANICAL/ELECTRICAL - REFER TO MEP DRAWINGS AND SPECIFICATIONS FOR SCOPE OF WORK.

AUDITORIUM BALCONY:

WALLS - EXISTING WOOD PANELS AT PERIMETER OF AUDITORIUM AND FRONT OF STAGE SHALL BE REMEDIATED, SANDED, STAINED AND SEALED. AREAS THAT HAVE BEEN EITHER DAMAGED OR CUT TO EXPOSE EXISTING CONDITIONS SHALL BE PATCHED TO MATCH ADJACENT SURFACES. AT CEILING/WALL INTERFACE, SAW CUT EXISTING WOOD PANELING TO A CONSTANT HEIGHT. EXISTING GYPSUM AND/OR PLASTER ABOVE PANELING TO BE PATCHED, PRIMED AND PAINTED. REMOVE AND REPLACE VINYL BASE.

FLOORS - REMEDIATE, SAND, SEAL AND POLISH EXISTING WOOD FLOOIINSTALL CARPET FLOORING AND TRANSITION STRIPS ALONG AISLE EDGES AND AT DOOR THRESHOLDS. CONSTRUCT STEPS ALONG THE AISLES AND PROVIDE GLASS FALL PROTECTION GUARD RAILS ON BALCONY EDGE.

CEILINGS - EXISTING PLASTER AND ACOUSTICAL CEILING SALL BE REMOVED IN ITS ENTIRETY. INSTALL RATED GYPSUM WALL BOARD CEILING ON EXISTING WOOD FRAMING AND PROVIDE SLOPED ACOUSTICAL CEILING AS INDICATED ON PLANS.

METAL DOORS AND FRAMES - EXISTING DOORS AND DOOR FRAMES TO BE SCRAPED, PRIMED AND PAINTED.

WOOD DOORS AND FRAMES - EXISTING DOORS AND DOOR FRAMES TO BE SANDED, PRIMED AND PAINTED/SEALED TO MATCH EXISTING.

SEATING - EXISTING SEATING TO BE REMOVED. CONTRACTOR TO COORDINATE INSTALLATION OF OWNER FURNISHED SEATING. SEATING INSTALLATION SHALL BE PERFORMED BY SEATING MANUFACTURER AUTHORIZED INSTALLER.

MECHANICAL/ELECTRICAL - REFER TO MEP DRAWINGS AND SPECIFICATIONS FOR SCOPE OF WORK.

ROOM FINISH SCHEDULE

ROOM NO.	ROOM NAME	FLOOR	BASE	WALLS				CEILING FINISH	CEILING HEIGHT	NOTES
				NORTH	SOUTH	EAST	WEST			
129	MAIN KITCHEN	PT SEALED CONC.	RES-1	PT	PT	PT	PT	PT GWB AND PT EXPOSED MECH.	REFER TO RCP	
129A	RECEIVING	PT SEALED CONC.	RES-1	PT	PT	PT	PT	PT GWB AND PT EXPOSED MECH.	REFER TO RCP	
129B	OFFICE	PT SEALED CONC.	RES-1	PT	PT	PT	PT	PT GWB AND PT EXPOSED MECH.	REFER TO RCP	
129C	OFFICE	PT SEALED CONC.	RES-1	PT	PT	PT	PT	PT GWB AND PT EXPOSED MECH.	REFER TO RCP	
129D	NON-FOOD STORAGE	PT SEALED CONC.	RES-1	PT	PT	PT	PT	PT GWB AND PT EXPOSED MECH.	REFER TO RCP	
129E	DRY FOOD STORAGE	PT SEALED CONC.	RES-1	PT	PT	PT	PT	PT GWB AND PT EXPOSED MECH.	REFER TO RCP	
129H	STAFF LOCKER	PT SEALED CONC.	RES-1	PT	PT	PT	PT	PT GWB AND PT EXPOSED MECH.	REFER TO RCP	
129J	TOILET	PT SEALED CONC.	RES-1	PT	PT	PT	PT	PT GWB AND PT EXPOSED MECH.	REFER TO RCP	
129L	SERVERY	PT SEALED CONC.	RES-1	PT	PT	PT	PT	PT GWB AND PT EXPOSED MECH.	REFER TO RCP	
130	CAFETERIA	VCT	RES-1	PT	-	PT	PT	PT GWB	REFER TO RCP	
229	STAGE	WD	-	EXPOSED BRICK	-	PT	PT	EXPOSED FRAMING	REFER TO RCP	
229A	STAIR LOBBY	WD	RES-1	PT	PT	PT	PT	PT GWB	REFER TO RCP	
229B	STAIR LOBBY	WD	RES-1	PT	PT	PT	PT	PT GWB	REFER TO RCP	
230	AUDITORIUM	CPT, WD	RES-1	WD PANEL/PT	WD PANEL/PT	WD PANEL/PT	WD PANEL/PT	PT	REFER TO RCP	
340	AUDITORIUM BALCONY	CPT, WD	RES-1	-	WD PANEL/PT	WD PANEL/PT	WD PANEL/PT	ACT/PT GWB	REFER TO RCP	
340A	MECHANICAL	WD	RES-1	PT	PT	PT	PT	PT	REFER TO RCP	
340B	MECHANICAL	WD	RES-1	PT	PT	PT	PT	PT GWB	REFER TO RCP	
STAIR #7	STAIR #7	EXISTING RUBBER MATTING	-	PT	PT	PT	PT	PT GWB	REFER TO RCP	
STAIR #8	STAIR #8	EXISTING RUBBER MATTING	-	PT	PT	PT	PT	PT GWB	REFER TO RCP	

FINISH MATERIAL SCHEDULE

MARK	MATERIAL	DESCRIPTION
RES-1	RESILIENT WALL BASE	
CPT	CARPET	
VCT	VINYL COMPOSITION TILE	
WD FLR	WOOD FLOORING	
PT	PAINT	

INTERIOR FINISH NOTES

1. G.C. OR THEIR SUBCONTRACTORS SHALL SUBMIT MANUFACTURER'S COLOR SELECTION FOR ALL SPECIFIED MATERIALS. (COLOR SCHEDULE TO BE COMPLETED UPON RECEIPT AND APPROVAL OF ALL SPECIFIED FINISHES)

2. G.C. OR THEIR SUBCONTRACTORS SHALL INSTALL FRT WOOD BLOCKING AT ALL AREAS INDICATED TO RECEIVE WALL MOUNTED ITEMS.

3. REFER TO REFLECTED CEILING PLANS, SECTIONS AND DETAILS FOR CEILING HEIGHTS AND SOFFITS.

4. ALL SPECIFIED FINISHES SHALL BE CONTINUOUS BEHIND ALL MOUNTED OR APPLIED ITEMS.

5. ALL RESILIENT BASE WILL BE STRAIGHT AT CARPETS AND COVED AT RESILIENT FLOORING.

6. PAINT ALL EXPOSED DUCTS, CONDUITS, PIPING, STRUCTURE, ETC, NOT CONCEALED BY ROOM FINISHES. COORDINATE WITH MEP DRAWINGS (NOT FACTORY FINISH)

7. PAINT ALL STEEL HANDRAILS, RISERS, STAIR STRINGERS AND UNDERSIDE OF STAIRS AT ALL EXPOSED AREAS.

8. G.C. AND THEIR SUBCONTRACTORS SHALL DETERMINE AVAILABILITY OF ALL FINISH MATERIALS. ANY DELIVERY SCHEDULE THAT POTENTIALLY MAY CAUSE COORDINATION PROBLEMS DURING THE CRITICAL PATH OF CONSTRUCTION/INSTALLATION SHALL BE BROUGHT TO ATTENTION OF THE ARCHITECT, EARLY ON, FOR POSSIBLE RE-EVALUATION OF MATERIAL DESIGNATION. THE LACK OF A TIMELY ORDER DOES NOT CONSTITUTE A RE-SELECTION.

9. A MINIMUM QUANTITY OF TWO (2) 1'-0" X 1'-0" FINISH SAMPLES OF ALL SPECIFIED FINISHES AND CURRENT STOCK CUTTINGS OF ALL SPECIFIED FABRICS SHALL BE PROVIDED FOR APPROVAL PRIOR TO ORDERING.

10. G.C. AND THEIR SUBCONTRACTORS SHALL ASSURE THAT NO ELECTRIC RECEPTACLE OR TELECOMMUNICATIONS OUTLET COVERPLATES HAVE BEEN INSTALLED PRIOR TO COMPLETION OF APPLICATION OF ANY WALL FINISH MATERIALS. ANY SUCH COVERPLATES OR SURFACE HARDWARE, ETC., IN PLACE, SHALL BE REMOVED PRIOR TO WALL FINISH APPLICATION.

11. UPON COMPLETION OF FINISH PHASE OF JOB, G.C. SHALL REMOVE ALL PAINT, WALLCOVERING PASTE, ETC., FROM WHERE IT HAS SPILLED, SPLASHED, OR SPATTERED.

12. ALL FINISH FLOORING MATERIAL INSTALLATION SHALL BE PER MANUFACTURERS RECOMMENDATION. SEAMS SHALL BE TIGHT/INVISIBLE. G.C. OR THEIR SUBCONTRACTORS SHALL PROVIDE AND MAINTAIN ADEQUATE PROTECTION FOR ALL NEWLY INSTALLED FLOORING MATERIALS FOR THE DURATION OF CONSTRUCTION AND REMOVE PROTECTION ONLY IMMEDIATELY BEFORE JOB COMPLETION, FLOOR WILL BE THOROUGHLY CLEANED OF ALL ADHESIVE, GROUT, CONSTRUCTION STAINS, ETC.

13. G.C. AND THEIR SUBCONTRACTORS ARE RESPONSIBLE FOR ALL FLASH PATCHING AND TO HAVE THE FLOOR IN A CONDITION TO RECEIVE FLOORING MATERIALS.

14. CARPET SUPPLIER/INSTALLER SHALL PROVIDE CURRENT STOCK SAMPLES OF SPECIFIED CARPET FINISHES FOR APPROVAL PRIOR TO ORDERING. PROVIDE TRANSITION STRIPS AS SPECIFIED OR NECESSARY.

15. G.C. AND VENDORS/SUBCONTRACTORS ARE RESPONSIBLE FOR FIELD VERIFICATION OF ALL DIMENSIONS, QUANTITIES ETC., OF THEIR RESPECTIVE WORK.

16. FOR FLOOR MATERIAL CHANGE LOCATIONS, SEE FLOOR PLANS, THRESHOLD DETAILS AND/OR FLOOR FINISH PLANS

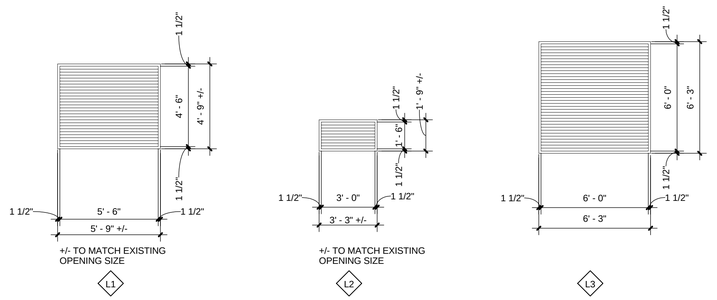
17. FOR WALL MATERIAL FINISH CHANGE LOCATIONS, SEE INTERIOR WALL ELEVATIONS

18. FOR ADDITIONAL WORK REQUIRED, SEE INTERIOR WALL ELEVATIONS

19. PROVIDE SPLASH TRIM AT ALL WALLS ADJACENT TO COUNTER TOPS U.O.N. TYPICAL

20. PROVIDE PAINTED FINISH AND CAULKING BEHIND SINKS, TYP

21. NOT ALL WALL OBJECTS MAY BE SHOWN. COORDINATE WITH MECHANICAL AND ELECTRICAL DRAWINGS ALSO REFER TO ARCHITECTURAL DWGS & SPECIFICATIONS FOR ADDITIONAL ITEMS.



LOUVER TYPES

1/4" = 1'-0"

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REVISIONS

Number	Description	Date

ISSUED FOR BID

Somerville Public Schools
Education · Inspiration · Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

FINISH SCHEDULE AND OPENINGS

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

A602

SHEET 20 **OF** 61

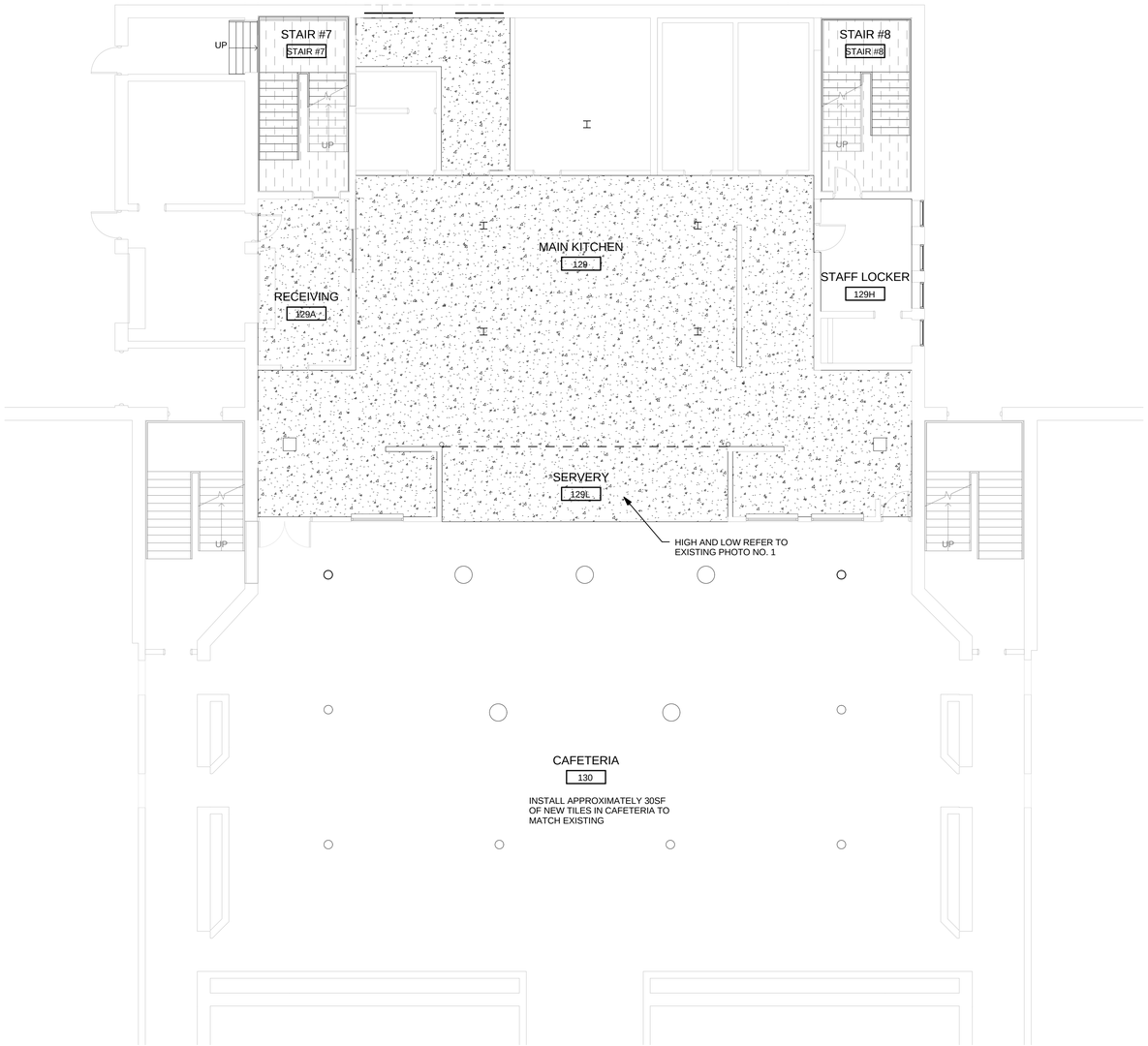
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GENERAL FINISH LEGEND

- PAINTED CONCRETE
- CARPET
- HARD WOOD FLOORING
- EXISTING RUBBER FLOORING

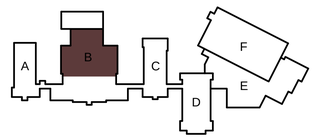


1 **CAFETERIA/KITCHEN FLOOR FINISH PLAN**
SCALE: 1/8" = 1'-0"



PHOTO NO. 1

SERVERY SOFFIT CAVITY



KEY PLAN

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CAFETERIA/ KITCHEN FLOOR FINISH PLAN

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
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CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

A630

SHEET 21 **OF** 61

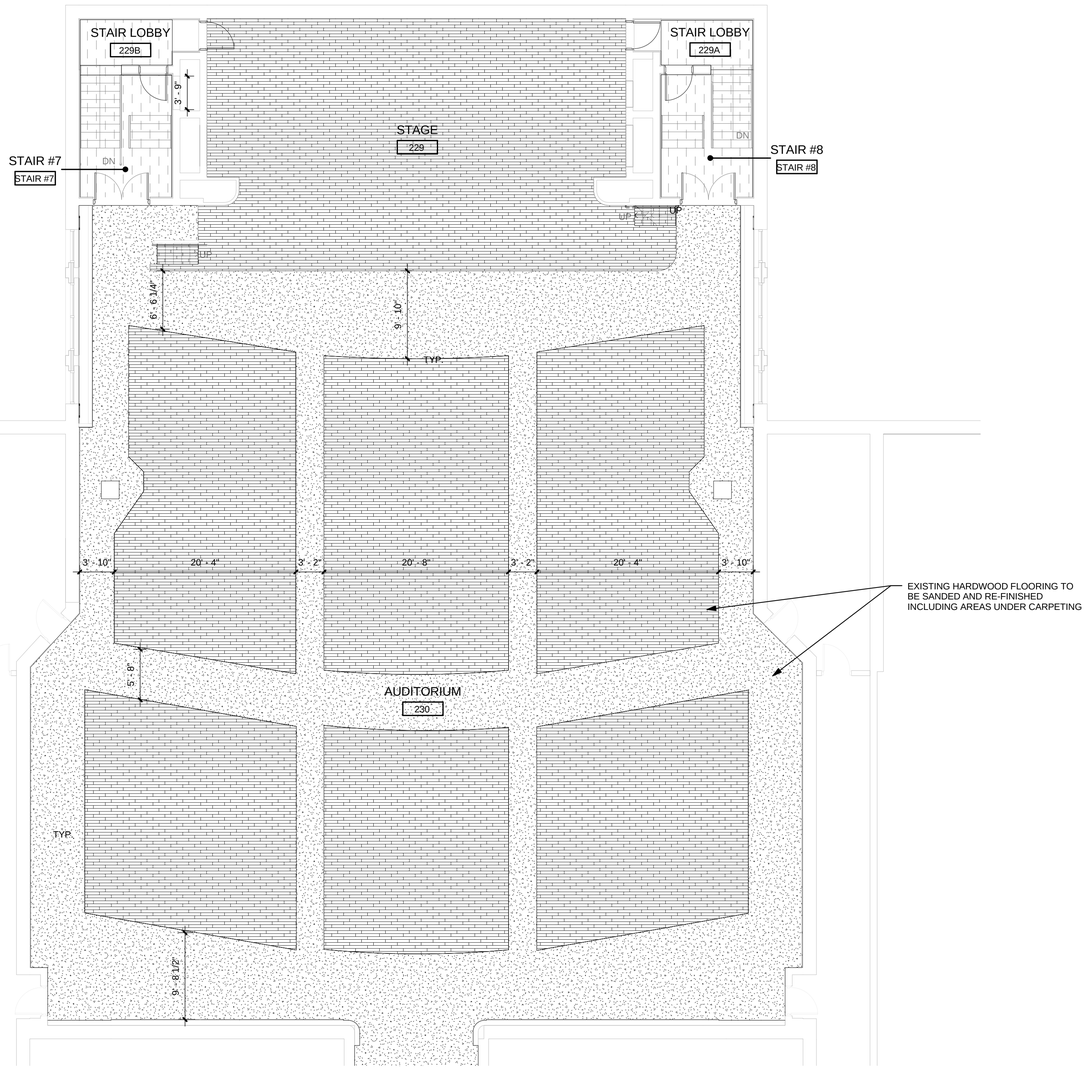
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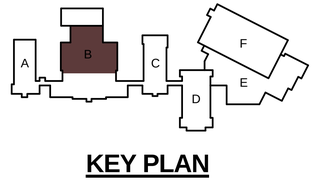
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GENERAL FINISH LEGEND

- PAINTED CONCRETE
- CARPET
- HARD WOOD FLOORING
- EXISTING RUBBER FLOORING



1 **AUDITORIUM FLOOR FINISH PLAN**
SCALE: 1/8" = 1'-0"



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AUDITORIUM FLOOR FINISH PLAN

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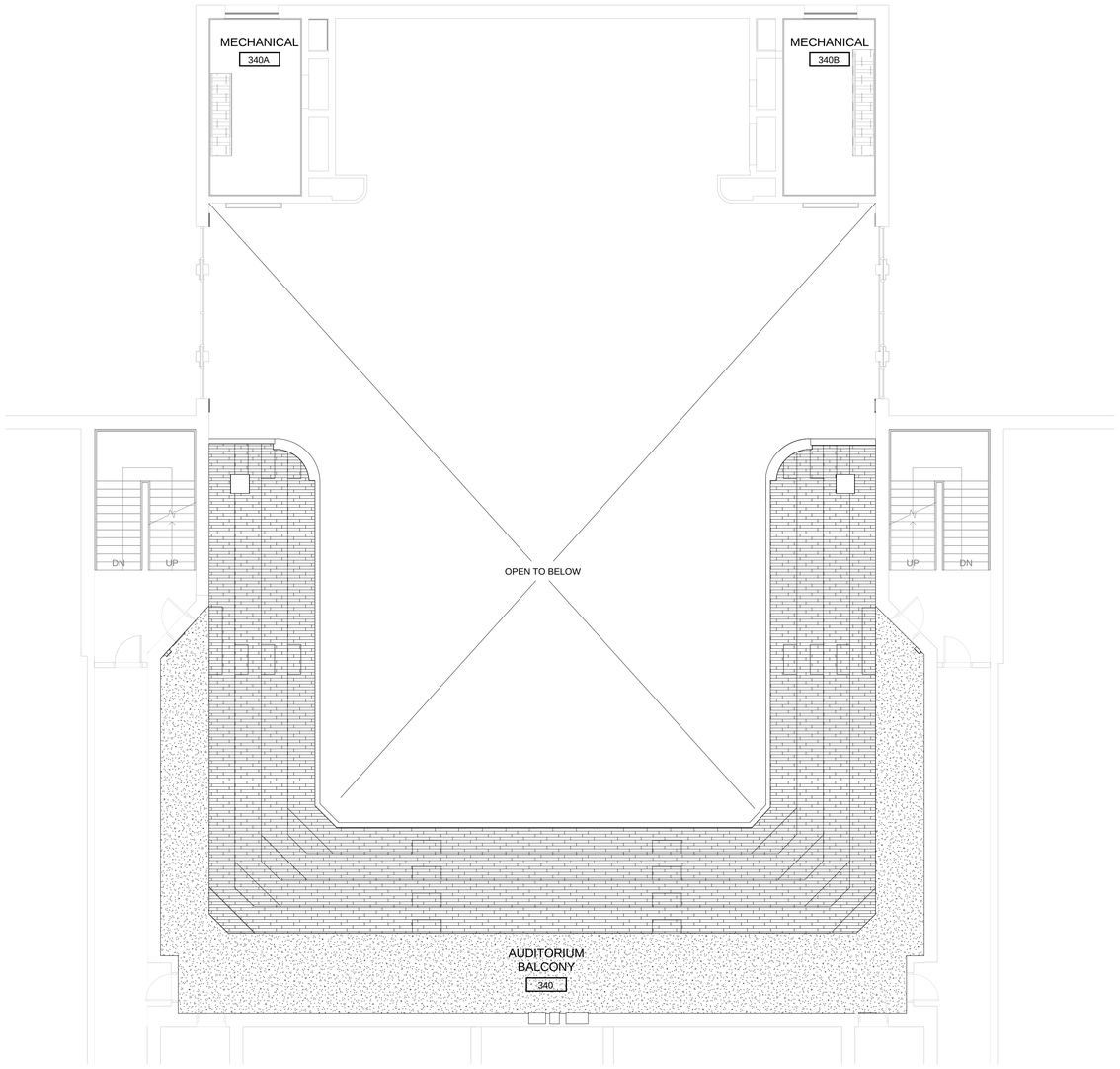
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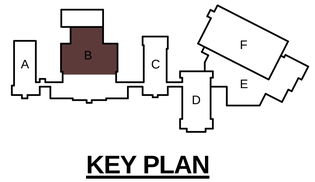
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GENERAL FINISH LEGEND

- PAINTED CONCRETE
- CARPET
- HARD WOOD FLOORING
- EXISTING RUBBER FLOORING

1 AUDITORIUM BALCONY FLOOR FINISH PLAN
SCALE: 1/8" = 1'-0"



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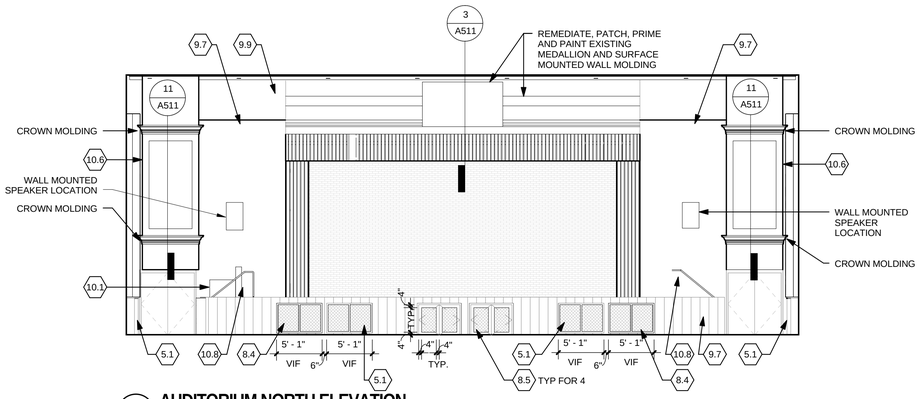
81 Highland Avenue,
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AUDITORIUM BALCONY FLOOR FINISH PLAN

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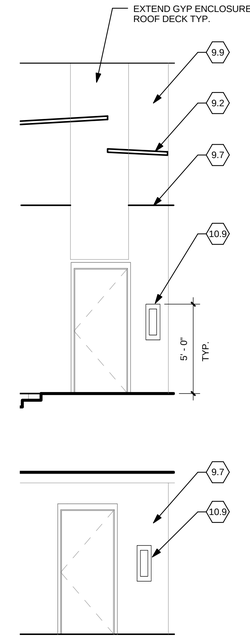
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1 AUDITORIUM NORTH ELEVATION

SCALE: 1/8" = 1'-0"

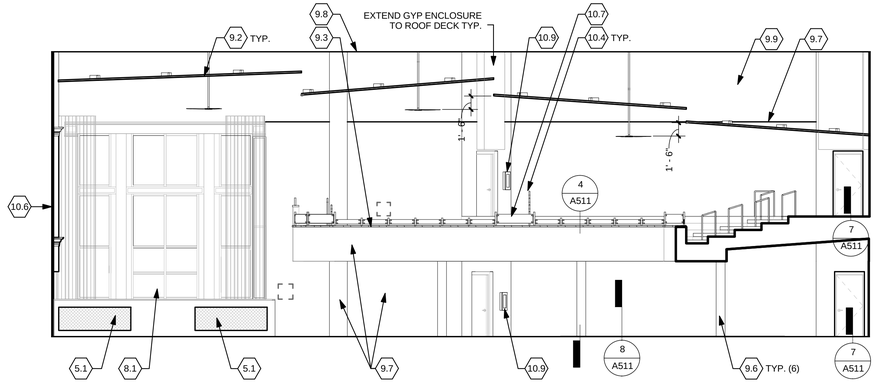


2 AUDITORIUM NORTH EAST ELEVATION

SCALE: 1/4" = 1'-0"

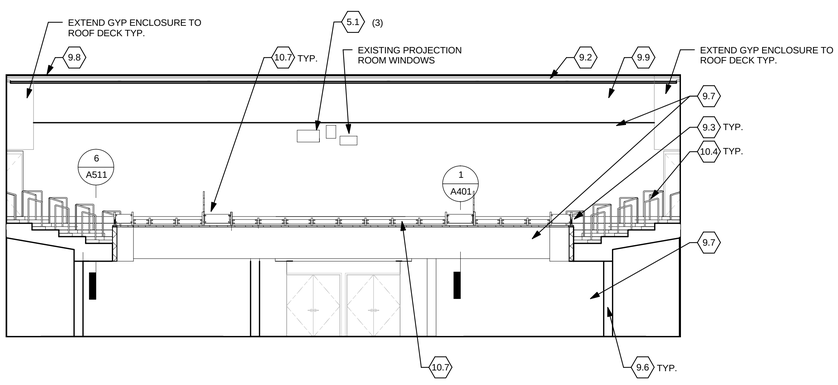
ELEVATION WORK NOTES	
WORK NOTE #	WORK NOTE
5.1	INSTALL METAL SCREEN
8.1	REINSTALL EXISTING OPERABLE SASH AND INSULATED GLASS
8.4	CUT OPENING IN EXISTING STAGE APRON AND INSTALL METAL GRILLE.
8.5	CUT OPENING EXISTING STAGE APRON DOORS AND INSTALL MTL GRILLE.
9.2	INSTALL ACT CEILING
9.3	INSTALL WOOD CAP
9.6	PAINT (6) EXISTING STEEL COLUMNS
9.7	EXISTING WOOD PANELS TO BE REMEDIATED, SANDED, STAINED AND SEALED. PANELS BELOW CEILING ON BALCONY AND STAGE TO BE SAW CUT AT A CONSISTANT HEIGHT.
9.8	INSTALL GYPSUM WALL BOARD TYPE X CEILING
9.9	EXISTING PLASTER WALLS BELOW CEILING TO BE PATCHED, PRIMED AND PAINTED.
10.1	INSTALL VERTICAL PLATFORM WHEELCHAIR LIFT (REFER TO ELECTRICAL)
10.4	INSTALL STAINLESS STEEL HANDRAILS ALONG AISLES AT STAIRS, SEE DETAILS 8, 9/A401
10.6	INSTALL AND BUILD OUT GYPSUM WALL BOARD SOFFIT. SEE DETAIL 5/A512.
10.7	INSTALL GUARDRAIL ON BALCONY PARAPET AT AISLE ENDS, SEE DETAILS 1, 2, 3, 4, 5/A401
10.8	INSTALL HANDRAILS AT STAGE STAIRS. SEE DETAIL 10, 11, 12, 13/A401
10.9	MOUNT FIRE EXTINGUISHER. TO BE WALL MOUNTED IN AUDITORIUM ON STAGE. SEE DETAIL 11/A512.

[ ] = SIGNIFYS AREAS THAT HAVE BEEN CUT TO EXPOSE EXISTING CONDITIONS TO BE PATCHED AND MATCHED TO ADJACENT SURFACES.



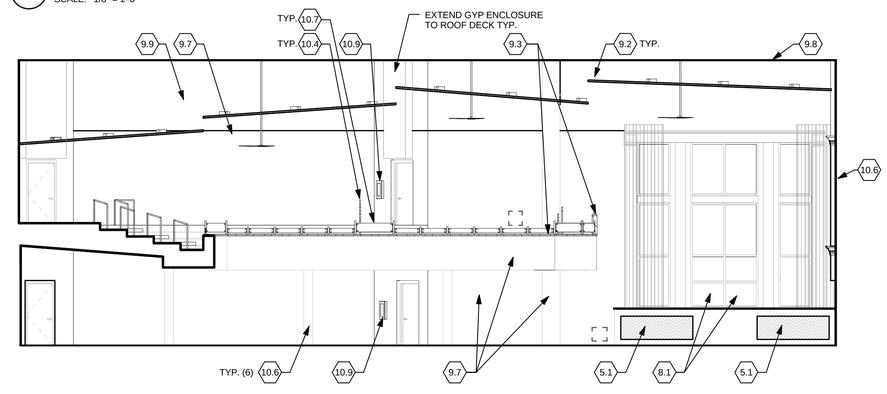
3 AUDITORIUM EAST ELEVATION

SCALE: 1/8" = 1'-0"



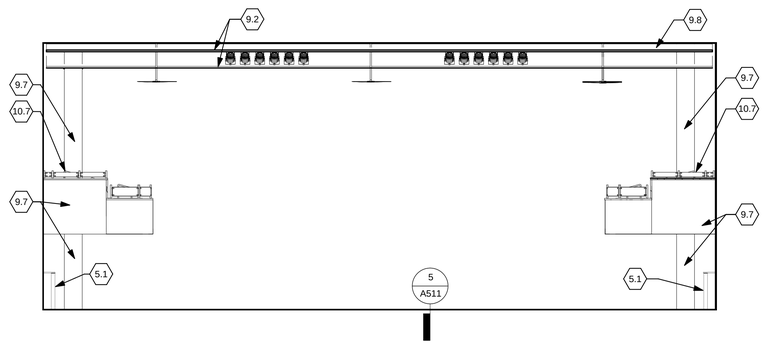
4 AUDITORIUM SOUTH ELEVATION

SCALE: 1/8" = 1'-0"



5 AUDITORIUM WEST ELEVATION

SCALE: 1/8" = 1'-0"



6 AUDITORIUM NORTH ELEVATION MEZZANINE

SCALE: 1/8" = 1'-0"

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REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools
Education - Inspiration - Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

INTERIOR ELEVATIONS

PROJECT NUMBER: 19431.01
DESIGNED BY: FC
DRAWN BY: EKM
CHECKED BY: FC
DATE: March 03, 2014
SCALE: As indicated

SHEET NUMBER:

A701

SHEET 24 **OF** 61

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

PLOTTED: 3/5/2014 5:37:24 PM

PROJECT FILE: C:\Users\EMorin\Documents\19431-Somerville_HS-Sandy_Repairs_EMorin.rvt

ABBREVIATIONS

A/C	AIR CONDITIONING	LBS	POUNDS
ACT	ACOUSTICAL CEILING TILE	LD	LINEAR DIFFUSER
ACD	AUTOMATIC CONTROL DAMPER	LF	LINEAR FEET
AD	ACCESS DOOR	LP	LOW POINT
ADD'L	ADDITIONAL	LRA	LOCKED ROTOR AMPS
AF	AIR FILTER OR AIR FOIL	LVG	LEAVING
AFF	ABOVE FINISHED FLOOR	LWT	LEAVING WATER TEMPERATURE
AFMS	AIR FLOW MONITORING STATION	MAX	MAXIMUM
AFR	ABOVE FINISHED ROOF	MAV	MANUAL AIR VENT
AHU	AIR HANDLING UNIT	MBH	THOUSAND BTUs HOUR
AL	ACOUSTIC DUCT LINER	MCA	MINIMUM CIRCUIT AMPACITY
ALT	ALTITUDE OR ALTERNATE	MD	MOTOR OPERATED DAMPER
AMB	AMBIENT	MECH	MECHANICAL
AMP	AMPERE	MEZZ	MEZZANINE
AP	ACCESS PANEL	MFR	MANUFACTURER
APD	AIR PRESSURE DROP	MIN	MINIMUM
ARCH	ARCHITECT	MOCP	MAX OVERCURRENT PROTECTION
AS	AIR STREAM	NA	NOT APPLICABLE
ATC	AUTOMATIC TEMP CONTROL	NC	NORMALLY CLOSED OR NOISE CRITERIA
ATM	ATMOSPHERE		
AVG	AVERAGE	NIC	NOT IN CONTRACT
BDD	BACKDRAFT DAMPER	NO	NORMALLY OPEN
BFC	BELOW FINISHED CEILING	NOM	NOMINAL
BHP	BRAKE HORSE POWER	NTS	NOT TO SCALE
BI	BACKWARD INCLINED	OA	OUTDOOR AIR
BLDG	BUILDING	OAI	OUTDOOR AIR INTAKE
BOD	BOTTOM OF DUCT	OBD	OPPOSED BLADE DAMPER
BOP	BOTTOM OF PIPE	OC	ON CENTER
BOS	BOTTOM OF STEEL	OD	OUTSIDE DIAMETER
BSMT	BASEMENT	ODP	OPEN DRIP PROOF
BTU	BRITISH THERMAL UNIT	OED	OPEN END DUCT
BTUH	BTU PER HOUR	OV	OUTLET VELOCITY
CAP	CAPACITY	PD	PRESSURE DROP/DIFFERENCE OR PUMPED DISCHARGE
CAV	CONSTANT AIR VOLUME		
CENT	CENTRIFUGAL	PH	PHASE
CF	CUBIC FEET OR CEILING FAN	PHC	PREHEAT COIL
CFM	CUBIC FEET PER MINUTE	PLBG	PLUMBING
CL	CENTER LINE	POS	PROVIDED BY OTHER SECTION
CLG	CEILING OR COOLING	PPM	PARTS PER MILLION
CO	CLEANOUT	PRV	PRESSURE REDUCING VALVE
CO2	CARBON DIOXIDE	PSI	POUNDS PER SQUARE INCH
COL	COLUMN	PSIA	PSI ABSOLUTE
CONC	CONCRETE	PSID	PSI DIFFERENTIAL
CONN	CONNECTION	PSIG	PSI GUAGE
CUH	CABINET UNIT HEATER	PVC	POLYVINYL CHLORIDE
D	DRAIN OR DEPTH	QTY	QUANTITY
DB	DRY BULB TEMPERATURE	R	RADIUS
DBD	DOUBLE DEFLECTION	RA	RETURN AIR
DDC	DIRECT DIGITAL CONTROLS	REQD	REQUIRED
DEG	DEGREE	RET	RETURN
DIA	DIAMETER	RF	RETURN FAN
DIM	DIMENSION	RG	RETURN GRILLE
DN	DOWN	RH	RELATIVE HUMIDITY
DOV	DRAIN OFF VALVE	RHC	REHEAT COIL
DP	DIFFERENTIAL PRESSURE	RLA	RUNNING LOAD AMPS
DWDI	DOUBLE WIDTH DOUBLE INLET	RLF	RELIEF
DX	DIRECT EXPANSION	RM	ROOM
EA	EACH OR EXHAUST AIR	RPM	REVOLUTIONS PER MINUTE
EAT	ENTERING AIR TEMPERATURE	RR	RETURN REGISTER
EC	ELECTRONICALLY COMMUTATED	SA	SUPPLY AIR OR SOUND ATTENUATOR
ECM	EC MOTOR	SCR	SCREEN
EER	ENERGY EFFICIENCY RATIO	SDET	SMOKE DETECTOR
EF	EXHAUST FAN	SEER	SEASONAL ENERGY EFF RATING
EFF	EFFICIENCY	SENS	SENSIBLE
ELEC	ELECTRICAL	SF	SUPPLY FAN OR SQUARE FEET
ELEV	ELEVATION	SFD	COMBINATION SD/FD WITH AP
EMS	ENERGY MANAGEMENT SYSTEM	SG	SUPPLY GRILLE
ENT	ENTERING	SHC	SENSIBLE HEAT CAPACITY
ESP	EXTERNAL STATIC PRESSURE	SHR	SENSIBLE HEAT RATIO
EV	EXHAUST VENT	SP	STATIC PRESSURE
EXH	EXHAUST	SPECS	SPECIFICATIONS
EXT	EXTERNAL	SF	SQUARE FEET
EXP	EXPANSION	SR	SUPPLY REGISTER
F	FAHRENHEIT	SS	STAINLESS STEEL
FA	FREE AREA	SST	SATURATED SUCTION TEMP
FC	FLEXIBLE CONNECTION	ST	STEAM TRAP
FCU	FAN COIL UNIT	STM	STEAM
FD	FIRE DAMPER	SUP	SUPPLY
FLA	FULL LOAD AMPS	SWSI	SINGLE WIDTH SINGLE INLET
FOB	FLAT ON BOTTOM	TA	TRANSFER AIR OR THROW AWAY
FPM	FEET PER MINUTE	TAV	THERMOSTATIC AIR VENT
FPS	FEET PER SECOND	TD	TRANSFER DUCT
FT	FEET	TEMP	TEMPERATURE
FTR	FINNED TUBE RADIATION	TEFC	TOTALLY ENCLOSED FAN COOLED
GA	GAUGE	TOD	TOP OF DUCT
GAL	GALLON	TON	12,000 BTUH COOLING CAPACITY
GALV	GALVANIZED	TOP	TOP OF PIPE
GC	GENERAL CONTRACTOR	TOT	TOTAL
GPH	GALLONS PER HOUR	TSP	TOTAL STATIC PRESSURE
GPM	GALLONS PER MINUTE	TSTAT	THERMOSTAT
GRD	GRADE	TYP	TYPICAL
GRV	GRAVITY RELIEF VENT	UC	1" UNDERCUT ON DOOR
GV	GRAVITY VENTILATOR	UH	UNIT HEATER
GWB	GYPSUM WALL BOARD	UNO	UNLESS NOTED OTHERWISE
HB	HOSE BIBB	UV	UNIT VENTILATOR
HC	HEATING COIL	V	VOLTS OR VENT
HD	HEAD	VAR	VARIABLE
HP	HORSEPOWER OR HIGH POINT	VB	VACUUM BREAKER
HR	HOUR	VD	VOLUME DAMPER
HT	HEIGHT	VEL	VELOCITY
HTG	HEATING	VFD	VARIABLE FREQUENCY DRIVE
HTR	HEATER	VTR	VENT THROUGH ROOF
HV	HEATING & VENTILATION UNIT	W	WIDTH OR WATT
HX	HEAT EXCHANGER	W/	WITH
HZ	HERTZ	W/O	WITHOUT
ID	INSIDE DIAMETER	WB	WET BULB TEMPERATURE
IN	INCHES	WC	WATER COLUMN
IN WC	INCHES, WATER COLUMN	WG	WATER GUAGE
IN WG	INCHES, WATER GAUGE	WMS	WIRE MESH SCREEN
KW	KILOWATT	ΔP	CHANGE IN PRESSURE
L	LENGTH	ΔT	CHANGE IN TEMPERATURE
LAT	LEAVING AIR TEMPERATURE	°F	DEGREES FARHENHEIT

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

PIPING ABBREVIATIONS

C(X)	STEAM CONDENSATE (X=PSIG)
S(X)	STEAM (X=PSIG)
(NAME)	REMOVE EXISTING PIPING

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

PIPING LEGEND

- GATE VALVE (OUTSIDE SCREW & YOKE UNLESS SPECIFIED OTHERWISE)
- GLOBE VALVE (OUTSIDE SCREW & YOKE UNLESS SPECIFIED OTHERWISE)
- BALL VALVE
- BUTTERFLY VALVE
- HOSE END BALL VALVE WITH CAP AND CHAIN
- PLUG VALVE
- PRESSURE REDUCING VALVE
- CHECK VALVE (SILENT CHECK TYPE ON PUMP DISCHARGE)
- STRAINER WITH HOSE END BLOWOFF VALVE, CAP AND CHAIN
- 2-WAY AUTOMATIC CONTROL VALVE (MODULATING)
- 2-WAY AUTOMATIC CONTROL VALVE (TWO POSITION)
- RELIEF/SAFETY VALVE
- UNION
- BLIND FLANGE
- PIPE - CAPPED
- PRESSURE GAUGE (W/ BALL VALVE(S), SNUBBER, AND FOR STEAM, SIPHON)
- PS — PRESSURE SWITCH
- THERMOMETER
- F&T — FLOAT & THERMOSTATIC STEAM TRAP
- VB — VACUUM BREAKER
- PT — PRESSURE/THERMOMETER WELL
- AV — AIR VENT - AUTOMATIC
- MV — AIR VENT - MANUAL
- TAV — THERMOSTATIC AIR VENT (STEAM ONLY)
- DIRECTION OF FLOW
- FLEXIBLE CONNECTOR
- PIPE CONNECTION - TOP
- PIPE CONNECTION - BOTTOM
- PIPE - DOWN
- PIPE - UP
- R — PITCH OF PIPE - (R) RISE OR (D) DROP
- REDUCER - CONCENTRIC
- REDUCER - ECCENTRIC
- PIPE BREAK (SINGLE LINE)
- DIRT LEG
- CO — CLEANOUT FOR CONDENSATE DRAIN

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

CALLOUT SYMBOLS

- CONNECT NEW TO EXISTING
- LIMIT OF DEMOLITION
- SECTION DESIGNATION (A / H2.0)
- SHEET NUMBER
- 1 — REVISION NUMBER
- T — THERMOSTAT, WALL MOUNTED
- S — TEMPERATURE SENSOR, WALL MOUNTED
- C — CARBON DIOXIDE SENSOR
- REMOVE EXISTING ITEM
- SA(100) — S = SUPPLY A = SCHEDULED DIFFUSER (100) = CFM TO BALANCE TO
- RA(100) — R = RETURN A = SCHEDULED DIFFUSER (100) = CFM TO BALANCE TO
- EA(100) — E = EXHAUST A = SCHEDULED DIFFUSER (100) = CFM TO BALANCE TO
- TA(100) — T = TRANSFER A = SCHEDULED DIFFUSER (100) = CFM TO BALANCE TO

EQUIPMENT REQUIRING ELECTRICAL SERVICE.
SEE SCHEDULE FOR PERFORMANCE REQUIREMENTS:

TAG 3.1 (XXX, XXX, XXX)

- SCHEDULED EQUIPMENT UNIT NUMBER
- FIRST DIGIT(S) = LEVEL WHERE UNIT IS LOCATED:
  - SB = SUB-BASEMENT
  - B = BASEMENT
  - LL = LOWER LEVEL
  - G = GROUND FLOOR
  - 1 = FIRST FLOOR
  - 2 = SECOND FLOOR
  - 3 = THIRD FLOOR, ETC
  - M = MEZZANINE
  - A = ATTIC
  - PH = PENTHOUSE
  - R = ROOF
- SECOND DIGIT(S):
  - 1 = FIRST UNIT OF THIS EQUIPMENT TYPE ON THIS LEVEL,
  - 2 = SECOND UNIT OF THIS EQUIPMENT TYPE ON THIS LEVEL,
  - 3 = THIRD UNIT OF THIS EQUIPMENT TYPE ON THIS LEVEL, ETC.
  - (DUE TO EDITING NOT ALL NUMBERS MAY BE USED)
- UNIT CAPACITY INFORMATION (IF APPLICABLE-DATA VARIES DEPENDING ON TYPE OF EQUIPMENT)
  - i.e. FOR FAN POWERED VAV BOXES:
  - FIRST NUMBER = MAX. CFM
  - SECOND NUMBER = MIN. CFM OR PERCENT OF MAX. CFM
  - THIRD NUMBER = COIL GPM OR KW

EQUIPMENT NOT REQUIRING ELECTRICAL SERVICE.
SEE SCHEDULE FOR PERFORMANCE REQUIREMENTS:

TAG 3.1 (XXX, XXX, XXX) — REFER TO EQUIPMENT REQUIRING ELECTRICAL SERVICE SYMBOL ABOVE FOR TAG AND DATA INFORMATION.

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

DUCTWORK

SINGLE LINE		DOUBLE LINE
W x D	RECTANGULAR DUCT W=WIDTH, D=DEPTH (INCHES UNLESS NOTED OTHERWISE) AS VIEWED	W - D, 10x6
DIA"Ø	ROUND RETURN/EXHAUST DUCT (DIA=INSIDE DIAMETER)	DIA"Ø, 10"Ø
	ROUND DUCT UP	
	RECTANGULAR SUPPLY DUCT UP	
	RECTANGULAR RETURN/ EXHAUST DUCT UP	
	RECTANGULAR SUPPLY DUCT DN	
	RECTANGULAR RETURN/ EXHAUST DUCT DN	
	STANDARD RADIUS ELBOW (R = W) SUPPLY/RETURN/EXHAUST	R
	FULL LENGTH SPLITTER VANES (R < W) SUPPLY/RETURN/EXHAUST	R, R/2
	HORIZONTAL OFFSET SUPPLY/RETURN/EXHAUST	
R/D	CHANGE OF ELEVATION (R) RISE OR DROP SUPPLY/RETURN/EXHAUST	R/D
	45° TAP TAKE-OFF	
	90° TAP TAKE-OFF (45°, SQUARE TO ROUND, 45° TAKE-OFF TRANSITION TO ROUND, AND BELLMOUTH, RESPECTIVELY)	
	CONVERGE RETURN/EXHAUST W/45° TAKE-OFFS	
10x8, 6"Ø, 10x8, 6"Ø	RECTANGULAR TO ROUND SUPPLY/RETURN/EXHAUST	6"Ø, 10x6
	ACOUSTICALLY LINED DUCTWORK	
	FLEXIBLE DUCTWORK	
	OPEN END DUCT W/ ½"x½" WMS	

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

DIFFUSERS

SINGLE LINE		DOUBLE LINE
VD	CEILING DUCT MOUNTED DIFFUSER/GRILLE	VD
VD	TAKE-OFF TO DIFFUSER/GRILLE	VD, HARD ELBOW, VD
VD	CEILING DUCT MOUNTED DIFFUSER/GRILLE	VD
	SIDEWALL DUCT MOUNTED REGISTER/GRILLE	
	OPEN END DUCT W/ 1/2"x1/2" WMS	

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

DESIGN CONDITIONS

CODE/STANDARD:

2009 INTERNATIONAL MECHANICAL CODE
MASSACHUSETTS STATE BUILDING CODE, EIGHTH EDITION

OUTDOOR AIR TEMPERATURE:

WINTER	7°F
SUMMER	91°F

INDOOR AIR TEMPERATURE:

SPACE	OCCUPIED HTG	UNOCCUPIED HTG
OFFICES	70°F	55°F
AUDITORIUM	70°F	55°F
KITCHEN	70°F	55°F

MINIMUM VENTILATION:

SPACE	CFM/SF/PERSON	CFM/FT	CFM
OFFICES	0.06/5	-	15
AUDITORIUM	0.06/5	-	8000
KITCHEN	0,7	-	1300
KITCHEN HOOD	-	550	9900
DISHWASHER HOOD	-	100	300

HVAC GENERAL NOTES

1. GENERAL NOTES APPLY TO ALL DRAWINGS.
2. THIS PROJECT INVOLVES CONSTRUCTION INSIDE AN EXISTING STRUCTURE. CONTRACTORS, BY SUBMITTING A BID, ARE DEEMED TO BE COMPLETELY FAMILIAR WITH THE EXISTING CONDITION OF THE BUILDING AS IT INFLUENCES THE WORK DESCRIBED. ABSOLUTELY NO CLAIMS FOR EXTRA COMPENSATION WILL BE CONSIDERED FOR EXISTING CONDITIONS VISIBLE OR REASONABLY INFERABLE FROM A CAREFUL EXAMINATION OF THE EXISTING BUILDING.
3. THIS CONTRACTOR SHALL INSPECT THE EXISTING FIELD CONDITIONS AT THE SITE AND THE "AS-BUILT" BASE BUILDING CONTRACT DOCUMENTS PRIOR TO THE START OF ANY WORK TO DETERMINE WHAT EFFECT THE EXISTING CONDITIONS WILL HAVE ON HIS WORK. POTENTIAL PROBLEM AREAS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT AND/OR ENGINEER IMMEDIATELY.
4. THIS CONTRACTOR SHALL CONNECT HIS WORK TO VARIOUS EXISTING PIPING, DUCTWORK, AND CONTROL SYSTEMS IN THE BASE BUILDING. THE NEW WORK SHALL BE COMPATIBLE WITH THE EXISTING SYSTEMS. LOCATION OF EQUIPMENT OR THE ROUTING OF THE VARIOUS SYSTEMS AS WELL AS OPENINGS IN FLOOR SLABS OR WALLS SHALL BE GOVERNED BY THE EXISTING CONDITIONS AS THEY APPEAR IN THE FIELD OR ON THE "AS-BUILT" DRAWINGS.
5. CARE SHALL BE TAKEN DURING THE INSTALLATION TO NOT DAMAGE OR INTERRUPT BUILDING SYSTEMS AND SERVICES THAT ARE ALREADY INSTALLED. DAMAGE TO SUCH SYSTEMS OR EQUIPMENT CAUSED BY THIS CONTRACTOR DURING INSTALLATION SHALL BE REPAIRED AND/OR REPLACED AT THIS CONTRACTOR'S EXPENSE TO THE COMPLETE SATISFACTION OF THE BUILDING OWNER.
6. SHUTDOWN OF EXISTING SYSTEMS FOR CONNECTION TO EXISTING SERVICES SHALL BE COORDINATED WITH THE CONSTRUCTION MANAGER OR GENERAL CONTRACTOR AND BUILDING OWNER. THIS CONTRACTOR SHALL SUBMIT REQUESTS, WHERE THEY AFFECT THE OPERATION OF THE BUILDING SYSTEMS, AT LEAST ONE WEEK IN ADVANCE OF ANY REQUIRED SHUTDOWN. THE ACTUAL SHUTDOWN PERIOD SHALL BE AS SHORT AS POSSIBLE AND AT A TIME MUTUALLY AGREEABLE TO THE BUILDING OWNER AND THE CONSTRUCTION MANAGER/GENERAL CONTRACTOR.
7. DRAWINGS ARE DIAGRAMMATIC, THEREFORE DETERMINE EXACT LOCATIONS OF SYSTEMS AND COMPONENTS IN FIELD.
8. ALL WORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN PIPING AND DUCTS (INCLUDING DIVIDED DUCTS) AND TRANSITIONS AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
9. VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. VERIFY AND PROVIDE DUCT AND/OR PIPE TRANSITIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.
10. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATIONS OF AIR TERMINAL DEVICES.
11. ALL MATERIALS AND EQUIPMENT UNLESS SPECIFICALLY INDICATED AS REUSED, SHALL BE NEW.
12. DUCTWORK SHALL NOT RUN ALONG FULL HEIGHT PARTITIONS.
13. ACCESS PANELS SHALL BE PROVIDED TO ALLOW FOR CLEANING OF COILS AND SERVICING OF DAMPERS, VALVES, AND ALL CONCEALED MECHANICAL EQUIPMENT.
14. THE INSIDE OF ALL DUCTWORK VISIBLE THROUGH A GRILLE OR DIFFUSER SHALL BE PAINTED FLAT BLACK.
15. EXISTING ROOM THERMOSTATS AND SENSORS SHALL BE PROTECTED DURING CONSTRUCTION AND RELOCATED AS INDICATED ON THE DRAWINGS. INSTALL NEW AND RELOCATED ROOM THERMOSTATS AND SENSORS 4 FEET AFF OR AS DIRECTED OTHERWISE BY ARCHITECT.
16. WHEN SECTION OF DUCTWORK IS NOT LABELED FOR SIZE, THE LARGER SIZE INDICATED ON THE CONNECTED DUCT SHALL PREVAIL. SIZE OF DUCT RUN-OUTS TO DIFFUSER SHALL EQUAL DIFFUSER NECK SIZE.
17. THE FIRE PROOFING OF THE BUILDING STRUCTURE IS NOT TO BE REMOVED FOR THE INSTALLATION OF HANGERS, SUPPORTS, DUCTWORK, ETC., IF FIRE PROOFING IS DAMAGED, IT SHALL BE REPAIRED AT THE EXPENSE OF THE TRADE.
18. CONTRACTOR SHALL TEST AND CALIBRATE ALL CONTROLS AND VERIFY ALL ARE FULLY FUNCTIONAL AND SUBMIT DOCUMENTATION. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
19. CONTRACTOR SHALL PROVIDE AND SUBMIT DOCUMENTATION FOR TESTING AND BALANCING OF ALL AIR SYSTEMS, DUCT AND PIPING PRESSURE AND LEAKAGE TESTS, OPERATING AND MAINTENANCE MANUALS, AND AS BUILT DRAWINGS. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
20. REFER TO THE PROJECT SPECIFICATIONS FOR FURTHER REQUIREMENTS.
21. MANY EQUIPMENT SCHEDULES DO NOT LIST QUANTITIES. CONTRACTOR SHALL REFER TO ALL DRAWINGS AND PROVIDE THE REQUIRED QUANTITIES FOR ALL COMPONENTS.
22. IN ACCORDANCE WITH SPECIFICATION 23 00 00 SECTION 1.14 AND 1.15, THE CONTRACTOR SHALL COORDINATE WITH ALL TRADES AND PREPARE COORDINATION DRAWINGS PRIOR TO INSTALLATION. COORDINATION DRAWINGS SHALL BE SUBMITTED TO THE OWNERS REPRESENTATIVE FOR REVIEW PRIOR TO INSTALLATION.

DUCTWORK/RGD SYMBOLS

- AFMS — AIR FLOW MONITORING STATION
- ACD — AUTOMATIC CONTROL DAMPER W/ ACCESS DOOR
- VD — MANUAL VOLUME DAMPER
- FD — SELF-CLOSING FIRE DAMPER W/ ACCESS DOOR
- SDET — DUCT MOUNTED SMOKE DETECTOR
- BDD — BACKDRAFT DAMPER
- STANDARD 4-WAY BLOW SUPPLY DIFFUSER
- 3-WAY BLOW SUPPLY DIFFUSER
- OR — 2-WAY BLOW SUPPLY DIFFUSER
- ONE-WAY BLOW SUPPLY DIFFUSER
- RETURN/EXHAUST GRILLE OR REGISTER
- RETURN OR EXHAUST AIR FLOW
- SUPPLY AIR FLOW

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

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REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools — Education • Inspiration • Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

HVAC LEGENDS, NOTES AND ABBREVIATIONS

PROJECT NUMBER 19431.01
DESIGNED BY: TC
DRAWN BY: TC
CHECKED BY: BEO
DATE: March 03, 2014
SCALE: NONE

SHEET NUMBER:

H000

SHEET 25 **OF** 61

ELEC: — MECH: — FIRE: — PLUM: — STRU: — ARCH: — REVIEWED BY: CIVIL:

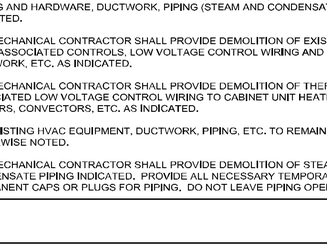
G:\2013\13013\13013-1 • Somerville High School Auditorium\1200 Drawings\1203 HVAC\Revit Files\2013\13013-1 H000 HVAC LEGEND, NOTES AND ABBREVIATIONS.dwg [Wed, March 03, 2014 - 3:06pm] dhancock

DEMOLITION WORK NOTES

1. DEMOLITION NOTES SHALL APPLY TO ALL DEMOLITION DRAWINGS.
2. ALL PIPE, DUCTWORK, AND LOUVER SIZES INDICATED ARE APPROXIMATE. THE MECHANICAL CONTRACTOR SHALL FIELD VERIFY EXACT SIZES IN THE FIELD.
3. THE MECHANICAL CONTRACTOR SHALL PROVIDE DEMOLITION OF EXISTING UNIT VENTILATOR AND ASSOCIATED THERMOSTATS, CONTROLS, LOW VOLTAGE CONTROL WIRING AND HARDWARE, DUCTWORK, PIPING (STEAM AND CONDENSATE), ETC. AS INDICATED.
4. THE MECHANICAL CONTRACTOR SHALL PROVIDE DEMOLITION OF EXISTING INLINE FANS, ASSOCIATED CONTROLS, LOW VOLTAGE CONTROL WIRING AND HARDWARE, DUCTWORK, ETC. AS INDICATED.
5. THE MECHANICAL CONTRACTOR SHALL PROVIDE DEMOLITION OF THERMOSTATS AND ASSOCIATED LOW VOLTAGE CONTROL WIRING TO CABINET UNIT HEATERS, UNIT HEATERS, CONVECTORS, ETC. AS INDICATED.
6. ALL EXISTING HVAC EQUIPMENT, DUCTWORK, PIPING, ETC. TO REMAIN UNLESS OTHERWISE NOTED.
7. THE MECHANICAL CONTRACTOR SHALL PROVIDE DEMOLITION OF STEAM AND CONDENSATE PIPING INDICATED. PROVIDE ALL NECESSARY TEMPORARY OR PERMANENT CAPS OR PLUGS FOR PIPING. DO NOT LEAVE PIPING OPEN ENDED.

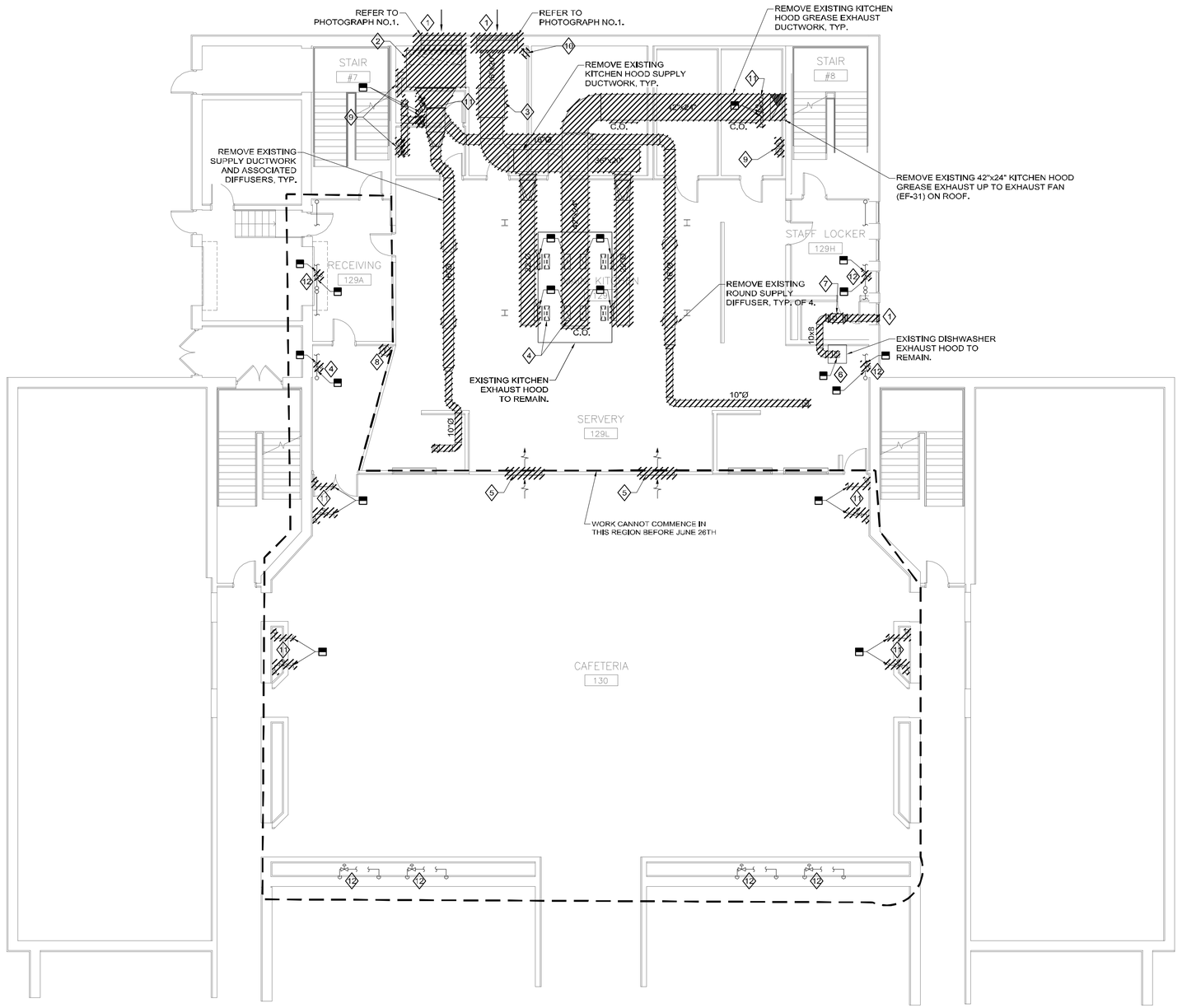
KEYNOTES

1	REMOVE EXISTING LOUVER. REFER TO ARCHITECTURAL PLANS.
2	REMOVE EXISTING UNIT VENTILATOR (UV-H-S), ASSOCIATED DUCTWORK, DAMPERS, LOW VOLTAGE CONTROL WIRING AND HARDWARE, PIPING (STEAM SUPPLY AND CONDENSATE), ETC. IN ITS ENTIRETY BACK TO NEAREST MAIN. PROVIDE NEW ISOLATION VALVES AND CAPS ON EXISTING BRANCH PIPING AT POINT WHERE DEMOLITION STOPS.
3	REMOVE EXISTING KITCHEN HOOD SUPPLY FAN (SF-2), ASSOCIATED DUCTWORK, DAMPERS, LOW VOLTAGE CONTROL WIRING AND HARDWARE, ETC. IN ITS ENTIRETY.
4	EXISTING 24"x10" EXHAUST CONNECTION (2700 CFM EA) AND EXISTING 24"x8" MAKE-UP AIR CONNECTION (1620 CFM EA) TO REMAIN, TYP OF 4. REMOVE EXISTING EXHAUST AND SUPPLY DUCTWORK FROM HOOD CONNECTIONS, TYP OF 4.
5	REMOVE EXISTING 46"x22" TRANSFER GRILLE, DUCTWORK, AND FIRE DAMPER. THE MECHANICAL CONTRACTOR SHALL COVER AND TAPE SEAL OPENING WITH 2" POLYSTYRENE INSULATION. LOUVER SHALL BE MADE AIR TIGHT.
6	EXISTING 10"x8" DISHWASHER EXHAUST CONNECTION (600 CFM EA) TO REMAIN. REMOVE EXISTING EXHAUST DUCTWORK FROM HOOD CONNECTION.
7	REMOVE EXISTING DISHWASHER EXHAUST FAN (EF-32), ASSOCIATED DUCTWORK, DAMPERS, LOW VOLTAGE CONTROL WIRING AND HARDWARE, ETC. IN ITS ENTIRETY. REMOVE EXISTING DUCTWORK UP TO LOUVER. THE MECHANICAL CONTRACTOR SHALL COVER AND TAPE SEAL OPENING WITH 2" POLYSTYRENE INSULATION. LOUVER SHALL BE MADE AIR TIGHT.
8	REMOVE THE EXISTING THERMOSTAT AND THE ASSOCIATED LOW VOLTAGE CONTROL WIRING FOR UV-H.
9	REMOVE THE EXISTING STEAM SUPPLY AND CONDENSATE PIPING RISERS BACK TO NEAREST MAIN. CONTRACTOR SHALL CAP AND SEAL PIPES. PROVIDE NEW ISOLATION VALVES AND CAPS ON EXISTING BRANCH PIPING AT POINT WHERE DEMOLITION STOPS.
10	REMOVE EXISTING CONTROL PANEL ENCLOSURE, CONTROLLER, AND ASSOCIATED LOW VOLTAGE WIRING IN ITS ENTIRETY. CONTRACTOR TO FIELD VERIFY LOCATION OF PANEL.
11	REMOVE EXISTING STEAM CONTROL VALVE, CONTRACTOR TO FIELD VERIFY LOCATION OF PIPING AND VALVE.
12	EXISTING STEAM CONTROL VALVE AND PIPING TO REMAIN IN ITS ENTIRETY.



PHOTOGRAPH NO.1

REMOVE TWO EXISTING LOUVERS. REFER TO ARCHITECTURAL PLANS.



1 HD201 HVAC FIRST FLOOR DEMOLITION PLAN
1/8" = 1'-0"

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81 Highland Avenue,
Somerville, MA 02143

HVAC CAFETERIA/ KITCHEN DEMO FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: TC
DRAWN BY: TC
CHECKED BY: BEO
DATE: March 03, 2014
SCALE: 1/8" = 1'-0"

SHEET NUMBER:

HD201

SHEET 26 **OF** 61

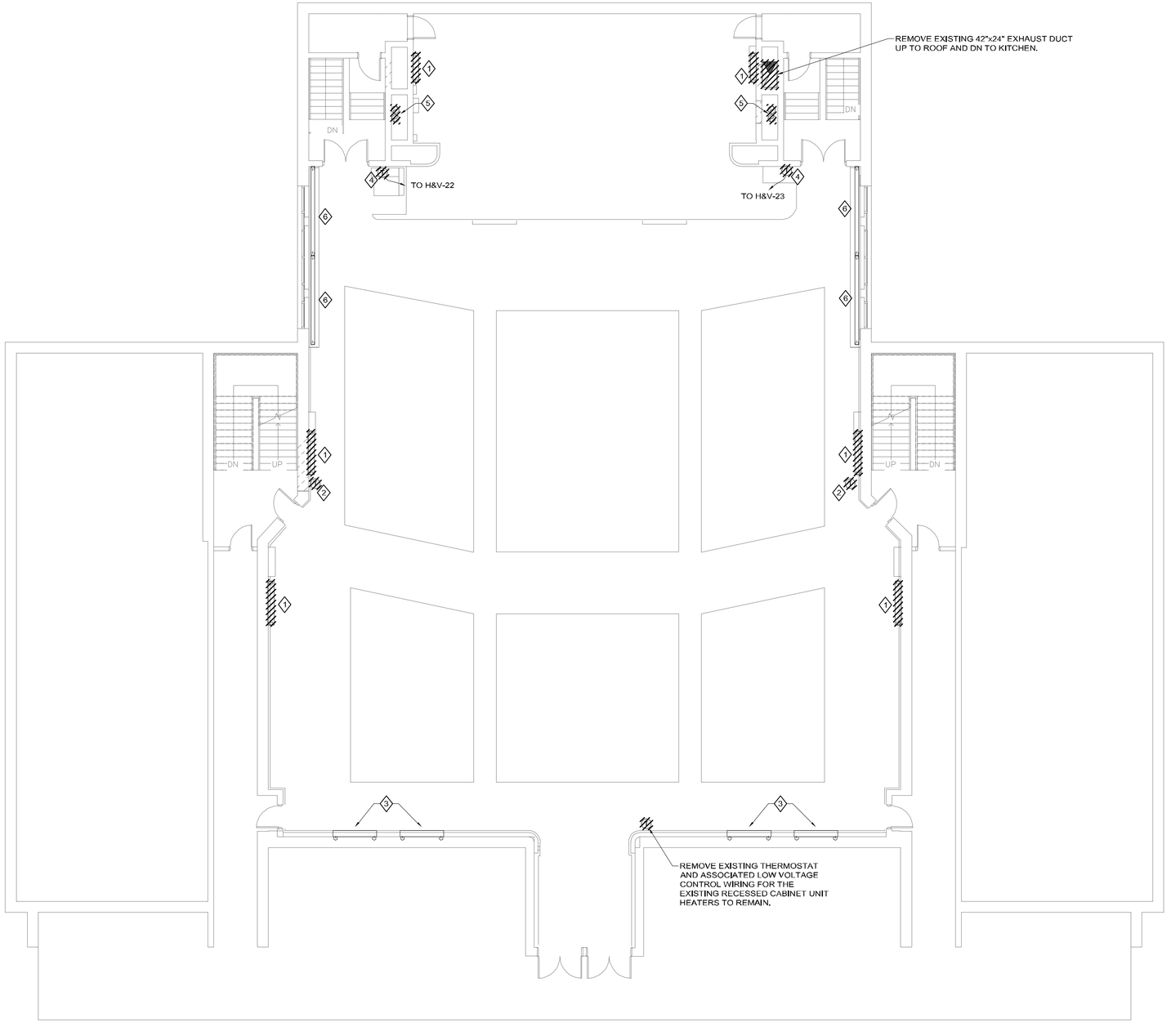
REVISED BY: DATE: ELEC: MECH: FIRE: PLUMB: STRUC: ARCH:

G:\2013\13013031 - Somerville High School Auditorium\1300 Drawings\1303 HVAC\Revit Files\2013\13031 H1303 1 HVAC CAFETERIA&KITCHEN DEMO FLOOR PLAN.rvt 3/3/2014 2:34:11 PM dthorsell

KEYNOTES	
1	REMOVE EXISTING CONVECTOR AND ASSOCIATED LOW VOLTAGE CONTROLS, STEAM SUPPLY PIPING, AND STEAM CONDENSATE PIPING IN ITS ENTIRETY BACK TO NEAREST MAIN.
2	REMOVE EXISTING THERMOSTAT AND ASSOCIATED LOW VOLTAGE CONTROL WIRING FOR THE EXISTING SURFACE CONVECTORS TO BE REMOVED.
3	EXISTING CABINET UNIT HEATER AND ASSOCIATED LOW VOLTAGE CONTROLS, STEAM PIPING, AND CONDENSATE PIPING TO REMAIN.
4	REMOVE THE EXISTING THERMOSTAT AND THE ASSOCIATED LOW VOLTAGE CONTROL WIRING FOR EACH AIR HANDLING UNIT SERVING THE AUDITORIUM (HV-22 & HV-23).
5	REMOVE EXISTING STEAM PIPING AND STEAM CONDENSATE PIPING RISERS IN ITS ENTIRETY BACK TO THE NEAREST MAIN. CONTRACTOR SHALL CAP AND SEAL PIPES. PROVIDE NEW ISOLATION VALVES ON EXISTING BRANCH PIPING AT POINT WHERE DEMOLITION STOPS.
6	CAST IRON RADIATORS AND ASSOCIATED CONTROLS, STEAM PIPING, AND CONDENSATE PIPING TO REMAIN.

PHOTOGRAPH NO.1

REMOVE TWO EXISTING CONVECTORS ON EACH SIDE OF THE AUDITORIUM AND LEAVE FOUR CABINET UNIT HEATERS IN THE REAR OF THE AUDITORIUM (TWO NOT SHOWN).



1 HD202 HVAC SECOND FLOOR DEMOLITION PLAN
1/8" = 1'-0"

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81 Highland Avenue, Somerville, MA 02143

HVAC AUDITORIUM DEMO FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: TC
DRAWN BY: TC
CHECKED BY: BEO
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

HD202

SHEET 27 **OF** 61

ELEC: MECH: FIRE: PLUM: STRU: ARCH: OWN: REVIEWED BY:

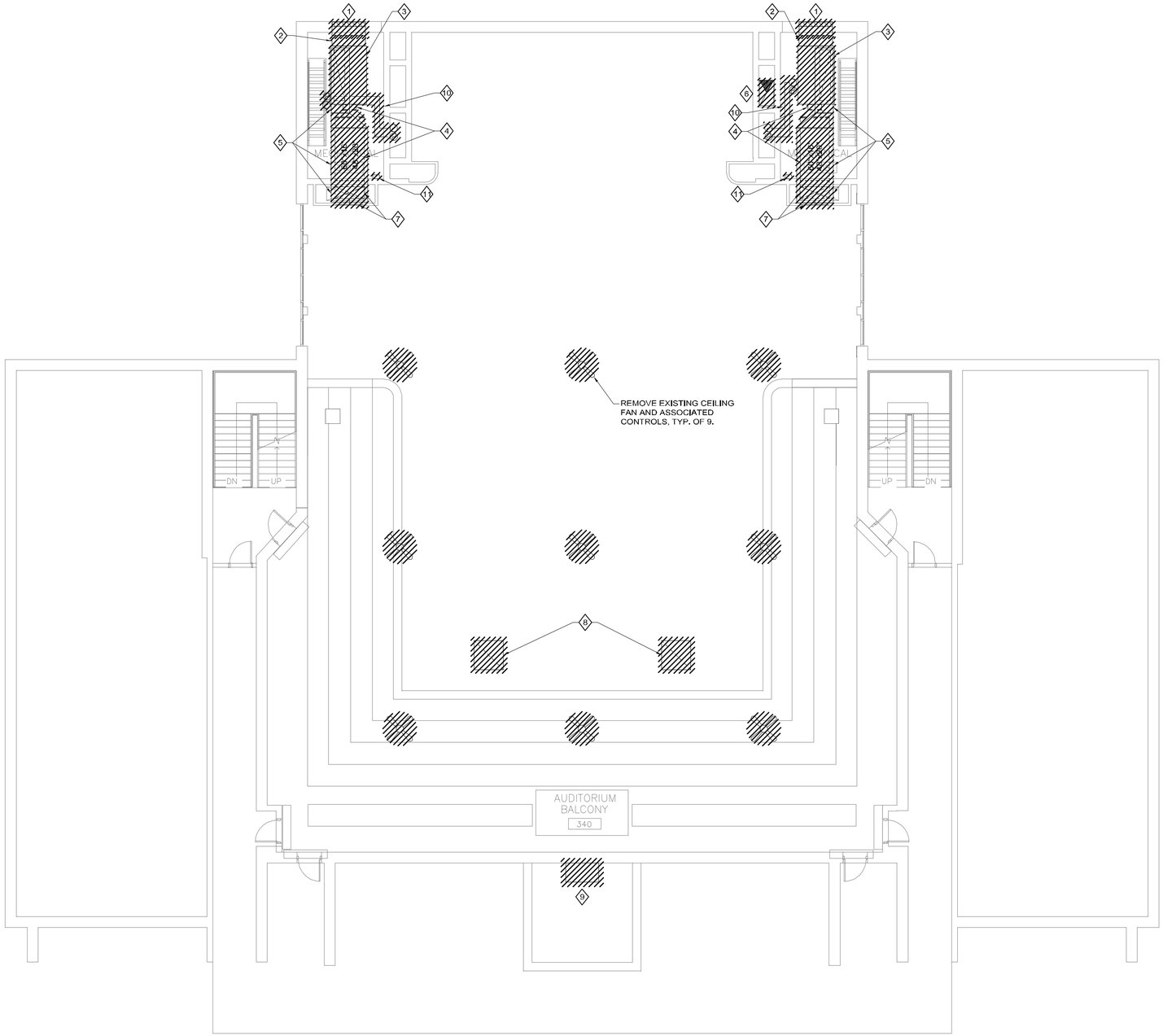
G:\2013\13011\13331 - Somerville High School Auditorium\1200 Drawings\1203 HVAC\Revit Files\13331 H0202 HVAC AUDITORIUM DEMO FLOOR PLAN.dwg [Web] March 03, 2014 - 3:41 pm rmarsack

KEYNOTES	
1	REMOVE EXISTING 47"Wx57"H LOUVER. REFER TO PHOTOGRAPH NO.1. REFER TO ARCHITECTURAL PLANS.
2	REMOVE EXISTING OA PLENUM, ANY DAMPERS, AND 57"x24" OA DUCT ASSOCIATED WITH THE AIR HANDLING UNIT.
3	REMOVE EXISTING AIR HANDLING UNIT (H&V-22 & H&V-23), ASSOCIATED DUCTWORK, DAMPERS, CONTROL WIRING AND HARDWARE, PIPING (STEAM AND CONDENSATE), ETC. IN ITS ENTIRETY. THE EXISTING AIR HANDLING UNIT SHALL BE DISMANTLED IN PLACE AND REMOVED IN PIECES.
4	REMOVE EXISTING 22"x22" DUCT CONNECTION AND EXISTING 48"x20" SUPPLY DUCT IN THEIR ENTIRETY.
5	REMOVE EXISTING 30"x26" RETURN DUCT AND EXISTING 60"x16" RETURN DUCT IN THEIR ENTIRETY, INCLUDING THE DUCT ABOVE THE AUDITORIUM ACT CEILING.
6	REMOVE EXISTING 42"x24" EXHAUST DUCT UP TO ROOF AND DN TO KITCHEN IN ITS ENTIRETY. COORDINATE ACCESS TO GREASE DUCT IN THE SHAFT WITH GC.
7	REMOVE EXISTING 56"x20" SUPPLY DUCT DN (EXPOSED IN AUDITORIUM) AND ASSOCIATED 46"x28" SUPPLY GRILLES (TYP OF 2).
8	REMOVE EXISTING 48"x48" RELIEF DUCT UP TO EXISTING GRAVITY RELIEF VENT MOUNTED ON THE ROOF. EXISTING GRAVITY RELIEF VENT (LOCATED ON ROOF) TO REMAIN. THE MECHANICAL CONTRACTOR SHALL COVER AND TAPE SEAL OPENING WITH 2" POLYSTYRENE INSULATION. BOTTOM OF GRAVITY RELIEF VENT SHALL BE MADE AIR TIGHT. COORDINATE ACT REMOVAL WITH THE GC.
9	REMOVE EXISTING CEILING FAN CONTROLS AND ASSOCIATED CONTROL WIRING. COORDINATE WITH DIV 26 AND GC AS REQUIRED.
10	REMOVE EXISTING STEAM SUPPLY AND CONDENSATE PIPING RISERS AND HORIZONTAL PIPING TO THE EXISTING AIR HANDLING UNITS BACK TO NEAREST MAIN. THE MECHANICAL CONTRACTOR SHALL CAP AND SEAL PIPES. PROVIDE NEW ISOLATION VALVES AND CAPS ON BRANCH PIPING AT POINT WHERE DEMOLITION STOPS. COORDINATE ANY ACCESS REQUIRED WITH THE GC.
11	REMOVE EXISTING CONTROL PANEL ENCLOSURE, CONTROLLER, AND ASSOCIATED WIRING IN ITS ENTIRETY. CONTRACTOR TO FIELD VERIFY LOCATION OF PANEL.



PHOTOGRAPH NO.1

REMOVE TWO EXISTING LOUVERS TO INSTALL TWO NEW LOUVERS. REFER TO ARCHITECTURAL PLANS.



1 HD200 HVAC THIRD FLOOR DEMOLITION PLAN
1/8" = 1'-0"

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81 Highland Avenue, Somerville, MA 02143

HVAC AUDITORIUM BALCONY DEMO FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: TC
DRAWN BY: TC
CHECKED BY: BEO
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

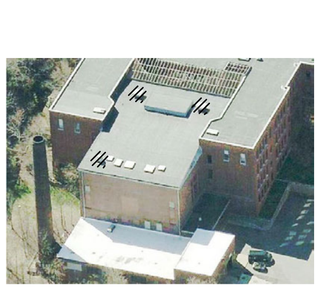
HD203

SHEET 28 OF 61

REVIEWED BY: OWNER ARCH STRUC PLUMB FIRE MECH ELEC

G:\2013\13019391 - Somerville High School Auditorium\1200 Drawings\1203 HVAC\Revit files\13019391 HD203 HVAC AUDITORIUM BALCONY DEMO FLOOR PLAN.rvt 3/3/2014 1:34:51 PM dfrancis

REVIEWED BY: CIVIL | ARCH | STRU | PLUMB | FIRE | MECH | ELEC



PHOTOGRAPH NO.1

REMOVE TWO EXISTING ROOF MOUNTED RELIEF HOODS (EV-17 AND EV-24), EXISTING ROOF CURB TO REMAIN. REMOVE EXISTING KITCHEN HOOD GREASE EXHAUST FAN (EF-31) AND ASSOCIATED ROOF CURB. REFER TO ARCHITECTURAL PLANS.

REMOVE EXISTING KITCHEN HOOD GREASE EXHAUST FAN (EF-31) AND CURB, REFER TO PHOTOGRAPH NO.1.

REMOVE EXISTING ROOF MOUNTED RELIEF HOOD, REFER TO PHOTOGRAPH NO.1. EXISTING ROOF CURBS TO REMAIN.

1 HD204 HVAC ROOF DEMOLITION PLAN
1/8" = 1'-0"

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HVAC ROOF DEMO PLAN

PROJECT NUMBER 19431.01
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DRAWN BY: TC
CHECKED BY: BEO
DATE: March 03, 2014
SCALE: 1/8" = 1'-0"

SHEET NUMBER:

HD204

SHEET 29 **OF** 61

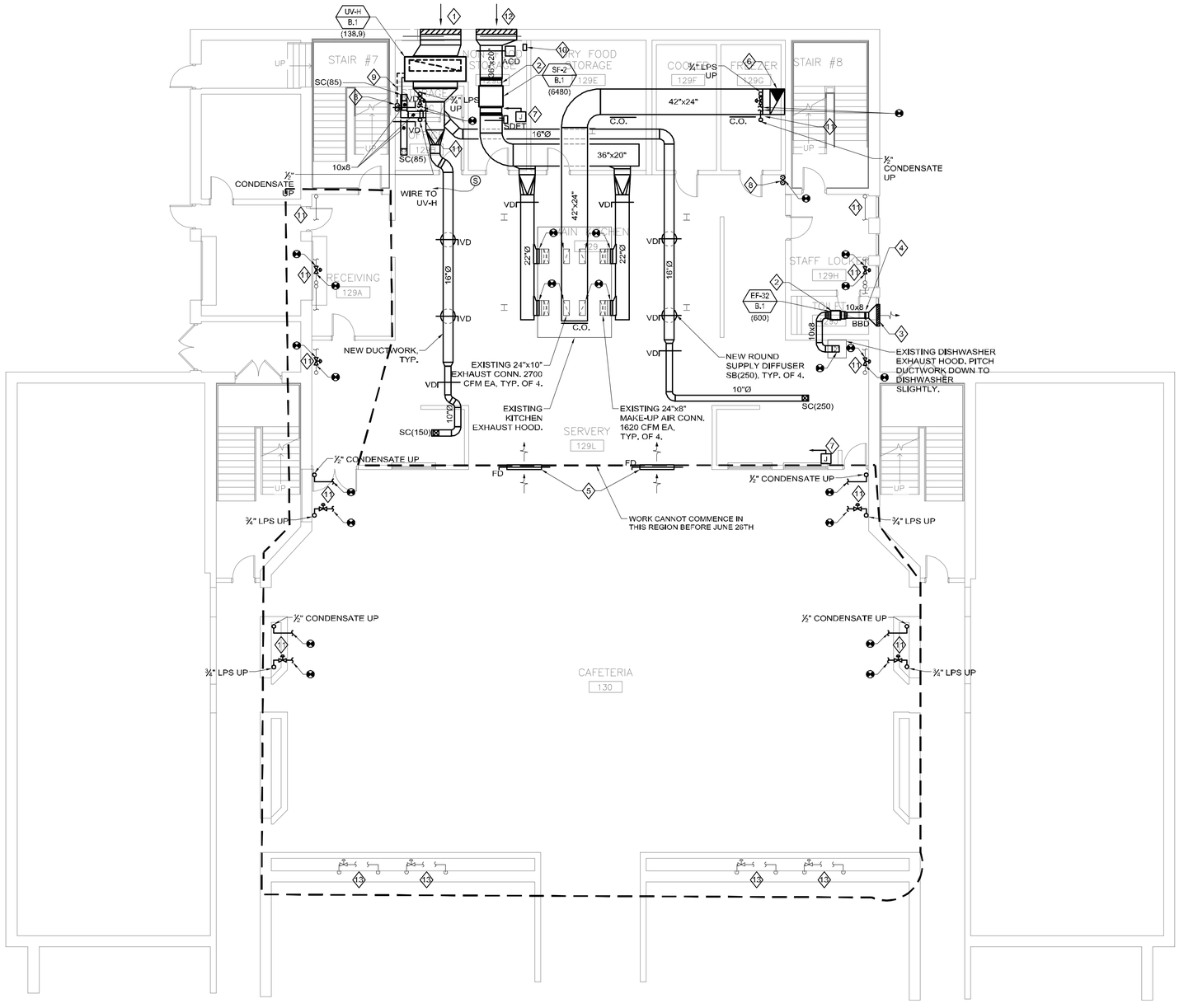
G:\2013\2013013\01 - Somerville High School Auditorium\300 Drawings\301 HVAC\Dwg Files\2013013(01) H\D204-HVAC ROOF DEMO PLAN.dwg [Hvac] March 03, 2014 - 3:41pm ethanoak

NEW WORK NOTES

1. NEW WORK NOTES SHALL APPLY TO ALL NEW DUCTWORK AND NEW PIPING DRAWINGS.
2. EXISTING DUCT AND PIPE SIZES INDICATED ARE APPROXIMATE. FIELD VERIFY EXISTING DUCT AND PIPE SIZES AFTER INSULATION IS REMOVED. PROVIDE TRANSITIONS FROM EXISTING DUCT AND PIPING TO NEW DUCT AND PIPING AS REQUIRED.
3. 1" FILTER MEDIA SHALL BE TEMPORARILY INSTALLED OVER ALL SUPPLY AIR DIFFUSERS AND REGISTERS PRIOR TO STARTING UP THE NEW AIR HANDLING EQUIPMENT. AFTER THE NEW AIR HANDLING EQUIPMENT HAS RUN FOR A SHORT PERIOD OF TIME, THE MECHANICAL CONTRACTOR SHALL REMOVE THE FILTER MEDIA.
4. BALANCE DIFFUSERS, REGISTERS, GRILLES, AND EQUIPMENT TO FLOWS INDICATED.
5. REFER TO ARCHITECTURAL PLANS FOR PAINTING OF ALL NEW EXPOSED DUCTWORK TO MATCH EXISTING CEILINGS.
6. EXISTING ROOF SHALL BE THOROUGHLY PROTECTED TO PREVENT DAMAGE FROM CONSTRUCTION AND/OR RIGGING. ANY ROOF DAMAGE SHALL BE REPAIRED TO THE SATISFACTION OF THE BUILDING OWNER WITHOUT ANY ADDITIONAL COST TO THE CONTRACT.
7. PROVIDE LOW-VOLTAGE WIRING FROM ELECTRICAL SOURCE TO MISCELLANEOUS ATC DEVICES. REFER TO AND COORDINATE WITH DIVISION 26.

KEYNOTES

1	NEW LOUVER. REFER TO ARCHITECTURAL PLANS. (FREE AREA 2.97 SQFT).
2	PROVIDE FLEXIBLE CONNECTOR FOR AT FAN INTAKE AND DISCHARGE OF FAN.
3	NEW LOUVER. REFER TO ARCHITECTURAL PLANS. (FREE AREA 0.6 SQFT).
4	NEW 10"x8" STAINLESS STEEL DISHWASHER EXHAUST DUCTWORK AND STAINLESS STEEL BACK DRAFT DAMPER. PROVIDE NEW LOUVER (REFER TO ARCHITECTURAL PLANS).
5	PROVIDE 46"x22" TRANSFER GRILLES (2 AT EACH LOCATION), DUCTWORK, AND FIRE DAMPER, TYP. OF 2.
6	NEW 42"x24" WELDED KITCHEN EXHAUST UP TO EXHAUST FAN ON ROOF. PROVIDE FIREWRAP ON ALL GREASE DUCTS.
7	PROVIDE LOW VOLTAGE WIRING FROM ELECTRICAL SOURCE TO HVAC CONTROL DEVICES. REFER TO DIVISION 26 FOR POWER SOURCE LOCATIONS.
8	NEW 3" LPS AND 1¼" CONDENSATE RISERS UP TO HV UNITS. EXTEND PIPING TO CLOSEST LPS AND CONDENSATE MAINS.
9	NEW 2" LPS AND ¾" CONDENSATE PIPING TO UV-H
10	PROVIDE NEW DDC CONTROL PANEL ENCLOSURE, CONTROLLER, AND ASSOCIATED WIRING IN ITS ENTIRETY. CONTRACTOR TO FIELD VERIFY LOCATION OF NEAREST EXISTING PANEL TO INTERFACE INTO EXISTING DDC CONTROL SYSTEM WITH.
11	PROVIDE NEW CONTROL VALVES AND NECESSARY PIPING. CONTRACTOR TO FIELD VERIFY LOCATION OF PIPING.
12	NEW LOUVER. REFER TO ARCHITECTURAL PLANS. (FREE AREA 12.96 SQFT).
13	EXISTING STEAM CONTROL VALVE AND PIPING TO REMAIN IN ITS ENTIRETY.



1 H201 HVAC FIRST FLOOR NEW PLAN
1/8" = 1'-0"

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HVAC CAFETERIA/ KITCHEN FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: TC
DRAWN BY: TC
CHECKED BY: BEO
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

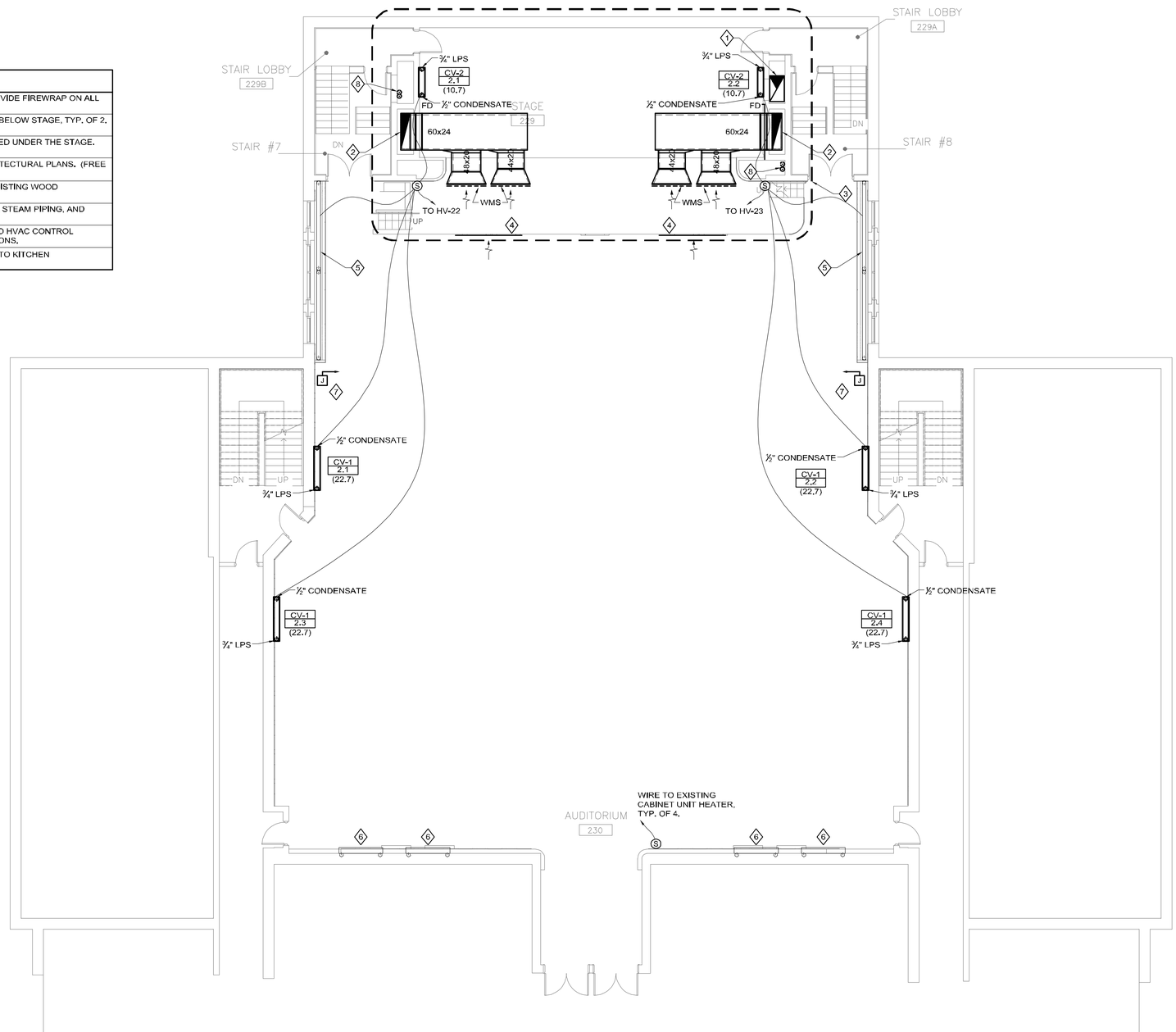
SHEET NUMBER:

H201

SHEET 30 **OF** 61

G:\2013\13013031 - Somerville High School Auditorium\1200 Drawings\1203 HVAC\Rvt Files\13013031 H201 HVAC CAFETERIA-KITCHEN FLOOR PLAN.dwg [Web] March 03, 2014 - 3:49pm dfranzak
REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

KEYNOTES	
1	42"x24" EXHAUST DUCT UP TO ROOF AND DN TO KITCHEN. PROVIDE FIREWRAP ON ALL GREASE DUCTS.
2	60"x16" LINED RETURN DUCT UP TO 3RD FLOOR AND DOWN TO BELOW STAGE, TYP. OF 2.
3	ALL PIPING AND LOW VOLTAGE WIRING SHALL BE PLENUM RATED UNDER THE STAGE.
4	PLENUM RETURN GRILLES TO BELOW STAGE. REFER TO ARCHITECTURAL PLANS. (FREE AREA 17 SQFT).
5	EXISTING CAST IRON RADIATOR AND ASSOCIATED PIPING IN EXISTING WOOD ENCLOSURE TO REMAIN, TYP. OF 2.
6	EXISTING CABINET UNIT HEATER AND ASSOCIATED CONTROLS, STEAM PIPING, AND CONDENSATE PIPING, TYP. OF 4.
7	PROVIDE LOW VOLTAGE WIRING FROM ELECTRICAL SOURCE TO HVAC CONTROL DEVICES. REFER TO DIVISION 26 FOR POWER SOURCE LOCATIONS.
8	3" LPS AND 1¼" CONDENSATE RISERS UP TO HV UNITS AND DN TO KITCHEN



1 HVAC SECOND FLOOR NEW PLAN
1/8" = 1'-0"

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HVAC AUDITORIUM FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: TC
DRAWN BY: TC
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DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

H202

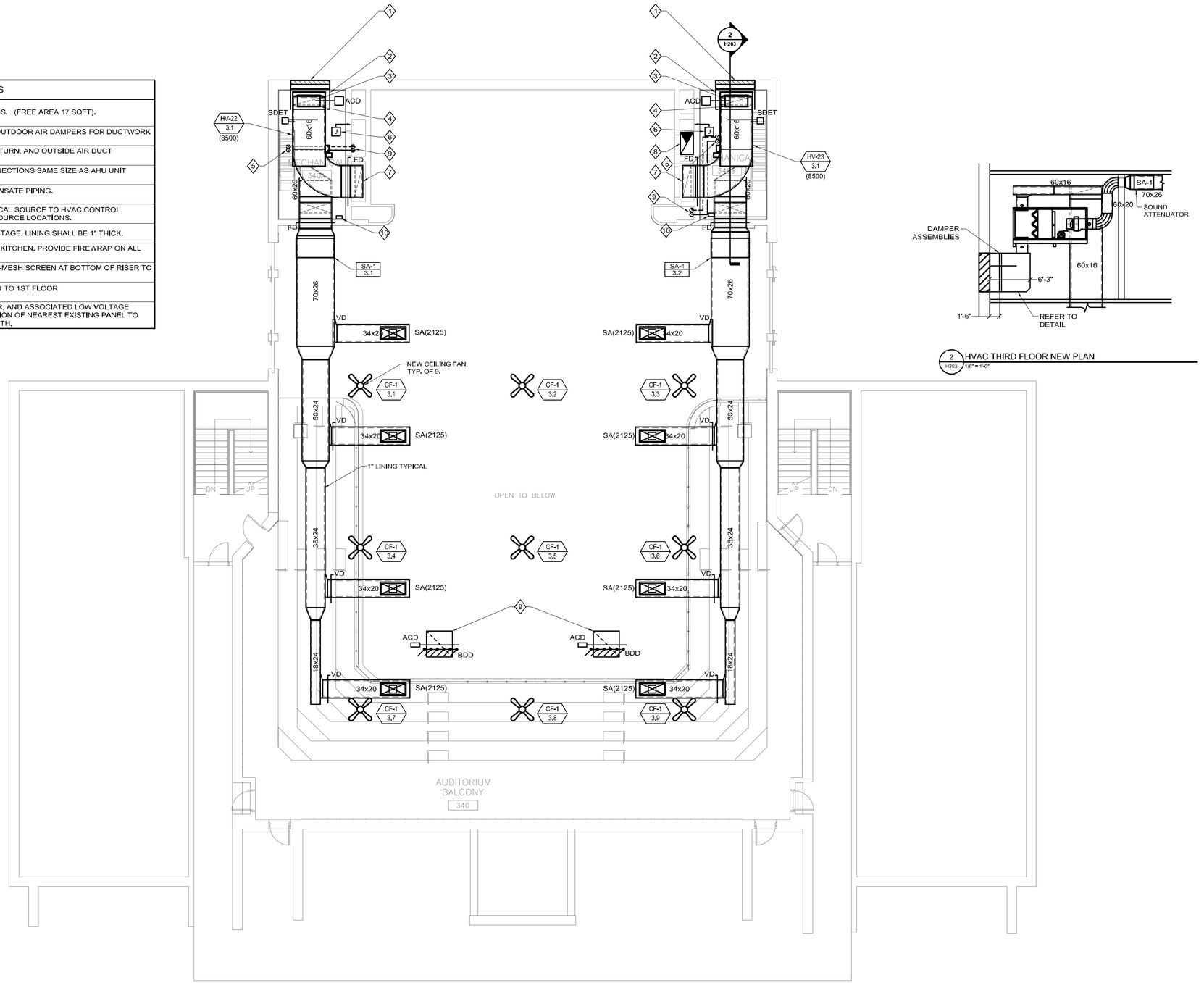
SHEET 31 **OF** 61

REVIEWED BY: CIVIL: ARCH: STRU: PLUMB: FIRE: MECH: ELEC:

G:\2013\19431.01 - Somerville High School Auditorium\1200 Drawings\1203 HVAC\Plot Files\19431.01 H202 HVAC AUDITORIUM FLOOR PLAN.dwg [Front] March 03, 2014 - 3:46pm dfrancek

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

KEYNOTES	
1	NEW LOUVER. REFER TO ARCHITECTURAL PLANS. (FREE AREA 17 SQFT).
2	PROVIDE INSULATED OA PLENUM. PROVIDE (2) OUTDOOR AIR DAMPERS FOR DUCTWORK INSTALLATION.
3	PROVIDE FLEXIBLE CONNECTOR AT SUPPLY, RETURN, AND OUTSIDE AIR DUCT CONNECTIONS TO AHU, TYP.
4	PROVIDE RETURN AND OUTSIDE AIR DUCT CONNECTIONS SAME SIZE AS AHU UNIT CONNECTIONS.
5	PROVIDE 3" STEAM PIPING AND NEW 1¼" CONDENSATE PIPING.
6	PROVIDE LOW VOLTAGE WIRING FROM ELECTRICAL SOURCE TO HVAC CONTROL DEVICES. REFER TO DIVISION 26 FOR POWER SOURCE LOCATIONS.
7	60"x16" LINED RETURN DUCT DOWN TO BELOW STAGE, LINING SHALL BE 1" THICK.
8	42"x24" EXHAUST DUCT UP TO ROOF AND DN TO KITCHEN. PROVIDE FIREWRAP ON ALL GREASE DUCTS.
9	48"x48" DUCT UP TO ROOF VENT. PROVIDE WIRE-MESH SCREEN AT BOTTOM OF RISER TO PROTECT OPENING.
9	3" LPS PIPING & 1¼" CONDENSATE RISERS DOWN TO 1ST FLOOR
10	PROVIDE DDC PANEL ENCLOSURE, CONTROLLER, AND ASSOCIATED LOW VOLTAGE WIRING. CONTRACTOR TO FIELD VERIFY LOCATION OF NEAREST EXISTING PANEL TO INTERFACE EXISTING DDC CONTROL SYSTEM WITH.



1 H203 HVAC THIRD FLOOR NEW PLAN
1/8" = 1'-0"

2 H203 HVAC THIRD FLOOR NEW PLAN
1/8" = 1'-0"

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HVAC AUDITORIUM BALCONY FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: TC
DRAWN BY: TC
CHECKED BY: BEO
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

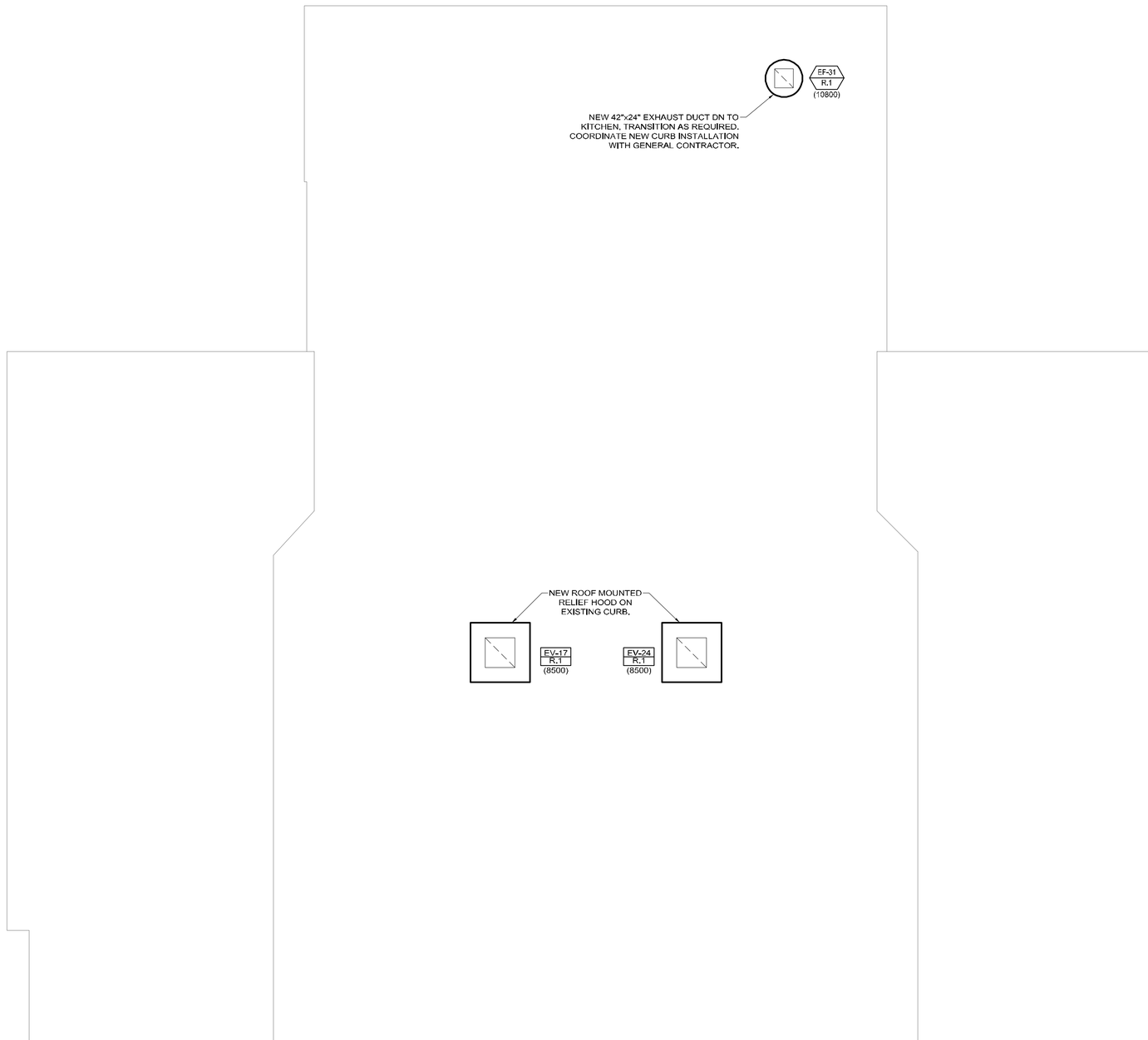
SHEET NUMBER:

H203

SHEET 32 **OF** 61

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1 H204 HVAC ROOF NEW PLAN
1/8" = 1'-0"

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H204

SHEET 33 **OF** 61

G:\2013\2013013\31 - Somerville High School Auditorium\1300 Drawings\1303 HVAC\Rfa Files\2013013(31) H204 HVAC ROOF PLAN.dwg [Work] March 03, 2014 - 3:45pm rfranzusk

GENERAL ATC NOTES

1. CONNECT TO EXISTING WEB BASED DDC AUTOMATIC TEMPERATURE CONTROL SYSTEM. CONTROL SOFTWARE TO ALLOW GRAPHIC REPRESENTATION OF THE HVAC SYSTEM WITH "POINT AND CLICK" SELECTION OF ALL EQUIPMENT AS RECOMMENDED BY MANUFACTURER. ALL TEMPERATURE SETPOINT CHANGES, SCHEDULING, ETC. SHALL BE ADJUSTABLE THROUGH THE USE OF A MOUSE. PROVIDE GRAPHIC REPRESENTATION OF ALL FLOOR PLANS SHOWING HVAC EQUIPMENT, VALVES, DAMPERS, TEMPERATURE SENSORS, HUMIDITY SENSORS, ETC.
2. EXISTING DDC CONTROL SYSTEM SHALL BE CONNECTED TO AND CONTROL NEW AIR HANDLING UNITS, UNIT VENTILATORS, FANS, CONVECTORS, EXISTING CABINET UNIT HEATERS, ETC.
3. ALL ATC CONTROLS SHALL BE HARDWIRED. NO WIRELESS TECHNOLOGY SHALL BE ALLOWED. ALL WIRING SHALL BE INSTALLED IN THE WALL WHERE POSSIBLE. ANY EXPOSED WIRING IN THE KITCHEN AND MECHANICAL ROOM SHALL BE INSTALLED IN MINIMUM ½ INCH GALVANIZED EMT CONDUIT. ANY EXPOSED WIRING LOCATED IN THE AUDITORIUM SHALL BE INSTALLED IN WIRE MOLD.
4. ALL DDC CONTROLLERS CONTROLLING THE AIR HANDLING UNITS SHALL BE PROVIDED WITH AN OPERATOR DISPLAY/INTERFACE ALLOWING THE USER TO PERFORM OPERATIONS TASKS ON THE ATC SYSTEM. PROVIDE PASSWORD PROTECTION.
5. THE CONTRACTOR SHALL CARRY 16 HOURS OF ADDITIONAL ON-SITE PROGRAMMING (ABOVE BASE CONTRACT) TO ALLOW FOR FIELD MODIFICATIONS THAT MAY BE NEEDED TO OPTIMIZE THE VARIOUS SYSTEMS TO FULLY CONFORM TO THE REQUIREMENTS OF THE SPECIFICATIONS, SEQUENCE OF CONTROLS AND WORK WITH THE ACTUAL OPERATING CONDITIONS AS INSTALLED. THIS WORK SHALL BE DONE AT NO ADDITIONAL COST.
6. ON-SITE TRAINING SHALL ALSO INCLUDE A MINIMUM OF 16 HOURS OF HANDS ON INSTRUCTION GEARED TOWARD OPERATION AND MAINTENANCE OF THE SYSTEMS, PRIOR TO TRAINING, THE NECESSARY LESSON PLANS, TRAINING DOCUMENTS, HANDOUTS, ETC. SHALL BE PROVIDED WITH THE CURRICULUM OUTLINE, WHICH SHALL INCLUDE AS A MINIMUM:
   a. INITIAL SESSION - 4 HRS
   b. 2ND SESSION, 2 WEEKS LATER - 4 HRS
   c. REMAINING 8 HRS TO BE SCHEDULED BY THE OWNER AS NEEDED.
9. ALL TRAINING SHALL BE RECORDED AND COPIED TO DVD BY THE ATC CONTRACTOR. THREE COPIES OF THE RECORDED SESSIONS SHALL BE SUBMITTED TO THE OWNER FOR THEIR USE.
10. PROVIDE LOW VOLTAGE WIRING FROM ELECTRICAL SOURCE TO MISCELLANEOUS ATC DEVICES. REFER TO HVAC PLANS, HVAC MECHANICAL ROOM PLANS, AND ELECTRICAL PLANS FOR LOCATION OF POWER SOURCES FOR ATC SYSTEM.
11. SUBMIT ACCEPTANCE TESTING PLAN, PRE-FUNCTIONAL PERFORMANCE TEST FORMS/NARRATIVES AND FUNCTIONAL TEST FORMS/NARRATIVES TO ENGINEER FOR REVIEW AND APPROVAL.
12. PROVIDE DEMOLITION OF EXISTING CONTROL COMPONENTS WHICH ARE BEING REPLACED BY THE NEW ATC CONTROL SYSTEM.
13. ALL MOTOR RATED RELAYS FOR FANS, ETC. SHALL BE FURNISHED BY DIVISION 23 AND TURNED OVER TO DIVISION 26 FOR INSTALLATION.
14. THE HVAC SYSTEM SHALL BE INDEXED TO HEATING WHEN STEAM IS AVAILABLE (GENERALLY BETWEEN THE MONTHS OF OCTOBER AND APRIL).
15. LOCATION OF ALL NEW DDC CONTROL PANELS SHALL BE FIELD VERIFIED WITH THE EXISTING CONDITIONS BY THE CONTRACTOR.

DIAGRAM EQUIPMENT SYMBOLS

- FILTER BANK
- STEAM HEATING COIL (H / C)
- CONVECTOR/ RADIATOR
- CABINET UNIT HEATER
- VARIABLE FREQUENCY DRIVE (S/S, ALM, VFDS, VFD, VFDSO)
- STARTER (STARTER, S/S, CT)
- CENTRIFUGAL FAN
- INLINE CENTRIFUGAL FAN
- UPBLAST FAN
- OPPOSED BLADE DAMPER (TWO POSITION)
- PARALLEL BLADE DAMPER (TWO POSITION)
- PARALLEL BLADE DAMPER (MODULATING)
- BACKDRAFT DAMPER
- 2-WAY AUTOMATIC CONTROL VALVE (MODULATING)
- 2-WAY AUTOMATIC CONTROL VALVE (TWO POSITION)

NOTE: SOME OR ALL ABBREVIATIONS MAY BE USED ON THIS PROJECT

CONTROL POINT DESCRIPTOR LEGEND

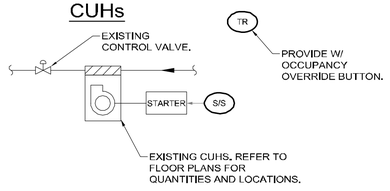
- TAG — ATC CONTRACTOR PROVIDED DDC POINT AND HARDWARE
- TAG / ELEC / PLBG — CONTROL DEVICE FURNISHED BY ELECTRICAL OR PLUMBING CONTRACTOR BUT INTERFACED TO DDC SYSTEM BY ATC CONTRACTOR
- TAG — ATC CONTRACTOR INTERFACE TO EQUIPMENT MANUFACTURER'S HARDWARE
- TAG — ATC CONTRACTOR PROVIDED LOCAL CONTROL POINT

CONTROL ABBREVIATIONS

ACD	AUTOMATIC CONTROL DAMPER	HOA	HANDS-OFF AUTOMATIC SWITCH
ACV	AUTOMATIC CONTROL VALVE	HS	HAND SWITCH
AFMS	AIR FLOW MEASURING STATION	HV	HEATING COIL CONTROL VALVE
ALM	ALARM	IFBD	INTEGRAL FACE & BYPASS DAMPER
ATC	AUTOMATIC TEMPERATURE CONTROL	LAT	LEAVING AIR TEMPERATURE SENSOR
BDD	BACKDRAFT DAMPER WITH ADJUSTABLE COUNTERWEIGHT	MAT	MIXED AIR TEMPERATURE SENSOR
		NC	NORMALLY CLOSED
C	CARBON DIOXIDE SENSOR	NO	NORMALLY OPEN
CAP	CAPACITY CONTROL	OAD	OUTSIDE AIR DAMPER
CLT	COIL LAT SENSOR	OAH	OUTSIDE AIR HUMIDITY SENSOR (WB)
CT	CURRENT TRANSFORMER (STATUS FEEDBACK)	OAT	OUTSIDE AIR TEMP SENSOR (DB)
		PR	PRESSURE SENSOR
DAT	DISCHARGE AIR TEMPERATURE SENSOR	RAD	RETURN AIR DAMPER
		RAH	RETURN AIR HUMIDITY SENSOR
DDC	DIRECT DIGITAL CONTROL	RAT	RETURN AIR TEMPERATURE SENSOR
DDCFP	DIRECT DIGITAL CONTROL FIELD PANEL	RH	RELATIVE HUMIDITY
		RI	RUN INDICATOR
DP	DIFFERENTIAL PRESSURE	RSID	RETURN SMOKE ISOLATION DAMPER
DPS	DP SWITCH	S	SWITCH
DPT	DP SENSOR/TRANSMITTER	SAD	SUPPLY AIR DAMPER
DPV	DIFFERENTIAL PRESSURE BYPASS VALVE	SCLAT	STEAM COIL LAT SENSOR
		SCV	STEAM COIL VALVE
DSP	DISCHARGE STATIC PRESSURE SENSOR	SD	SMOKE DAMPER
		SDET	SMOKE DETECTOR
DWDI	DOUBLE WIDTH DOUBLE INLET	SP	STATIC PRESSURE SENSOR
EAD	EXHAUST AIR DAMPER	SPD	SPEED CONTROL
EAT	ENTERING AIR TEMPSENSOR	S/S	START/STOP
ECON	ECONOMIZER	T	TEMPERATURE SENSOR/THERMOSTAT
ES	END SWITCH OR ENTHALPY SWITCH		
FA	FAULT ALARM	TAD	TRANSFER AIR DAMPER
FDPS	FILTER DIFFERENTIAL PRESSURE SWITCH	TEMP	TEMPERATURE
		TSET	TEMPERATURE SETPOINT
FID	FAN ISOLATION DAMPER	TR	TEMPERATURE SENSOR
FMT	FLOW METER/TRANSMITTER	VFDS	VARIABLE FREQUENCY DRIVE SPEED
FS	FLOW SWITCH	VFDO	VARIABLE FREQUENCY DRIVE OUTPUT
FZ	FREEZESTAT		
H	HUMIDITY SENSOR	VS	VIBRATION SWITCH
HCV	HEATING COIL CONTROL VALVE	WC	WATER COLUMN
HCLT	HEATING COIL LEAVING AIR TEMP SENSOR	X	REMOVE EXISTING ITEM

NOTE: SOME OR ALL ABBREVIATIONS MAY BE USED ON THIS PROJECT

CUHs



CABINET UNIT HEATER CONTROLS:

GENERAL:
1. EXISTING CABINET UNIT HEATERS SHALL BE STARTED AND STOPPED VIA DDC CONTROLLER (PROVIDED BY THE ATC CONTRACTOR).
2. ALL SETPOINTS SHALL BE ADJUSTABLE.
3. MOTOR RATED RELAYS SHALL BE PROVIDED TO INTERFACE MANUAL MOTOR STARTER WITH CONTROL WIRING TO SATISFY CONTROL SEQUENCE.
4. ALL TEMPERATURES LISTED ARE FAHRENHEIT.

OCCUPIED CABINET UNIT HEATER CONTROL
1. THE CABINET UNIT HEATER'S FAN SHALL BE DE-ENERGIZED, UPON A CALL FOR HEAT, 70°F (ADJ), FROM THE TEMPERATURE SENSOR THE CABINET UNIT HEATER'S CONTROL VALVE HV-1 SHALL OPEN, THEN, AFTER A 15 SECOND (ADJ) TIME DELAY, THE FAN SHALL BE ENERGIZED. THE REVERSE SHALL OCCUR ON A RISE IN TEMPERATURE ABOVE 73°F (ADJ.).

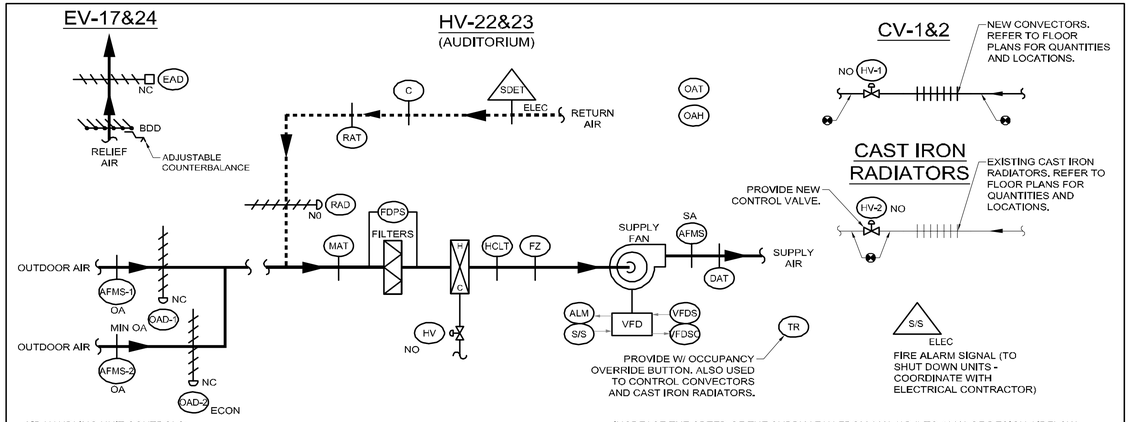
UNOCCUPIED CABINET UNIT HEATER CONTROL
1. THE CABINET UNIT HEATER'S FAN SHALL BE DE-ENERGIZED, UPON A CALL FOR HEAT, 55°F (ADJ), FROM THE TEMPERATURE SENSOR THE CABINET UNIT HEATER'S CONTROL VALVE HV-1 SHALL OPEN, THEN, AFTER A 15 SECOND (ADJ) TIME DELAY, THE FAN SHALL BE ENERGIZED. THE REVERSE SHALL OCCUR ON A RISE IN TEMPERATURE ABOVE 58°F (ADJ.).

OVERRIDE DURING UNOCCUPIED HOURS
1. THE PUSH BUTTON ON THE TEMPERATURE SENSOR SHALL OVERRIDE THE UNOCCUPIED MODE AND FOLLOW THE OCCUPIED MODE SEQUENCE FOR 2 HOURS (ADJ.) AND THEN RETURN TO THE UNOCCUPIED MODE.

ALARMS
1. IF THE ROOM TEMPERATURE FALLS BELOW 50° (ADJ) FOR 10 MINUTES (ADJ) OR LONGER, SEND A DETAILED ALARM TO THE FRONT END.

RDK — CABINET UNIT HEATER CONTROL SEQUENCE — HC001

EV-17&24 / HV-22&23 (AUDITORIUM) / CV-1&2



AIR HANDLING UNIT CONTROLS:

GENERAL
1. AIR HANDLING UNIT, CAST IRON RADIATORS, AND CONVECTORS SHALL BE CONTROLLED VIA DEDICATED FULLY PROGRAMMABLE DDC CONTROLLER(S) (PROVIDED BY THE ATC CONTRACTOR). COORDINATE OCCUPIED AND UNOCCUPIED SCHEDULES WITH OWNER. ALL SETPOINTS SHALL BE ADJUSTABLE. ALL ACTUATORS SHALL BE ELECTRONIC.
2. ATC CONTRACTOR AND UNIT MANUFACTURER SHALL COORDINATE AFMS, VFD, AND ALL SENSOR SIGNALS AND RANGES.
3. LOCAL HAND-OFF-AUTOMATIC SWITCHES (H-O-A) FOR FANS SHALL OVERRIDE DDC START/STOP (S/S) COMMANDS. ALL HARDWIRED SAFETIES SHALL BE ACTIVE IN BOTH "H" AND "A" POSITIONS.
4. ALL TEMPERATURES LISTED ARE IN FAHRENHEIT.
5. ALL TEMPERATURE SENSORS IN THE UNIT AND DUCTWORK SHALL BE AVERAGING TYPE EXCEPT FOR FREEZESTATS WHICH SHALL BE LOW POINT READING TYPE.
6. PROVIDE OPTIMAL START/STOP PROGRAMMING TO TRACK OCCUPIED/UNOCCUPIED MODES
7. OCCUPIED HEATING SET POINT FOR TR SHALL BE 75°F (ADJ.). UNOCCUPIED HEATING SETPOINT FOR TR SHALL BE 55°F (ADJ).

FAN CONTROL
1. WHILE IN UNOCCUPIED MODE (OR OFF ON SAFETY OR MANUAL DISCONNECT) AHU SUPPLY FAN SHALL BE OFF WITH THE OUTSIDE AIR DAMPERS (OAD-1 AND OAD-2), EXHAUST AIR DAMPER (EAD), AND THE HEATING COIL CONTROL VALVE (HV) CLOSED AND THE RETURN AIR DAMPER (RAD) OPEN. THE HEATING VALVE (HV) CONTROLLED BY HEATING COIL LEAVING TEMPERATURE SENSOR (HCLT) TO MAINTAIN 50°F IN THE UNIT CASING.
2. WHEN STARTED, THE OUTSIDE AIR DAMPERS (OAD-1 AND OAD-2) AND EAD SHALL BE CLOSED, THE RAD SHALL BE OPEN 100%, AND THE AHU SUPPLY FAN SHALL START IN RECIRCULATION MODE (100% RETURN AIR) AT MINIMUM SPEED.
3. THE SUPPLY FAN VFD SHALL SLOWLY INCREASE THE SPEED OF THE VARIABLE FREQUENCY DRIVE TO MAINTAIN A MINIMUM OF 30% (ADJ) OF AHU AIR FLOW AT THE SUPPLY AIR FLOW MONITORING STATION.
4. AFTER START-UP, ONCE FAN OPERATION IS STABLE, DURING THE OCCUPIED MODE THE OAD (OAD-1) AND THE RAD SHALL SLOWLY OPEN TO MINIMUM OUTDOOR AIR POSITION AS CONTROLLED BY THE OUTDOOR AIR AFMS-1 (SEE CO2 CONTROL). OAD-2 SHALL REMAIN CLOSED. WHEN INDEXED TO HEATING BY BAS, COIL LEAVING AIR TEMPERATURE SENSOR (HCLT) SHALL ALWAYS MAINTAIN A MINIMUM OF 50°F BY MODULATING HEATING COIL CONTROL VALVE (HV).
5. REFER TO HEATING AND ECONOMIZER COOLING CONTROL FOR ADDITIONAL CONTROL SEQUENCE ASSOCIATED WITH VARIABLE FREQUENCY DRIVES. THE OPERATING RANGE OF THE VARIABLE FREQUENCY DRIVE SHALL BE LIMITED TO BETWEEN 30% (ADJ) AND 100% (ADJ.) OF AHU DESIGN AIR FLOW.

OCCUPIED CARBON DIOXIDE CONTROL
1. THE ACTUAL MINIMUM OUTDOOR AIRFLOW SHALL VARY BETWEEN 10% AND 100% OF THE SCHEDULED MINIMUM OUTDOOR AIR VOLUME. NORMAL MINIMUM OUTDOOR AIR (OA) QUANTITY SHALL BE CONTROLLED BY THE OUTDOOR AIR AFMS-1 TO 10% OF THE SCHEDULED MINIMUM OA. IF THE FOLLOWING OCCURS, THE OUTDOOR AIR AFMS-1 SHALL SLOWLY MODULATE THE OAD-1, OAD-2, AND RAD AS REQUIRED AND INCREASE THE FAN SPEED TO MAINTAIN THE MAXIMUM CO2 WITHIN 50 PPM OF THE LISTED LIMIT:
   a. IF THE CO2 LEVEL AT THE SENSOR (C) RISES ABOVE LIMIT OF 900 PPM FOR 5 MINUTES.
   b. ON RISE OVER 1000 PPM, INCREASE SUPPLY AIR CFM TO AT LEAST EQUAL TO THE SCHEDULED MIN OA.

WARM-UP/ ECONOMIZER COOL DOWN CONTROL
1. PROVIDE WARM-UP/ ECONOMIZER COOL DOWN CONTROL AND OPTIMAL START/STOP (INCLUDING CALCULATED START TIME).
2. DURING MORNING WARM-UP, THE CONVECTORS' CONTROL VALVE HV-1 AND CAST IRON RADIATORS' CONTROL VALVE HV-2 SHALL MODULATE OPEN TO OBTAIN OCCUPIED HEATING TEMPERATURE SETPOINT. IF, AFTER 30 MINUTES (ADJ.), ADDITIONAL HEAT IS NEEDED FOR WARM-UP, THE AIR HANDLING UNIT SHALL BE ENERGIZED AT MIN SPEED AND THE HEATING COIL CONTROL VALVE (HV) SHALL MODULATE OPEN AS REQUIRED TO MAINTAIN A DISCHARGE AIR TEMPERATURE OF 90°F (ADJ.). THE AIRFLOW SHALL INCREASE (UP TO 75% CFM), THE OUTDOOR AIR DAMPERS (OAD-1 AND OAD-2) SHALL BE CLOSED AND THE RETURN AIR DAMPER OPEN. AFTER THE SPACE TEMPERATURE SENSOR REACHES 70°F (ADJ) THE AIR HANDLING UNIT OCCUPIED MODE SHALL START.
3. DURING MORNING ECONOMIZER COOL DOWN, THE AIR HANDLING UNIT SHALL BE ENERGIZED (UP TO 100% CFM) FOR ECONOMIZER COOLING. IF THE OUTSIDE ENTHALPY IS BELOW THE RETURN AIR ENTHALPY, THE OUTSIDE DAMPERS (OAD-1 UP TO 4000 CFM AND OAD-2 4000-8500 CFM) AND RETURN AIR DAMPER (RAD) SHALL BE PROPORTIONALLY MODULATED UP TO 100% OA TO MAINTAIN A DISCHARGE TEMPERATURE OF 55°F (ADJ) FOR 30 MINUTES (ADJ) PRIOR TO THE SPACE BECOMING OCCUPIED. AFTER THE SPACE TEMPERATURE SENSOR DROPS TO 72°F (ADJ), THE AIR HANDLING UNIT'S OCCUPIED MODE SHALL START.

   TWO BAROMETRIC RELIEF DAMPERS SHALL PREVENT THE SPACE FROM BEING OVER-PRESSURIZED. WHEN THE TOTAL OA IS 1000 TO 4000 CFM (AS MEASURED BY AFMS-1 AND AFMS-2), RELIEF DAMPER FOR EV-17 SHALL OPEN. WHEN THE TOTAL OA IS OVER 4000 (AS MEASURED BY AFMS-1 AND AFMS-2), RELIEF DAMPER FOR EV-24 SHALL OPEN. WHEN ANY OF THE AIR HANDLING UNITS ARE IN ECONOMIZER MODE, THE EAD ASSOCIATED WITH BOTH RELIEF DAMPERS SHALL OPEN, WHEN NONE OF THE AIR HANDLERS ARE IN THE ECONOMIZER MODE, THE EAD ASSOCIATED WITH BOTH RELIEF DAMPERS SHALL BE CLOSED, UNLESS OVERRIDDEN OPEN BASED ON THE AMOUNT OF OUTSIDE AIR ENTERING INTO THE AUDITORIUM.

   IF THE OUTSIDE AIR ENTHALPY RISES ABOVE THE RETURN AIR ENTHALPY, THE OUTSIDE AIR DAMPERS (OAD-1 AND OAD-2) SHALL CLOSE AND THE ATC CONTROLLER SHALL SLOWLY INCREASE THE SPEED OF THE SUPPLY FAN FROM 30% (ADJ) TO 100% OF DESIGN AIRFLOW, THROUGH IT'S VARIABLE FREQUENCY DRIVE FOR 30 MINUTES (ADJ) PRIOR TO THE SPACE BECOMING OCCUPIED. AFTER THE SPACE TEMPERATURE REACHES 75°F (ADJ), THE AIR HANDLING UNIT'S OCCUPIED MODE SHALL START.

OCCUPIED HEATING CONTROL
1. IN THE OCCUPIED HEATING MODE, THE AIR HANDLING UNIT SHALL OPERATE CONTINUOUSLY, AT MINIMUM AIR FLOW. UPON A DROP IN ROOM TEMPERATURE BELOW THE ROOM TEMPERATURE SETPOINT OF 70°F (ADJ). THE RAD SHALL MODULATE OPEN TO MAINTAIN A MAT OF 50°F AND THE HEATING COIL CONTROL VALVE (HV) SHALL MODULATE OPEN TO MAINTAIN A DISCHARGING AIR TEMPERATURE UP TO 72°F (ADJ.). IF ADDITIONAL HEATING IS NEEDED, CONVECTORS' CONTROL VALVE HV-1 AND CAST IRON RADIATORS' CONTROL VALVE HV-2 SHALL OPEN. IF MORE HEAT IS NEEDED THE ATC CONTROLLER SHALL SLOWLY LINEARLY INCREASE THE SPEED OF THE SUPPLY FAN FROM 30% (ADJ.) TO 75% (ADJ.) THROUGH IT'S VARIABLE FREQUENCY DRIVE AND RAISE DAT TO 80°F TO MAINTAIN HEATING SETPOINT.
2. THE REVERSE SHALL HAPPEN WHEN THE ROOM TEMPERATURE SETPOINT OF 70°F (ADJ) IS SATISFIED.
3. THE AIR HANDLING UNIT DISCHARGE TEMPERATURE SENSOR SHALL ALWAYS CONTROL THE HEATING COIL CONTROL VALVE (HV) TO MAINTAIN A MINIMUM 0F 53°F (ADJ).

UNOCCUPIED HEATING CONTROL
1. THE CONVECTORS' CONTROL VALVE HV-1 AND THE CAST IRON RADIATORS' CONTROL VALVE HV-2 SHALL BE CLOSED. UPON A CALL FOR HEAT, 55°F (ADJ.), FROM THE TEMPERATURE SENSOR, HV-1 AND HV-2 CONTROL VALVES SHALL OPEN. THE REVERSE SHALL OCCUR ON A RISE IN SPACE TEMPERATURE OF 58°F (ADJ.).
2. IF, WHEN THE CONVECTORS AND THE CAST IRON RADIATORS ARE IN THE UNOCCUPIED MODE AND THE TEMPERATURE SENSOR DROPS BELOW 50°F (ADJ.), THE AIR HANDLING UNIT SHALL START WITH THE RETURN AIR DAMPER OPEN AND OUTDOOR AIR AND EXHAUST AIR DAMPERS CLOSED. THE HEATING COIL CONTROL VALVE (HV) SHALL BE CONTROLLED BY THE DISCHARGE AIR SENSOR TO SUPPLY 90°F (ADJ) AIR. WHEN THE ROOM TEMPERATURE RISES ABOVE 56°F (ADJ), THE UNIT SHALL SHUT DOWN. WHEN ENERGIZED, THE ATC CONTROLLER SHALL SLOWLY INCREASE THE VARIABLE FREQUENCY DRIVE UP TO 50% (ADJ) WHERE IT SHALL OPERATE FOR THE ENTIRE TIME IN WHICH THE AIR HANDLING UNIT IS ENERGIZED DURING THE UNOCCUPIED MODE. THE CONVECTORS AND CAST IRON RADIATORS SHALL SERVE AS THE MAIN SOURCE OF HEATING DURING THE UNOCCUPIED MODE.

OCCUPIED ECONOMIZER COOLING CONTROL
1. IF THE OUTSIDE AIR ENTHALPY IS BELOW THE RETURN AIR ENTHALPY, THE OUTSIDE AND RETURN AIR DAMPERS SHALL BE PROPORTIONALLY MODULATED UP TO 100% OUTDOOR AIR TO MAINTAIN A SPACE TEMPERATURE SETPOINT OF 75°F (ADJ).

   TWO BAROMETRIC RELIEF DAMPERS SHALL PREVENT THE SPACE FROM BEING OVER-PRESSURIZED DURING ECONOMIZER OPERATION. WHEN ANY OF THE AIR HANDLING UNITS ARE IN ECONOMIZER MODE, THE EAD ASSOCIATED WITH THE RELIEF DAMPERS SHALL OPEN. WHEN NONE OF THE AIR HANDLERS ARE IN THE ECONOMIZER MODE, THE EAD ASSOCIATED WITH THE RELIEF DAMPERS SHALL BE CLOSED, UNLESS OVERRIDDEN OPEN BASED ON THE AMOUNT OF OUTSIDE AIR ENTERING INTO THE AUDITORIUM.

   IF ADDITIONAL COOLING IS REQUIRED, THE ATC CONTROLLER SHALL SLOWLY INCREASE THE SPEED OF THE SUPPLY FAN FROM 30% (ADJ) TO 100% OF DESIGN AIRFLOW, THROUGH IT'S VARIABLE FREQUENCY DRIVE, THE REVERSE SHALL OCCUR ON A DROP IN SPACE TEMPERATURE. THE DISCHARGE AIR SENSOR SHALL OVERRIDE, IF REQUIRED, TO LIMIT THE SUPPLY AIR TO A MINIMUM OF 55°F (ADJ).
2. IF THE OUTSIDE AIR ENTHALPY RISES ABOVE THE RETURN AIR ENTHALPY, THE ECONOMIZER SHALL BE POSITIONED TO PROVIDE MINIMUM VENTILATION AIR AND THE ATC CONTROLLER SHALL SLOWLY INCREASE THE SPEED OF THE SUPPLY FAN FROM 30% (ADJ) TO 100% OF DESIGN AIRFLOW, THROUGH IT'S VARIABLE FREQUENCY DRIVE.

OVERRIDE DURING UNOCCUPIED HOURS
1. THE PUSH BUTTON ON THE TEMPERATURE SENSOR SHALL OVERRIDE THE UNOCCUPIED MODE AND FOLLOW THE OCCUPIED MODE SEQUENCE FOR 2 HOURS (ADJ.) AND THEN RETURN TO THE UNOCCUPIED MODE.

SAFETIES
1. THE FREEZESTAT SHALL CAUSE AN ALARM AT THE BAS AND BE INTERLOCKED TO THE SUPPLY FAN FOR FAN SHUTDOWN WHEN SENSING A TEMPERATURE OF 37°F (ADJ) OR LESS AND HV SHALL OPEN.
2. WHEN ANY SMOKE DETECTOR SENSES SMOKE, THE AIR HANDLING UNITS SHALL BE DE-ENERGIZED. A DETAILED ALARM SIGNAL SHALL BE SENT TO THE BAS.

ALARMS
1. IF ANY AHU FAN FAILS OR ANY SAFETY IS TRIPPED, THE DDC CONTROLLER SHALL GIVE A DETAILED ALARM SIGNAL TO THE BAS.
2. IF THE SPACE TEMPERATURE SENSOR SENSES A TEMPERATURE MORE THAN 5°F BELOW THE SETPOINT FOR 5 MINUTES OR LONGER, THE DDC CONTROLLER SHALL GIVE A DETAILED ALARM SIGNAL TO THE BAS.
3. IF FILTER PRESSURE DROP EXCEEDS SETPOINT (REFER TO SCHEDULE FOR INITIAL PD) FOR 10 MINUTES, THE DDC CONTROLLER SHALL GIVE A DETAILED ALARM SIGNAL TO THE BAS.
4. IF THE OUTDOOR AIR QUANTITY FALLS BELOW 10% OF THE MINIMUM AIRFLOW, AN ALARM SHALL BE SENT TO THE BAS.

RDK — VAV AIR HANDLING UNIT SINGLE ZONE (HV-22&23) CONTROL SEQUENCE — CA05R

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REVISIONS		
Number	Description	Date

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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

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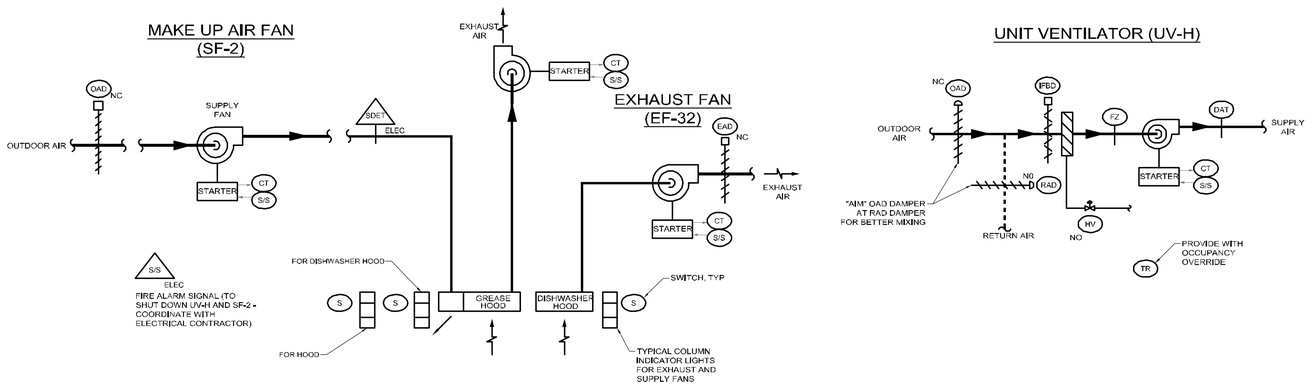
HVAC CONTROL SEQUENCES

PROJECT NUMBER 19431.01
DESIGNED BY: TC
DRAWN BY: TC
CHECKED BY: BEO
DATE: March 03, 2014
SCALE: NONE

SHEET NUMBER: H500

SHEET 34 **OF** 61

REVIEWED BY: CHK'D: ARCH: STRU: PLUM: FIRE: MECH: ELEC:
Q:\2013\2013031 - Somerville High School Auditorium\200 Drawings\2013 HVAC Files\2013031 H500 HVAC CONTROL SEQUENCES.dwg [Wed] March 05, 2014 - 2:05pm dhanak



GENERAL

1. MAKE-UP AIR FAN (SF-2), EXHAUST AIR FANS (EF-31 AND EF-32), AND UNIT VENTILATOR (UV-H) SHALL BE CONTROLLED BY PROGRAMMABLE DDC CONTROLLER. MAKE-UP AIR FAN SHALL BE INTERLOCKED WITH THE GREASE HOOD EXHAUST FAN. ALL SETPOINTS SHALL BE ADJUSTABLE. ALL ACTUATORS SHALL BE ELECTRONIC. BAS CONTRACTOR SHALL PROVIDE ALL EXHAUST FAN CONTROLS, INSTALL ALL REMOTE SENSORS AND COORDINATE/INTERFACE WITH CONTROLLER TO PROVIDE ALARMS.

2. KITCHEN GREASE HOOD AND DISHWASHER EXHAUST FANS SHALL BE MANUALLY STARTED VIA LOCAL SWITCHES. SWITCHES SHALL BE TIED INTO THE DDC SYSTEM FOR POSITION STATUS. PROVIDE CURRENT TRANSFORMERS FOR SUPPLY AND EXHAUST FANS TO INDICATE STATUS/FAILURE. BAS CONTRACTOR SHALL PROVIDE THREE SETS OF LABELED COLUMN INDICATOR LIGHTS (3-COLOR) TO INDICATE WHEN THE ASSOCIATED FANS ARE ON (GREEN), OFF (RED), OR FAILED (FLASHING AMBER).

3. LOCAL HAND-OFF-AUTOMATIC SWITCH (H-O-A) FOR FANS SHALL OVERRIDE DDC START/STOP (S/S) COMMANDS. ALL HARDWIRED SAFETIES SHALL BE ACTIVE IN BOTH "H" AND "A" POSITIONS.

4. ALL TEMPERATURES LISTED ARE FAHRENHEIT.

5. ALL TEMPERATURE SENSORS IN THE DUCTWORK SHALL BE AVERAGING.

6. COORDINATE OCCUPIED AND UNOCCUPIED SCHEDULES WITH THE OWNER.

FAN CONTROL

1. WHEN OFF, THE SUPPLY FAN (SF-2) AND EXHAUST FAN (EF-31) SHALL BE OFF WITH THE ASSOCIATED OUTSIDE AIR DAMPER (OAD) CLOSED.

2. WHEN THE GREASE HOOD EXHAUST FAN IS STARTED, THE OAD SHALL OPEN AND THE SUPPLY FAN SHALL START. ACTUATION OF THE KITCHEN HOOD EXHAUST/MAKE-UP AIR SYSTEM SHALL ALSO OVERRIDE THE UNIT VENTILATOR INTO THE OCCUPIED MODE (WITH THE OAD FULLY OPEN)

3. WHEN OFF, THE EXHAUST FAN (EF-32) SHALL BE OFF WITH THE ASSOCIATED OUTSIDE AIR DAMPERS (EAD) CLOSED.

4. WHEN THE DISHWASHER EXHAUST FAN IS SIGNALED TO START, THE EAD AND CV-H OAD SHALL OPEN FIRST, AND THEN THE EXHAUST FAN AND CV-H FAN SHALL START.

UV-H OCCUPIED HEATING CONTROL

1. THE UNIT'S FAN SHALL BE ENERGIZED TO MAX SPEED AND OPERATE CONTINUOUSLY. THE UNIT'S OAD AND RAD SHALL BE OPENED TO THE MINIMUM VENTILATION POSITION, WHEN KITCHEN HOOD EXHAUST FAN IS ACTIVATED, OAD SHALL BE OPENED TO MAXIMUM POSITION.

2. WHEN THE OUTDOOR AIR TEMPERATURE IS ABOVE 40°F (ADJ). THE FACE AND BYPASS DAMPERS (IFBD) SHALL BE IN THE FULL FACE POSITION. WHEN THERE IS A CALL FOR HEAT FROM THE SPACE TEMPERATURE SENSOR THE TWO-WAY CONTROL VALVE (HV) SHALL MODULATE OPEN AS REQUIRED TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT RESET BY THE SPACE TEMPERATURE SETPOINT, 70°F (ADJ.). THE DISCHARGE AIR TEMPERATURE SHALL BE NO LOWER THAN 55°F (ADJ.).

3. WHEN THE OUTDOOR AIR TEMPERATURE IS 40°F (ADJ.) OR BELOW, THE TWO-WAY CONTROL VALVE (HV) SHALL BE IN THE FULL OPEN POSITION. WHEN THERE IS A CALL FOR HEAT FROM THE SPACE TEMPERATURE SENSOR, THE FACE AND BYPASS DAMPERS (IFBD) SHALL MODULATE OPEN AS REQUIRED TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT RESET BY THE SPACE TEMPERATURE SETPOINT, 70°F (ADJ.). THE DISCHARGE AIR TEMPERATURE SHALL BE NO LOWER THAN 55°F (ADJ.).

4. IF WHEN THE SPACE TEMPERATURE IS 75°F (ADJ) OR ABOVE AND THE SPACE TEMPERATURE IS HIGHER THAN THE OUTDOOR TEMPERATURE, THE RETURN AND OUTSIDE AIR DAMPERS SHALL MODULATE TO LOWER THE SUPPLY AIR TEMPERATURE (ECONOMIZER). THE SUPPLY AIR SENSOR SHALL MAINTAIN A MINIMUM SUPPLY AIR TEMPERATURE OF 55°F (ADJ.).

UV-H UNOCCUPIED HEATING CONTROL

1. THE UNIT'S SUPPLY FAN SHALL BE DE-ENERGIZED. THE UNIT'S OUTDOOR AIR DAMPER (OAD) SHALL BE CLOSED AND THE UNIT'S RETURN AIR DAMPER (RAD) SHALL BE OPEN.

2. WHEN THERE IS A CALL FOR HEAT FROM THE SPACE TEMPERATURE SENSOR THE FACE AND BYPASS DAMPERS (IFBD) SHALL BE IN THE FULL FACE POSITION AND THE TWO-WAY CONTROL VALVE (HV) SHALL MODULATE OPEN AS REQUIRED TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT RESET BY THE SPACE TEMPERATURE SETPOINT, 55°F (ADJ). THE DISCHARGE AIR TEMPERATURE SHALL BE NO LOWER THAN 55°F (ADJ). THE UNIT'S SUPPLY FAN SHALL BE AUTOMATICALLY ENERGIZED AT MAX SPEED.

UV-H OVERRIDE DURING UNOCCUPIED HEATING CONTROL

1. THE PUSH BUTTON ON THE TEMPERATURE SENSOR SHALL OVERRIDE THE UNOCCUPIED MODE AND FOLLOW THE OCCUPIED MODE SEQUENCE FOR 2 HOURS (ADJ) AND THEN RETURN TO THE UNOCCUPIED MODE.

SAFETIES

1. THE FOLLOWING SAFETIES SHALL SHUT DOWN UV-H AND SF-2 VIA HARDWARE BEFORE H-O-A.

   a. WHEN THE FREEZESTAT SENSES A LOW TEMPERATURE CONDITION, THE UNIT'S SUPPLY FAN SHALL BE DE-ENERGIZED, THE UNIT'S OUTDOOR AIR DAMPER SHALL CLOSE, THE HEATING VALVE HV SHALL OPEN 100%, AND THE IFBD SHALL BE POSITIONED IN THE BYPASS POSITION.

   b. WHEN ANY SMOKE DETECTOR (SDET) IS ACTIVATED SF-2 AND UV-H SHALL SHUT DOWN. RESET SHALL BE MANUAL.

ALARMS

1. IF ANY OF THE SUPPLY OR EXHAUST FANS OR THE UNIT VENTILATOR FAILS OR IF ANY SAFETY IS TRIPPED, THE DDC CONTROLLER SHALL GIVE A DETAILED ALARM SIGNAL TO THE FRONT END. IF THE GREASE HOOD EXHAUST FAN FAILS, SF-2 SHALL BE STOPPED.

2. IF, WHEN OPERATING, DAT INDICATES A TEMPERATURE BELOW 45°F FOR 5 MINUTES, THE DDC CONTROLLER SHALL GIVE A DETAILED ALARM SIGNAL TO THE FRONT END.

3. THE TEMPERATURE SENSOR LOCATED IN THE SPACE SHALL RELAY THE SPACE TEMPERATURE TO THE ATC CONTROL SYSTEM. PROVIDE AN ALARM SIGNAL TO THE FRONT END IF THE TEMPERATURE IN THE SPACE DROPS BELOW 50°F (ADJ).

RDK | COMMERCIAL KITCHEN MAKE-UP AIR & KITCHEN EXHAUST HOOD CONTROL SEQUENCES | HC015

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REVISIONS		
Number	Description	Date

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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

HVAC CONTROL SEQUENCES

PROJECT NUMBER 19431.01
DESIGNED BY: TC
DRAWN BY: TC
CHECKED BY: BEO
DATE: March 03, 2014
SCALE: NONE

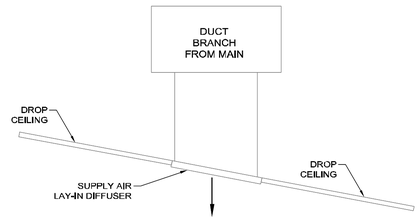
SHEET NUMBER:

H501

SHEET 35 **OF** 61

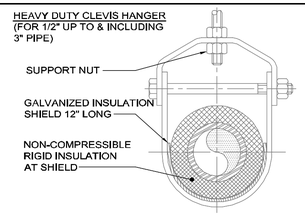
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RDK

HV UNIT SUPPLY AIR TYPICAL DIFFUSER CONNECTION

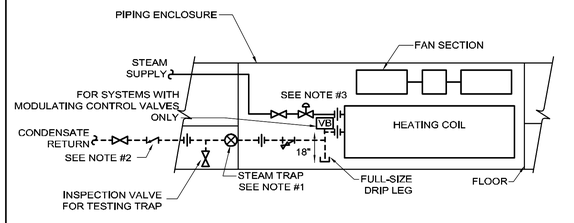


NOTES:
1. SEE SPECIFICATION FOR HANGER SIZES.
2. PIPES 8" AND LARGER SHALL BE ROLLER SUPPORTED W/ DUAL RODS.

RDK

PIPE HANGER SUPPORT

H001

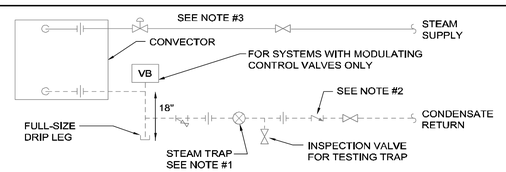


NOTES:
1. TRAP SHALL BE FLOAT-AND-THERMOSTATIC TYPE FOR LOW-PRESSURE.
2. INSTALL CHECK VALVE WHEN CONNECTING TO AN ELEVATED CONDENSATE-RETURN LINE (WITHOUT A MODULATING CONTROL VALVE).
3. REFER TO AUTOMATIC CONTROL DRAWINGS AND SPECIFICATIONS FOR CONTROL REQUIREMENTS.

RDK

UNIT VENTILATOR

H222

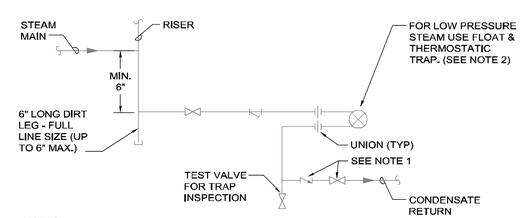


NOTES:
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2. INSTALL CHECK VALVE WHEN CONNECTING TO AN ELEVATED CONDENSATE-RETURN LINE (WITHOUT A MODULATING CONTROL VALVE).
3. REFER TO AUTOMATIC CONTROL DRAWINGS AND SPECIFICATIONS FOR CONTROL REQUIREMENTS.

RDK

STEAM CONVECTOR

H217R

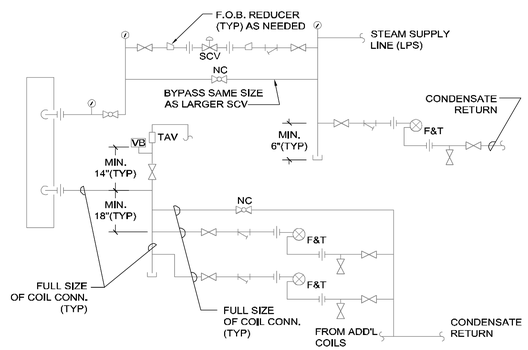


NOTES:
1. INSTALL CHECK AND GATE VALVE FOR MPS AND HPS SYSTEMS AND WHEN CONNECTING TO AN ELEVATED CONDENSATE RETURN LINE ON LPS SYSTEM.
2. SUBSTITUTE FLOAT AND THERMOSTATIC TRAP (F & T) WITH THERMODYNAMIC DISC TRAP FOR MEDIUM AND HIGH PRESSURE STEAM SYSTEMS.

RDK

MAIN/ RISER DRIP TRAP

H1002

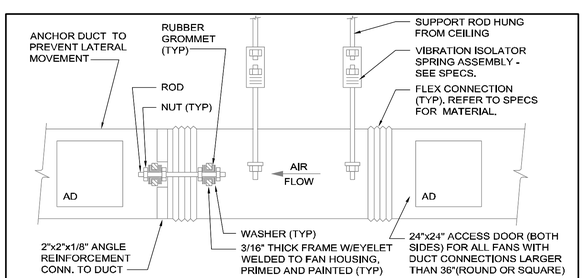


NOTES:
1. CONFIGURE PIPE UNIONS/FLANGES TO ALLOW INDIVIDUAL COIL REMOVAL.
2. SIZE EACH TRAP AT 2 TIMES PEAK CONDENSATE LOAD OF ASSOCIATED COIL AT 1/2 PSID.

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STEAM COIL SUBJECT TO FREEZING

H232R



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INLINE FAN

H408

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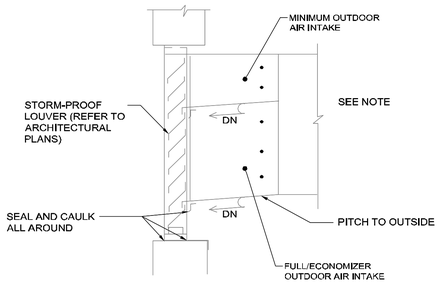
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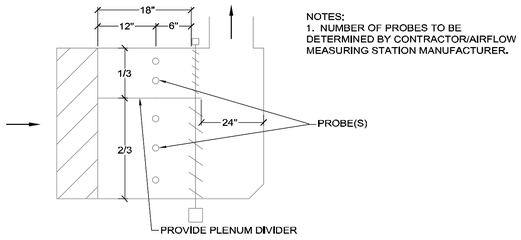
H700

SHEET 36 OF 61

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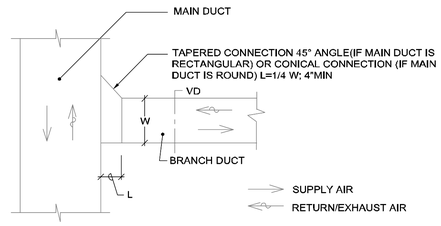
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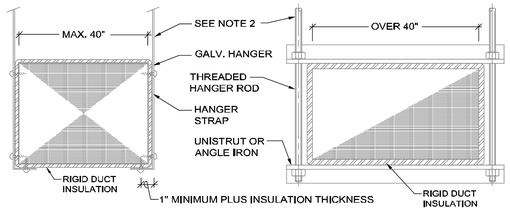
NOTES:
1. NUMBER OF PROBES TO BE DETERMINED BY CONTRACTOR/AIRFLOW MEASURING STATION MANUFACTURER.

RDK AHU OUTDOOR AIR PLENUM AFMS



DUCT TAKE-OFF

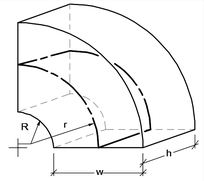
RDK BRANCH TAKE-OFFS H1501



NOTES:
1. CUTTING AND PATCHING SHALL BE LIMITED TO A MINIMUM AS REQUIRED FOR PROPER INSTALLATION.
2. SUPPORTS SHALL BE SPACED AND SIZED AS PER SMACNA.

RDK DUCT HANGER SUPPORT H1508

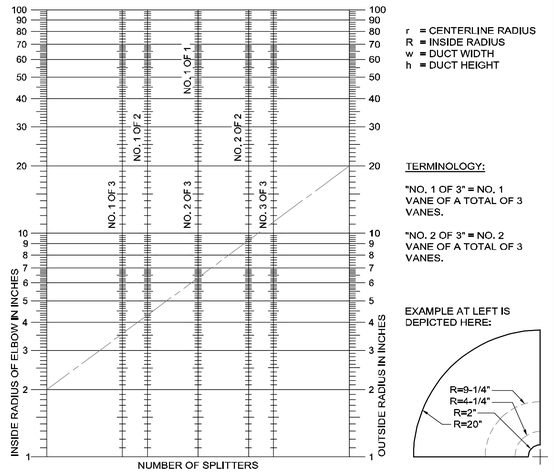
RADIUS ELBOW AND SPLITTER VANE REQUIREMENTS



r/w RATIO:	NO. OF VANES FOR 1 ELBOW:	NO. OF VANES WHEN 2 ELBOWS ARE WITHIN 2 EQUIV. DIA.:
r/w >= 1.50	0	1
1.5 > r/w >= 0.70	1	2
0.7 > r/w >= 0.60	2	3
0.6 > r/w >= 0.55	3	3

EQUIVALENT DIAMETER = (w+h)/2

NOTE: r/w = 0.5 IS A SQUARE THROAT ELBOW! HOWEVER, MINIMUM INSIDE RADIUS R SHOULD BE 2".



r = CENTERLINE RADIUS
R = INSIDE RADIUS
w = DUCT WIDTH
h = DUCT HEIGHT

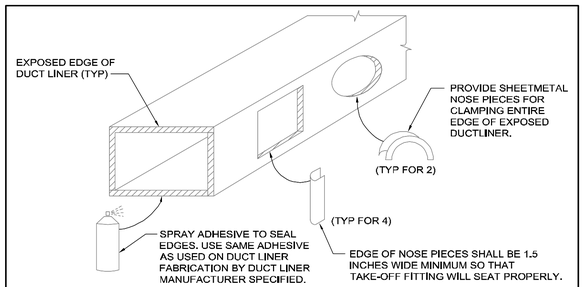
TERMINOLOGY:

"NO. 1 OF 3" = NO. 1 VANE OF A TOTAL OF 3 VANES.

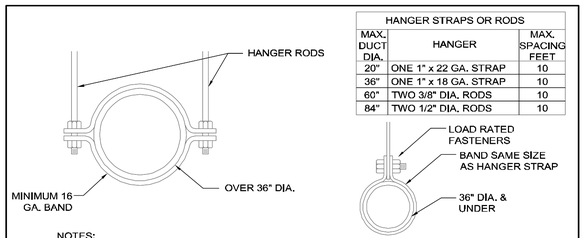
"NO. 2 OF 3" = NO. 2 VANE OF A TOTAL OF 3 VANES.

EXAMPLE AT LEFT IS DEPICTED HERE:

RDK NUMBERING & SPACING OF DUCT SPLITTER VANES H1520



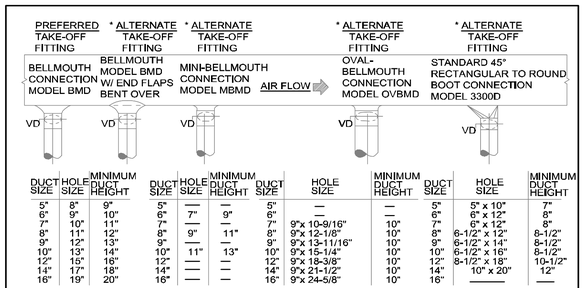
RDK SEALING & SECURING EXPOSED DUCTLINER H1503



HANGER STRAPS OR RODS		
MAX. DUCT DIA.	HANGER	MAX. SPACING FEET
20"	ONE 1" x 22 GA. STRAP	10
36"	ONE 1" x 18 GA. STRAP	10
60"	TWO 3/8" DIA. RODS	10
84"	TWO 1/2" DIA. RODS	10

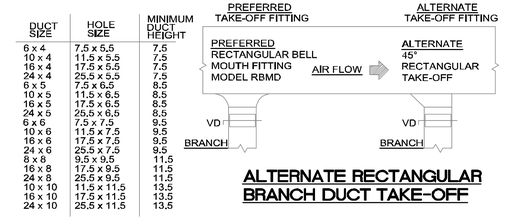
NOTES:
1. ALL SUPPORTS SHALL BE GALVANIZED STEEL FOR STEEL DUCT, STAINLESS STEEL FOR STAINLESS STEEL DUCT, OR ALUMINUM FOR ALUMINUM DUCT.
2. HANGERS MUST NOT DEFORM DUCT SHAPE.
3. ATTACHEMENTS TO STRUCTURE SHALL BE PER SMACNA.

RDK ROUND METAL DUCT HANGERS H008



ALTERNATE ROUND BRANCH DUCT TAKE-OFFS

* ALTERNATE FITTING'S TO BE USED WHEN DUCT HEIGHT DOES NOT PERMIT THE USE OF THE FULL SIZE BELLMOUTH



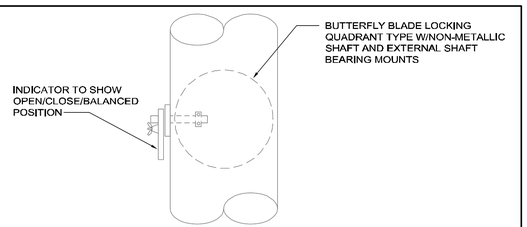
DUCT SIZE	HOLE SIZE	MINIMUM DUCT HEIGHT
6 x 4	7.5 x 5.5	7.5
10 x 4	11.5 x 5.5	7.5
16 x 4	17.5 x 5.5	7.5
24 x 4	25.5 x 5.5	7.5
6 x 5	7.5 x 6.5	8.5
10 x 5	11.5 x 6.5	8.5
16 x 5	17.5 x 6.5	8.5
24 x 5	25.5 x 6.5	8.5
6 x 6	7.5 x 7.5	9.5
10 x 6	11.5 x 7.5	9.5
16 x 6	17.5 x 7.5	9.5
24 x 6	25.5 x 7.5	9.5
8 x 8	9.5 x 9.5	11.5
16 x 8	17.5 x 9.5	11.5
24 x 8	25.5 x 9.5	11.5
10 x 10	11.5 x 11.5	13.5
16 x 10	17.5 x 11.5	13.5
24 x 10	25.5 x 11.5	13.5

ALTERNATE RECTANGULAR BRANCH DUCT TAKE-OFF

NOTES:
ALL ROUND AND RECTANGULAR BELLMOUTH FITTINGS SHALL BE INCLUDED WITH THE FOLLOWING STANDARD FEATURES:

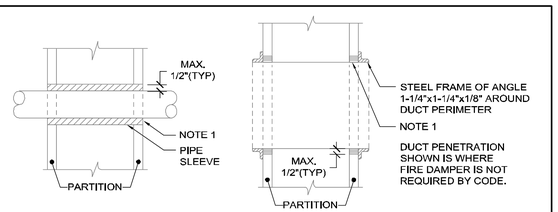
1. NEOPRENE GASKET TO MINIMIZE AIR LEAKAGE.
2. PRE-DRILLED HOLES FOR QUICK MOUNTING.
3. CONSTRUCTED OF HEAVY GALVANIZED STEEL.
4. 26 GAUGE GALV. QUADRANT VOLUME DAMPER W/ TIGHT FITTING GASKETING TO MINIMIZE LEAKAGE AT DAMPER PIVOT POINTS. (FOR LOW PRESSURE DUCTWORK)

RDK TYPICAL DUCT TAKE-OFF H1521



NOTES:
1. DAMPER SHALL BE MFR. OF SAME MATERIAL AS DUCTWORK
2. GAUGE OF DAMPER TO BE (2) GAUGES HEAVIER THAN DUCTWORK

RDK ROUND VOLUME DAMPER BELOW 14"Ø - LOW PRESSURE H1514



NOTES:
1. AT FIRE RATED PARTITIONS ADD ADDITIONAL LAYER OF FIRE SAFING INSULATION AROUND PENETRATIONS SO AS TO FILL CAVITY.
2. DUCT AND PIPE PENETRATIONS THROUGH CORRIDOR WALLS ABOVE THE CEILING ARE TO BE FIRE STOPPED AROUND THE PENETRATION.

RDK DUCT & PIPE PENETRATIONS H901

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HVAC DETAILS

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SHEET NUMBER:

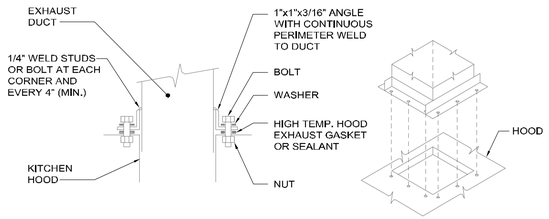
H701

SHEET 37 OF 61

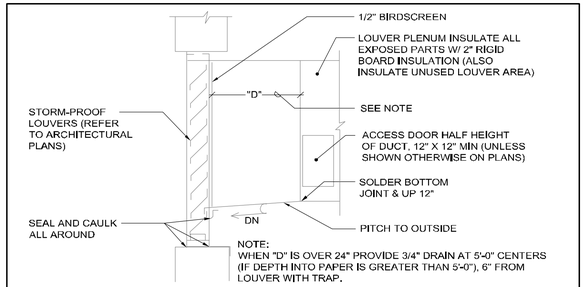
REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

G:\2013\2013035\1 - Somerville High School Auditorium\1200 Drawings\2013 HVAC\Revit Files\2013035 H701 HVAC DETAILS.rvt Mon Mar 03, 2014 - 3:41pm dhancock

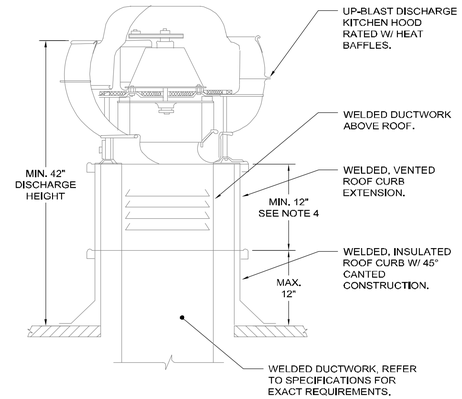
REVIEWED BY: CIVIL ____ ARCH ____ STRU ____ PLUM ____ FIRE ____ MECH ____ ELEC ____



RDK **EXHAUST DUCT CONNECTION TO KITCHEN HOOD** H701



RDK **LOUVER CONNECTION** H1519

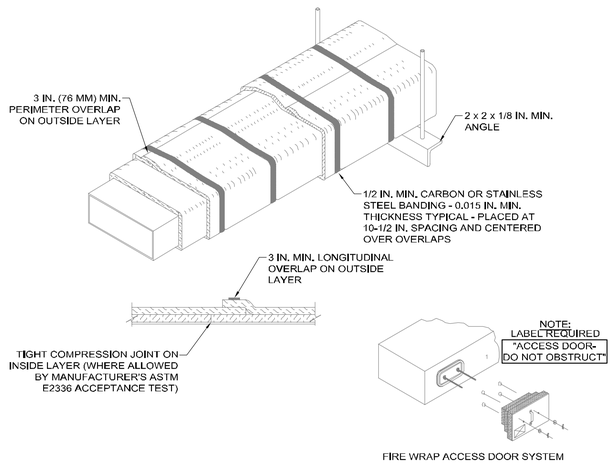


NOTES:
1. BLOCK CURB AS REQUIRED TO LEVEL FAN.
2. PROVIDE GREASE DRAIN & TRAP.
3. PROVIDE CLEARANCE TO COMBUSTIBLES AS REQUIRED BY LOCAL CODES.
4. ACTUAL HEIGHT OF ROOF CURB EXTENSION IS DETERMINED BY THE HEIGHT OF THE FAN. IN ORDER TO MAINTAIN THE MINIMUM 42" DISCHARGE HEIGHT CLEARANCE.
5. COORDINATE ROOF CURB INSTALLATION WITH ROOF MANUFACTURER TO MAINTAIN ROOF WARRANTY.

RDK **ROOF MOUNTED KITCHEN EXHAUST FAN** H406

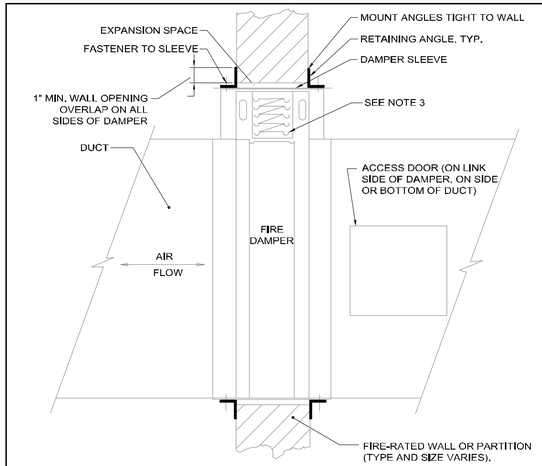
NOTES:

1. FIRE WRAP FOR GREASE DUCTS SHALL BE TESTED IN ACCORDANCE WITH ASTM E2336 TO PROVIDE ZERO CLEARANCE TO COMBUSTIBLES AND MEET THE REQUIREMENTS FOR ONE OR TWO HOUR ENCLOSURES. THROUGH PENETRATIONS FIRESTOP SYSTEMS SHALL BE TESTED IN ACCORDANCE WITH EITHER ASTM E 814 OR UL 1479.
2. INSULATION SHALL BE APPLIED IN TWO LAYERS WITH TIGHT COMPRESSION JOINT ON INSIDE LAYER AND 3 INCH MINIMUM OVERLAPS ON BOTH PERIMETER AND LONGITUDINAL OVERLAPS ON OUTSIDE LAYER.
3. GREASE EXHAUST DUCT SHALL RUN FROM THE HOOD EXHAUST CONNECTION UP TO THE EXHAUST FAN ON THE ROOF WITH MINIMAL TURNS OR BENDS AND MAINTAINING MINIMUM 1/4 UNIT VERTICAL RISE PER 12 UNITS HORIZONTAL RUN. PROVIDE CODE COMPLIANT ACCESS DOORS LOCATED AS REQUIRED BY CODE AND THE PROJECT SPECIFICATIONS (WHICHEVER IS MORE STRINGENT).
4. ROOF MOUNTED EXHAUST FAN SHALL BE MOUNTED ON A HINGED BASE WHICH ALLOWS ACCESS TO THE DUCT FROM THE ROOF.
5. SUPPORT HANGER SYSTEMS DO NOT NEED TO BE WRAPPED PROVIDED THE HANGER RODS ARE AT LEAST A MINIMUM OF 3/8 IN. DIAMETER. USE MINIMUM 2 X 2 X 1/8 IN. STEEL ANGLE OR SMACNA EQUIVALENT SUPPORT SYSTEM.
6. FIRE WRAP DUCT ENCLOSURE SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.
7. UNLESS SPECIFICALLY SHOWN OTHERWISE, FIRE WRAP SHALL BE INSTALLED ON THE DUCT FROM THE HOOD CONNECTION TO THE CONNECTION TO THE FAN.



FIRE WRAP ACCESS DOOR SYSTEM

RDK **GREASE DUCT FIRE WRAP INSTALLATION DETAIL** H1527



NOTES:
1. WALL OPENING SHALL BE SIZED TO MAINTAIN MANUFACTURER'S REQUIRED EXPANSION SPACE AROUND DAMPER.
2. DAMPER BLADES SHALL BE OUT OF AIRSTREAM TYPE "3A,3B,7 OR 8" (SEE SMACNA FIRE DAMPER AND HEAT STOP GUIDE - 2ND EDITION PAGE 9 OR NEWER VERSION IF APPLICABLE) WHEN OPEN 100% FREE AREA IS REQUIRED. WHEN DUCT DIMENSIONS ARE LARGER THAN THE LARGEST AVAILABLE CURTAIN TYPE DAMPER (SHOWN), PROVIDE BLADE TYPE DAMPERS (SIMILAR TO FIRE/SMOKE DAMPERS), IF POWERED ACTIVATORS ARE REQUIRED, THE WIRING SHALL BE INCLUDED IN THE MECHANICAL CONTRACTOR'S COST.
3. PROVIDE SPRING LOADED CLOSURE FOR ALL FIRE DAMPERS.
4. WHEN DUCTWORK IS INSULATED OR LINED, PROVIDE INSULATED ACCESS DOOR.
5. ACCESS DOOR SHALL BE 12" X 12" OR LARGER IF REQUIRED FOR FUSIBLE LINK REPLACEMENT.
6. TYPE "1" OR "2" FIRE DAMPERS (BLADES OR FRAME IN AIR STREAM) MAY BE SUBSTITUTED FOR TYPE "3A OR 3B" WHERE VELOCITIES ARE UNDER 500 FPM IN LOW PRESSURE DUCT SYSTEMS ONLY.
7. INSTALLATION SHOWN AS AN EXAMPLE. SPECIFIC INSTALLATION REQUIREMENTS, INCLUDING BREAKAWAY CONNECTIONS, SHALL CONFORM WITH MANUFACTURER'S UL APPROVED INSTRUCTIONS.

RDK **FIRE DAMPER** H1510

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REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools — Education · Inspiration · Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

HVAC DETAILS

PROJECT NUMBER 19431.01
DESIGNED BY: TC
DRAWN BY: DO
CHECKED BY: BEO
DATE: March 03, 2014
SCALE: NONE

SHEET NUMBER: H702

SHEET 38 **OF** 61

G:\2013\20130351 - Somerville High School Auditorium\200 Drawings\2013 HVAC\Revit Files\20130351 H702 HVAC DETAILS.dwg [Xiom] March 03, 2014 - 3:41pm dhancock

H&V AIR HANDLING UNIT SCHEDULE

TAG	SERVICE	LOCATION	CFM TOTAL	CFM MIN. O.A.	FAN DATA: CAPACITY CONTROL RANGE	CAPACITY CONTROL TYPE	STATIC PRESS. (IN. WG) EXT	STATIC PRESS. (IN. WG) TOTAL W/ DIRTY FILTERS	OUTLET VELOCITY (FPM)	WHEEL DIA. (IN.)	WHEEL TYPE	MOTOR RPM	MOTOR BHP	MOTOR BHP/1000 CFM	MOTOR HP	MOTOR V	MOTOR PH	HEATING COIL (STEAM) TYPE	CAPACITY (MBH)	FACE VELOCITY (FPM)	AIR DATA EAT (°F)	AIR DATA LAT (°F)	AIR DATA P.D. (IN.WG)	STEAM DATA LB./HR	STEAM DATA ENT. PSIG	ROWS	FINS PER IN	WEIGHT (LBS)	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
HV-22	AUDITORIUM	MEZZANINE	8500	4000	2200 - 8500	VFD	1.5	2.5	2699	18	AF	1800	6.5	0.76	10	208	3		407	541	35	79	0.1	458	2	1	8	2700	JCI SOLUTION INDOOR 60x60	1 THRU 11
HV-23	AUDITORIUM	MEZZANINE	8500	4000	2200 - 8500	VFD	1.5	2.5	2699	18	AF	1800	6.5	0.76	10	208	3		407	541	35	79	0.1	458	2	1	8	2700	JCI SOLUTION INDOOR 60x60	1 THRU 11

NOTES:
1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2. PROVIDE WITH ANGLED FILTER SECTION WITH FILTER GAUGE, MIXING BOX SECTION WITH RETURN AIR DAMPER AND OA OPENING, SUPPLY FAN SECTION WITH REAR OUTLET, AND STEAM HEATING COIL SECTION. PROVIDE WITH 6" HIGH BASE RAIL. REFER TO AIR HANDLING UNIT CONFIGURATION DRAWINGS ON H800 FOR LAYOUTS AND ADDITIONAL REQUIREMENTS.
3. UNITS TO BE DOUBLE WALLED WITH R-13 FOAM INSULATION. PROVIDE GALVANIZED LINER. PROVIDE INSULATED DOUBLE WALL ACCESS DOOR (WITH VISION PANEL) AND FLUORESCENT LIGHT FOR EACH SECTION AS INDICATED IN THE CONFIGURATION DRAWING. OUTDOOR AIR DAMPERS SHALL BE INSULATED ULTRA LOW LEAKAGE DAMPERS WITH BLADE SEALS. SUPPLY AIR FAN ASSEMBLY TO BE PROVIDED WITH INTERNAL VIBRATION ISOLATORS (WITH 2 INCH DEFLECTION SPRING ISOLATORS).
4. PROVIDE 2" THICK PLEATED MERV 8 FILTERS. PROVIDE FOUR SETS OF REPLACEMENT AIR FILTERS. PROVIDE 2 SPARE BELTS.
5. PROVIDE UNITS WITH PREMIUM EFFICIENCY MOTORS. VFD SHALL BE PROVIDED BY DIV 26 AND MOUNTED REMOTELY.
6. CONTRACTOR TO VERIFY LOCATION OF COIL CONNECTION, ACCESS DOORS, FILTER PULL, MOTOR ACCESS, ETC. PRIOR TO ORDERING UNITS. REFER TO PLANS.
7. THE DIRTY FILTER PRESSURE DROP (0.25" WG) SHALL BE INCLUDED IN THE UNIT TOTAL STATIC PRESSURE DROP. FOR THE PURPOSES OF AIR BALANCING, SIMULATE THE FILTERS AS DIRTY BY ADDING PRESSURE DROP (BY ADDING CHEESE CLOTH OR BY OTHER MEANS).
8. CONTRACTOR TO WIRE SMOKE DETECTOR (PROVIDED BY DIV 26) TO SHUT DOWN UNIT UPON DETECTION OF SMOKE.
9. STEAM HEATING COIL SHALL BE FULL FACE TYPE.
10. PROVIDE FLEXIBLE DUCT CONNECTORS AT ALL SUPPLY, RETURN, AND OUTDOOR AIR OPENINGS.
11. ORDER AIR HANDLING UNITS IN SECTIONS AND REASSEMBLE IN FIELD AS REQUIRED. PROVIDE KNOCK DOWN CONSTRUCTION OF AIR HANDLING UNITS (AS REQUIRED) IN ADDITION TO THE SUGGESTED SHIPPING SPLITS. CONTRACTOR TO CONFIRM ACTUAL DELIVERY OF UNITS WITH EXISTING CONDITIONS. SECTIONS/SHIPPING SPLITS FOR AIR HANDLING UNITS SHALL BE DISASSEMBLED ON SITE AND REASSEMBLED IN THE APPROPRIATE MECHANICAL ROOM. RIGGING OF THE UNITS, RIGGING EQUIPMENT, AND LABOR ASSISTANCE TO DISASSEMBLE AND REASSEMBLE SEGMENT MODULES SHALL BE BY THE CONTRACTOR.

UNIT VENTILATOR SCHEDULE

(HEATING LBS/HR)

TAG	LOCATION	FAN TOTAL CFM	FAN MIN OA CFM	FAN ESP (IN.WG)	FAN QTY	FAN DIA	FAN MOTOR HP	FAN MOTOR RPM	FAN MOTOR BHP	HEATING COIL (STEAM) MBH	HEATING COIL (STEAM) LB./HR	HEATING COIL (STEAM) MIN. ENT. PSI	HEATING COIL (STEAM) EAT (°F)	HEATING COIL (STEAM) LAT (°F)	HEATING COIL (STEAM) ROWS	UNIT ELECTRIC SERVICE FLA	UNIT ELECTRIC SERVICE MCA	UNIT ELECTRIC SERVICE MOCP	UNIT ELECTRIC SERVICE V	UNIT ELECTRIC SERVICE PH	WEIGHT (LBS)	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
UV-H	SEE PLANS	1485	1485	0.45	5	8.3	½	-	-	138.9	143	3	0	87	1	3.3	4.1	15	208	1	600	JCI JCUHF5	1 THRU 6

NOTES:
1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2. PROVIDE WITH 18 GAUGE PANELS, BOTTOM RETURN, REAR OUTDOOR AIR, AND FRONT DISCHARGE WITH DUCT COLLAR.
3. PROVIDE WITH FACTORY MOUNTED DDC CONTROLS AND NIGHT SETBACK RELAY.
4. PROVIDE FACTORY FACE AND BYPASS. FACE AND BYPASS SHALL BE CONSTRUCTED OF ALUMINUM. PROVIDE COLD WEATHER DAMPER ASSEMBLY.
5. PROVIDE 2" THICK PLEATED MERV 8 FILTERS. PROVIDE 4 SETS OF REPLACEMENT FILTERS.
6. PROVIDE ECM HIGH EFFICIENCY MOTOR.
7. PROVIDE MANUFACTURER RECOMMENDED CEILING HANGERS FOR UNIT SUPPORT.

STEAM CONVECTOR SCHEDULE

(LB/HR)

TAG	LOCATION	OUTPUT (MBH)	EAT (°F)	STEAM PRESS. (PSIG)	STEAM LB./HR	CABINET SIZE (IN.) DEPTH	CABINET SIZE (IN.) LENGTH*	CABINET SIZE (IN.) HEIGHT	CABINET TYPE	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
CV-1	AUDITORIUM	22.1	65	2	22.7	6	64	32	SLOPE	STERLING SW-A632	
CV-2	STAGE	10.4	65	2	10.7	6	36	20	SLOPE	STERLING SW-A620	

NOTES:
1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2. PROVIDE 18 GAUGE CONSTRUCTION. PROVIDE FACTORY SLOPE OUTLET TYPE ENCLOSURE.
3. PROVIDE FACTORY BAKED ENAMEL FINISH. COORDINATE FINAL COLOR WITH ARCHITECT.
4. REFER TO PLANS FOR LOCATIONS AND QUANTITIES.
* LENGTH INDICATED DOES NOT INCLUDE ANY END POCKETS.

FAN SCHEDULE

(CFM)

TAG	SERVICE	LOCATION	CFM	FAN TYPE	E.S.P. (IN.WG)	WHEEL DIA. (IN.)	WHEEL TYPE	WHEEL DRIVE	OUTLET VELOCITY (FPM)	MOTOR RPM	MOTOR BHP	MOTOR HP	MOTOR FLA	MOTOR V	MOTOR PH	WEIGHT (LBS)	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
SF-2	KITCHEN HOOD	KITCHEN	6,480	INLINE	1.5	24.5	BI	BELT	772	1725	3.66	5	16.7	208	3	530	GREENHECK BSQ-240HP-50	1 THRU 6
EF-31	KITCHEN HOOD	ROOF	10,800	UPBLAST	1.0	36	BI	BELT	1490	1725	3.44	5	16.7	208	3	420	GREENHECK CUBE-360HP-50	1, 3, 9 THRU 11
EF-32	DISHWASHER	KITCHEN	600	INLINE	0.5	10.8	BI	DIRECT	600	1550	0.13	⅛	3.1	120	1	80	GREENHECK SQ-95-VG	1, 5 THRU 8

NOTES:
1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2. PROVIDE UNIT WITH GALVANIZED STEEL HOUSING, MOTOR COVER, BOLTED ACCESS PANELS, AND INTEGRAL DUCT FLANGES.
3. PROVIDE EXTENDED LUBE LINES.
4. PROVIDE 2 SETS OF SPARE BELTS.
5. PROVIDE FACTORY SPRING HANGING TYPE VIBRATION ISOLATION.
6. PROVIDE 24VAC ACTUATOR AND MOTORIZED DAMPER WITH END SWITCH.
7. PROVIDE EC MOTOR WITH 0-10 VDC INPUT SIGNAL.
8. PROVIDE UNIT WITH ALUMINUM HOUSING, ALUMINUM MOTOR COVER, AND STAINLESS STEEL FASTENERS.
9. PROVIDE UNIT WITH ALUMINUM HOUSING AND STAINLESS STEEL FASTENERS.
10. PROVIDE WITH NEMA PREMIUM EFFICIENCY MOTOR, DUAL DRIVES. STAINLESS STEEL SHAFT, AND 2 SETS OF SPARE BELTS.
11. PROVIDE FACTORY ROOF CURB, VENTED CURB EXTENSION, HINGED CURB CAP, CLEAN OUT PORT, DRAIN TROUGH, AND GREASE TRAP WITH DRAIN CONNECTION. (REFER TO DETAIL H406)

ROOF VENT SCHEDULE

TAG	SERVICE	FUNCTION	CFM	P.D. (IN.WG)	ROOF OPENING (IN.) L	ROOF OPENING (IN.) W	VENT FREE AREA (S.F.)	CURB TYPE	CURB HT. (IN.)	DAMPER SIZE (IN)	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
EV-17	AUDITORIUM	RELIEF	8,500	0.06	46	46	16	EXISTING		46"x46"	GREENHECK FGI	1 THRU 4
EV-24	AUDITORIUM	RELIEF	8,500	0.06	46	46	16	EXISTING		46"x46"	GREENHECK FGI	1 THRU 4

NOTES:
1. REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.
2. PROVIDE GRAVITY BACK DRAFT DAMPER WITH COUNTERWIGHT INTENDED FOR HORIZONTAL INSTALLMENT AND AUTOMATIC CONTROL DAMPER
3. PROVIDE GALVANIZED STEEL HOUSING AND BIRDSCREEN.
4. PROVIDE RUBBER CURB CAP SEAL AND 12" EXTENDED BASE HEIGHT. MOUNT NEW ADJ COUNTERWEIGHT GRAVITY RELIEF TO EXISTING ROOF CURB (MAX 0.05" PD AT MAX FLOW). VERIFY EXISTING CURB DIMENSION PRIOR TO ORDERING.

CEILING FAN SCHEDULE

TAG	LOCATION	CFM	FAN TYPE	AIRFOIL LENGTH (IN)	FAN TYPE	FAN DRIVE	MOTOR RPM	MOTOR W	MOTOR FLA	MOTOR V	MOTOR PH	WEIGHT (LBS)	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
CF-1	AUDITORIUM	46,000	CIRCULATION FAN	60	AIRFOIL	DIRECT	315	160	1.4	120	1	30	LEADING EDGE 6000-1	1 THRU 6

NOTES:
1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2. PROVIDE FACTORY DIRECT DRIVE PSC TYPE MOTOR WITH THERMAL OVERLOAD AND AUTOMATIC RESET.
3. PROVIDE FAN BLADES THAT ARE STRAIGHT WITH CONTOURED SHAPED DESIGN.
4. PROVIDE THREE FACTORY SOLID STATE LINE VOLTAGE SPEED CONTROLS. EACH SPEED CONTROL SHALL CONTROL 3 FANS (REFER TO DWG H203) .
5. PROVIDE FANS WITH 36" DOWNROD (CONFIRM LENGTH TO MATCH EXISTING) AND TILTED CANOPY COVER.
6. REFER TO FLOOR PLANS FOR LOCATIONS AND QUANTITIES.

SOUND ATTENUATOR SCHEDULE

TAG	SERVICE	LOCATION	CFM	OVERALL SIZE (IN.) W	OVERALL SIZE (IN.) H	OVERALL SIZE (IN.) L	FACE VELOCITY (FPM)	P.D. (IN.WG)	DYNAMIC INSERTION LOSS (dB) IN EACH OCTAVE BAR (HZ) 63	125	250	500	1000	2000	4000	8000	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
SA-1	HV-22	AUDITORIUM	8500	70	26	36	604	.01	1	2	6	14	10	8	5	1	VIBRO ACOUSTICS RFMB-UHV-F4	
SA-2	HV-23	AUDITORIUM	8500	70	26	36	604	.01	1	2	6	14	10	8	5	1	VIBRO ACOUSTICS RFMB-UHV-F4	

NOTES:
1. REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.
2. CONTRACTOR TO COORDINATE SILENCER SIZES WITH COORDINATION DRAWING DUCT SIZES.
3. PROVIDE 18 GAUGE GALVANIZED CASING, 22 GAUGE GALVANIZED LINER, GLASS FIBER ACOUSTIC MEDIA, 1"SLIP CONNECTION.

DIFFUSER, GRILLE & REGISTER SCHEDULE

TAG	SELECTION RANGE (CFM)	NECK SIZE (IN.)	OVERALL SIZE (IN.)	SERVICE	MOUNTING	TYPE	ACCESSORIES	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
SA	0-2290	46x22	48x24	SUPPLY	CEILING	LOUVERED FACE	OBD	TITUS 300	1 THRU 4, 6, 7
SB	0-250	10"Ø	18"Ø	SUPPLY	SIDEWALL	DBD	OBD	TITUS TMR	1 THRU 3, 5 THRU 7
SC	0-250	10x10	10x10	SUPPLY	SIDEWALL	DBD	OBD	TITUS 300RS	1 THRU 3, 5 THRU 7

NOTES:
1. REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.
2. RUNOUTS TO DIFFUSERS SHALL BE THE SAME SIZE AS INLET/NECK SIZE
3. PROVIDE FACTORY POWDER COAT FINISH. COORDINATE FINAL COLOR TO MATCH EXISTING DIFFUSERS.
4. NC RATING NOT TO EXCEED 19
5. NC RATING NOT TO EXCEED 25
6. COORDINATE BLOW PATTERN WITH HVAC PLANS
7. CONTRACTOR SHALL VERIFY QUANTITY OF DIFFUSERS, GRILLES, REGISTERS, ETC. REQUIRED. REFER TO PLANS.

PIPE INSULATION

MINIMUM INSULATION THICKNESS IN INCHES FOR INDOOR PIPE SIZES (SEE NOTES BELOW)

PIPING SYSTEM TYPES	FLUID TEMP. RANGE (°F)	< 1"	1" TO 1¼"	1½" TO 3"	K-FACTOR (BTU-INCH/°F-HR-SF) AT AVE. TEMP. (°F)
LOW PRESSURE STEAM OR ANY STEAM CONDENSATE	201 - 250	2.5	2.5	2.5	0.27-0.30 @ 150°F

NOTES:
1. REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.
2. FOR MINIMUM THICKNESS OF ALTERNATIVE INSULATION TYPES OUTSIDE THE STATED CONDUCTIVITY RANGE, SEE TEST METHOD FOR STEADY STATE HEAT TRANSFER PROPERTIES OF HORIZONTAL PIPE INSULATIONS, ASTM C 335-95, AND THE STATE ENERGY CODE.

MINIMUM DUCT INSULATION R-VALUES

LOCATION	SUPPLY	RETURN	RAW OUTDOOR AIR	EXHAUST
ATTIC TYPE SPACE (EXPOSED ROOF ABOVE)	R-8	R-8	R-4	R-6*
UNCONDITIONED SPACE (SHAFT OR CEILING WITH DUCTED RETURN AIR)	R-5	R-5	R-4	-0-
EXPOSED IN MECHANICAL ROOM	R-5	R-5	R-5	-0-

* R-VALUE SHOWN IS ONLY IF AREA OF BUILDING BEING EXHAUSTED IS HUMIDIFIED. IF NOT HUMIDIFIED, NO INSULATION (-0-), UNLESS FIRE WRAP OR LINING IS NEEDED.

DUCT LINING SCOPE: ACOUSTIC DUCT LINING OF THE TYPE AND THICKNESS SPECIFIED SHALL BE INSTALLED ON ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK WITHIN 20 FEET OF ALL TYPES OF AIR HANDLING UNITS (INCLUDING HV , UV, ETC., AND ALL BRANCHES WITHIN 20') ALL FANS (INCLUDING BRANCHES), AND WHERE DETAILED OR SHOWN ON DRAWINGS. LINING SHALL NOT BE USED ON DUCTWORK SERVING KITCHEN AND FUME HOOD EXHAUST AND WET/HUMID EXHAUST SUCH AS DISHWASHER SYSTEMS.

NOTES: (SEE SPECIFICATIONS FOR R-VALUES OF VARIOUS DUCT INSULATION AND LINERS)
1. REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.
2. R-VALUES SHOWN MAY BE OBTAINED BY ADDING THE R-VALUES OF BOTH THE LINING (WHERE SHOWN OR USED) AND EXTERNAL DUCT INSULATION.
3. R-VALUES SHOWN ARE AS INSTALLED. USE R-VALUES FOR 25% COMPRESSION FOR NON-RIGID INSULATION.

DUCTWORK PRESSURE CLASS AND SEAL CLASS

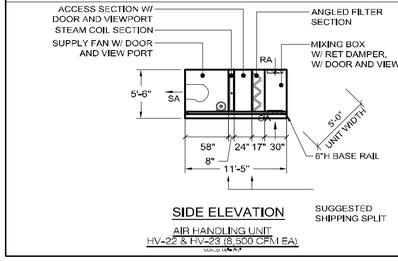
PRESSURE CLASS	STATIC PRESSURE CLASS	SMACNA SEAL CLASS	SMACNA LEAKAGE CLASS RECTANGULAR	SMACNA LEAKAGE CLASS ROUND	DESIGN VELOCITY LIMITS
2"	2" POS. OR NEG.	A	6	3	2000 FPM OR LESS

UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS, USE THE FOLLOWING PRESSURE CLASSIFICATIONS FOR THE TYPES OF DUCTWORK LISTED BELOW

2" CLASS:	ALL DUCTWORK.

NOTES:
1. REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.

AIR HANDLING UNITS CONFIGURATIONS



SIDE ELEVATION
AIR HANDLING UNIT
HV-22 & HV-23 (8,500 CFM EA)

NOTES:
1. BREAK DOWN UNITS INTO SMALLER COMPONENTS AND RIG INTO MECHANICAL ROOM THROUGH NEW 72"W X72"H EXTERIOR LOUVER OPENING PRIOR TO LOUVER INSTALLATION. FINAL SHIPPING SPLITS AND ROUTE OF RIGGING/ASSEMBLY TO BE DETERMINED BY THE CONTRACTOR.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL FIELD MEASUREMENTS. COORDINATE LOCATION OF ACCESS DOORS, COIL PULLS, COIL CONNECTIONS, FILTER ACCESS WITH FLOOR PLANS. CONTRACTOR TO FIELD VERIFY SHIPPING SPLITS WITH ACTUAL FIELD CONDITIONS PRIOR TO ORDERING AIR HANDLING UNITS.
3. SHIPPING SPLITS/SECTIONS OF THE AIR HANDLING UNITS WILL NEED TO BE BROKEN DOWN INTO SMALLER INDIVIDUAL COMPONENTS TO GAIN ACCESS TO THE MECHANICAL ROOMS. NO ADDITIONAL COMPENSATION SHALL BE GRANTED TO THE CONTRACTOR FOR EQUIPMENT WHICH HAS TO BE DISMANTLED AND REASSEMBLED INSIDE THE BUILDING.
4. AIR HANDLING UNIT SHIPPING SPLITS INCLUDE AN EXTRA 3" AT EVERY SECTION.
5. PROVIDE FACTORY LIGHTING IN EACH SECTION, EXCEPT STEAM COIL AND FILTER SECTIONS. PROVIDE FACTORY OUTLET IN FAN SECTION.

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REVISIONS		
Number	Description	Date

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Somerville Public Schools — Education • Inspiration • Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

HVAC SCHEDULES

PROJECT NUMBER 19431.01
DESIGNED BY: TC
DRAWN BY: TC
CHECKED BY: BEO
DATE: March 03, 2014
SCALE: NONE

SHEET NUMBER: H800

SHEET 39 **OF** 61

REVIEWED BY: CIVIL | ARCH | STRU | PLUM | FIRE | MECH | ELEC
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ABBREVIATIONS

A/AMP	AMPERE	KWH	KILOWATT HOURS
AC	ALTERNATION CURRENT	LTG	LIGHTING
ADA	AMERICAN WITH DISABILITIES ACT	MCB	MAIN CIRCUIT BREAKER
AF	AMPERE FRAME	MEC	MASSACHUSETTS ELECTRICAL CODE
AFF	ABOVE FINISHED FLOOR	M/G	MOTOR/GENERATOR SET
AFG	ABOVE FINISHED GRADE	MH	MANHOLE
AIC	AMPERE INTERRUPTING CAPACITY	MLO	MAIN LUGS ONLY
AL	ALUMINUM	MTD	MOUNTED
AT	AMPERE TRIP	MTG	MOUNTING
ATS	AUTOMATIC TRANSFER SWITCH	NC	NORMALLY CLOSED CONTACT
AWG	AMERICAN WIRE GAUGE	NEC	NATIONAL ELECTRICAL CODE
B	BURIED	NO	NORMALLY OPEN CONTACT
C	CONDUIT	NTS	NOT TO SCALE
CA	CABLE	#	NUMBER
CATV	CABLE TELEVISION	OPD	OVER CURRENT PROTECTION DEVICE
CCTV	CLOSED CIRCUIT TELEVISION SYSTEM	POS	PROVIDED UNDER OTHER SECTIONS
CB	CIRCUIT BREAKER	PVC	POLYVINYL CHLORIDE
CKT	CIRCUITS	PWR	POWER
CPU	CENTRAL PROCESSING UNIT	RGS	RIGID GALVANIZED STEEL
℄	CENTERLINE	RMS	ROOT MEAN SQUARE VALUE
dB	DECIBEL	RPM	REVOLUTIONS PER MINUTE
DC	DIRECT CURRENT	SN	SOLID NEUTRAL
DWG	DRAWING	SWBD	SWITCHBOARD
EC	ELECTRICAL CONTRACTOR	TB	TERMINAL BLOCK
EMT	ELECTRIC METALLIC TUBING	TEL	TELEPHONE
FDR	FEEDER	TERMN	TERMINAL
FLMT	FLEXIBLE LIQUID TIGHT METALLIC TUBING	TSP	TWISTED SHIELDED-PAIR
FREQ	FREQUENCY	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSER
GEC	GROUNDING ELECTRODE CONDUCTOR	TYP	TYPICAL
GFI	GROUND FAULT INTERRUPTING	UG	UNDERGROUND
GND	GROUND	UNO	UNLESS NOTED OTHERWISE
HH	HANDHOLE	UPS	UNINTERRUPTIBLE POWER SUPPLY
HP	HORSEPOWER	UTP	UNSHIELDED TWISTED-PAIR
HVAC	HEATING, VENTILATING AND AIR CONDITIONING	V	VOLTS
HZ	HERTZ	VA	VOLT-AMPERE
IG	ISOLATED GROUND	VSD	VARIABLE SPEED DRIVE
JB	JUNCTION BOX	W	WATTS
KVA	KILOVOLT-AMPERE	WP	WEATHERPROOF
KW	KILOWATT		

LIGHTING FIXTURE LEGEND

- FR2 / 2,a — LIGHTING FIXTURE (SEE LIGHTING FIXTURE SCHEDULE)
  "FR2" - INDICATES LIGHTING FIXTURE TYPE
  "2" - INDICATES CIRCUIT NUMBER
  "a" - INDICATES SWITCH CONTROL
  "N2,y" - INDICATES CIRCUIT NUMBER AND SWITCH CONTROL FOR NORMAL POWER
  "E10" - INDICATES CIRCUIT NUMBER FOR EMERGENCY POWER
- FR5 / N2,y / E10 — LIGHTING FIXTURE
- AR1 / 2,a — LIGHTING FIXTURE WALL MOUNTED
- HW2 / 2,a — EXIT SIGN LIGHTING FIXTURE, CEILING, PENDANT MOUNTED, ARROWS AND EXIT FACE (SHADED) AS INDICATED
- ES2 (W) — EXIT SIGN LIGHTING FIXTURE, WALL MOUNTED, ARROWS AND EXIT FACE AS (SHADED) AS INDICATED.
- ES1 (W)
- EW1 (W)
- FR / # — LIGHTING FIXTURE SHADING INDICATES FIXTURE EMERGENCY (LIFE SAFETY) POWER SOURCE
- FS5
- AR1

SWITCH LEGEND

- S_a — SINGLE POLE SWITCH, RATED 20A, 120/277V
  "a" LOWER CASE LETTER INDICATES FIXTURE SWITCH CONTROL
- S^P — SINGLE POLE SWITCH RATED 20A, 120/277V, WITH PILOT LIGHT
- S^{LV} — LOW VOLTAGE SWITCH FOR CONTROL OF "LCC" RELAYS, PROVIDE LC+D CHELSEA DIGITAL SWITCH (2-BUTTON)
- S^{WP} — SINGLE POLE SWITCH, WEATHERPROOF
- R — EMERGENCY SUPERVISORY BY-PASS RELAY. REFER TO DETAIL ON DRAWING E201
- LCC — LOW VOLTAGE LIGHTING CONTROL CANBINET (LCC). PROVIDE LC+D GR 1400 BLUE BOS WITH 8 CONTROL RELAYS

EXISTING EQUIPMENT LEGEND

- XM — EXISTING EQUIPMENT TO REMAIN
- X — EXISTING EQUIPMENT TO BE REMOVED
- XR — EXISTING EQUIPMENT TO BE RELOCATED
- XN — NEW LOCATION OF EXISTING RELOCATED EQUIPMENT
- NR — EXISTING EQUIPMENT TO BE REMOVED AND NEW EQUIPMENT TO BE INSTALLED ON EXISTING BRANCH/FEEDER
- EXISTING EQUIPMENT FOR INFORMATION ONLY- INDICATED BY SYMBOL WITH LIGHT AND OUT OF FUNCTION LINE TYPE
- EXISTING EQUIPMENT TO BE REWORKED- INDICATED BY SYMBOL WITH DASHED AND IN FUNCTION LINE TYPE

POWER DISTRIBUTION

- 208Y/120 VOLT PANELBOARD, SURFACE MOUNTED
  REFER TO SCHEDULE OF PANELBOARDS
- 208Y/120 VOLT PANELBOARD, RECESSED MOUNTED
  REFER TO SCHEDULE OF PANELBOARDS
- GROUND BAR

MOTOR & CONTROLS LEGEND

- S_M — MANUAL MOTOR STARTING SWITCH WITH THERMAL OVERLOAD PROTECTION
- COMBINATION FUSED DISCONNECT MAGNETIC MOTOR STARTER,
  REFER TO MAGNETIC MOTOR STARTER FOR TYPE, SIZE AND ENCLOSURE
- 2 — MOTOR, NUMERAL INDICATES HORSEPOWER
  "2" - INDICATES HORSEPOWER RATING
- 30AS — DISCONNECT SWITCH RATED 30AMP, 3-POLE, IN NEMA TYPE 1 ENCLOSURE, UNLESS OTHERWISE NOTED
  "3R" - INDICATES NEMA TYPE 3R ENCLOSURE
  "2P" - INDICATES 2 POLE SINGLE PHASE DISCONNECT
  "60AS" - INDICATES 60A SWITCH
- 60AS / 60AF — FUSED DISCONNECT SWITCH, 3-POLE, IN NEMA TYPE 1 ENCLOSURE, UNLESS OTHERWISE NOTED.
  "3R" - INDICATES NEMA TYPE 3R ENCLOSURE
  "60AS" - INDICATES 60AMP SWITCH
  "50AF" - INDICATES 50AMP FUSES
- FR# / 7.5KW — EQUIPMENT TAG, TOP ALPHANUMERIC CORRESPONDS TO EQUIPMENT ID LOWER INDICATES LOAD (KW, HP, ETC.)

BRANCH CIRCUIT & FEEDER LEGEND

- BRANCH CIRCUIT OR FEEDER CONCEALED IN FINISHED AREAS
- BRANCH CIRCUIT OR FEEDER, CONCEALED IN OR UNDER FLOOR SLAB
- BRANCH CIRCUIT OR FEEDER TURNING UP TOWARDS OBSERVER
- BRANCH CIRCUIT OR FEEDER TURNING DOWN AWAY FROM OBSERVER
- CONDUIT STUBBED ABOVE CEILING
- R22A-1,3,5 — BRANCH CIRCUIT HOME RUN TICKS INDICATE QUANTITY OF CONDUCTORS, GROUND CONDUCTORS ARE NOT INDICATED, NO TICKS INDICATES 2#12 & 1#12G IN 3/4"C MINIMUM. R22A-1,3,5 INDICATES PANEL AND CIRCUIT DESIGNATION FROM WHICH HOMERUN SHALL ORIGINATE, EACH CIRCUIT SHALL BE 20A-1P (20AMP SINGLE POLE) UNLESS NOTED OTHERWISE.
- FLEXIBLE CONNECTION TO EQUIPMENT. RACEWAY AND CONDUCTOR RATING TO MATCH ASSOCIATED BRANCH CIRCUIT OR FEEDER

WIRING DEVICE LEGEND

- 5 / GFI — DUPLEX RECEPTACLE, GROUNDING TYPE, RATED 20A, 125V
  "5"- INDICATES CIRCUIT NUMBER
  "GFI"- INDICATES INTEGRAL GROUND FAULT CIRCUIT INTERRUPTER
  "WP" - INDICATES WEATHERPROOF
  "C" - INDICATES COUNTER HEIGHT
- a — DUPLEX RECEPTACLE, SHADING INDICATES EACH RECEPTACLE WIRED SEPARATELY, ONE ON CONSTANT SOURCE & ONE ON SWITCHED SOURCE FROM SWITCH "a"
- SINGLE RECEPTACLE, GROUNDING TYPE, RATED 20A, 125V
- DOUBLE DUPLEX RECEPTACLE, GROUNDING TYPE, RATED 20A, 125V
- CE — DUPLEX RECEPTACLE MOUNTED FLUSH TO FINISHED CEILING
- 15 — SPECIAL PURPOSE RECEPTACLE.
  "15" - INDICATES TAG NUMBER
  REFER TO SPECIAL PURPOSE RECEPTACLE SCHEDULE
- CORD DROP WITH DUPLEX RECEPTACLE
- J — JUNCTION BOX
- PB — PULLBOX

TELECOMMUNICATIONS LEGEND

- DATA OUTLET

AUDIO/VISUAL LEGEND

- TV — TV OUTLET, WALL MOUNTED
- AV — AUDIO VISUAL OUTLET, WALL MOUNTED
- CAMERA, WALL MOUNTED

GENERAL DEMOLITION NOTES

1. REFER TO THE ARCHITECTURAL DRAWINGS FOR THE FULL EXTENT OF THE SCOPE OF DEMOLITION. DISCONNECT AND MAKE SAFE ALL ELECTRICAL EQUIPMENT IDENTIFIED FOR REMOVAL ON THE HVAC, PLUMBING AND FIRE PROTECTION PLANS. THE ELECTRICAL SCOPE MAY EXTEND BEYOND THE AREA DEFINED BY THE ARCHITECTURAL DEMOLITION LIMITS TO FULLY COMPLY WITH VARIOUS REQUIREMENTS DEFINED BY THESE NOTES.
2. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OF ALL SYSTEMS OR BUILDING COMPONENTS DAMAGED DURING THE EXECUTION OF THE WORK. DAMAGE SHALL INCLUDE BUT NOT BE LIMITED TO DESTRUCTION OR DISPOSAL OF ITEMS INTENDED TO REMAIN OR TO BE SALVAGED.
3. THE ELECTRICAL CONTRACTOR SHALL CIRCUIT TRACE AND LABEL ALL EXISTING BRANCH CIRCUITS AND FEEDERS WITHIN THE AREA OF DEMOLITION SCOPE PRIOR TO DE-ENERGIZING AND DISCONNECTION. ALL CIRCUITS WITHIN PANELBOARDS IDENTIFIED FOR REMOVAL SHALL BE TRACED AND LABELED TO ENSURE THAT NO AREA OUTSIDE THE DEMOLITION SCOPE LIMIT IS AFFECTED.
4. THE ELECTRICAL CONTRACTOR SHALL IDENTIFY ALL BRANCH CIRCUITS, FEEDERS AND SYSTEM COMPONENTS, WHICH ARE TO REMAIN WITHIN THE AREA OF DEMOLITION SCOPE. THERE SHALL BE NO INTERRUPTION OF SERVICE TO ANY AREA OUTSIDE THE SCOPE LIMITS WITHOUT APPROVAL FROM THE OWNER'S REPRESENTATIVE. EXISTING EQUIPMENT TO REMAIN SHALL BE LEFT IN A CODE COMPLIANT MANNER.
5. THE ELECTRICAL CONTRACTOR SHALL DE-ENERGIZE AND REMOVE ALL CONDUCTORS AND RACEWAYS TO THEIR POINTS OF ORIGIN WITHIN THE AREA OF DEMOLITION SCOPE. ITEMS IDENTIFIED FOR DEMOLITION SHALL NOT BE ABANDONED IN PLACE. RACEWAYS THAT ENTER MASONRY WALLS AND FLOORS SHALL BE CUT FLUSH AT THE SURFACE FOR PATCHING BY OTHERS. ALL CIRCUIT BREAKERS ASSOCIATED WITH THE DEMOLITION SCOPE SHALL BE DE-ENERGIZED AND LABELED SPARE.
6. THE ELECTRICAL CONTRACTOR SHALL TEMPORARILY SUPPORT ALL ITEMS TO REMAIN THAT ARE AFFECTED BY THE DEMOLITION OF BUILDING STRUCTURAL COMPONENTS (WALLS, CEILINGS, ETC.). TEMPORARILY SUPPORTED ITEMS SHALL BE PERMANENTLY SUPPORTED AND INSTALLED WHEN FINALIZED STRUCTURES ARE IN PLACE.
7. ALL REMOVED ITEMS SHALL BE LEGALLY DISPOSED OF UNLESS IDENTIFIED FOR REUSE. THE OWNER'S REPRESENTATIVE SHALL INSPECT ALL RETAINED ITEMS PRIOR TO PLACEMENT IN THE IDENTIFIED STORAGE LOCATION BY THE ELECTRICAL CONTRACTOR.

EXISTING EQUIPMENT LEGEND

- XM — EXISTING EQUIPMENT TO REMAIN
- X — EXISTING EQUIPMENT TO BE REMOVED
- XR — EXISTING EQUIPMENT TO BE RELOCATED
- XN — NEW LOCATION OF EXISTING RELOCATED EQUIPMENT
- NR — EXISTING EQUIPMENT TO BE REMOVED AND NEW EQUIPMENT TO BE INSTALLED ON EXISTING BRANCH/FEEDER
- EXISTING EQUIPMENT FOR INFORMATION ONLY- INDICATED BY SYMBOL WITH LIGHT AND OUT OF FUNCTION LINE TYPE
- EXISTING EQUIPMENT TO BE REWORKED- INDICATED BY SYMBOL WITH DASHED AND IN FUNCTION LINE TYPE

LEGEND NOTES:

1. REFER TO SPECIFICATIONS, ARCHITECTURAL DRAWINGS, APPLICABLE SCHEDULES AND DETAILS FOR ADDITIONAL INFORMATION ASSOCIATED WITH EACH DEVICE ILLUSTRATED ON THIS LEGEND.
2. SUBSCRIPTS ILLUSTRATED ON THE LEGEND WITH ONE SYMBOL ONLY TO MINIMIZE SPACE. ANY SUBSCRIPT INDICATED WITHIN A LEGEND FAMILY MAY BE APPLIED TO A CORRESPONDING SYMBOL.
3. ABBREVIATIONS SUCH AS "WP" MAY BE APPLIED TO ANY SYMBOL.

GENERAL NOTES

1. REFER TO ARCHITECTURAL DRAWINGS, INCLUDING BUT NOT LIMITED TO, REFLECTED CEILING PLANS AND ELEVATIONS FOR ASSOCIATED NOTES AND MOUNTING DETAILS, EXACT LOCATIONS OF ALL DEVICES AND LIGHTING FIXTURES SHALL BE FIELD COORDINATED PRIOR TO ROUGH-IN.
2. DEVICES PROVIDED ON EXISTING WALLS/CEILINGS TO REMAIN SHALL BE, IN GENERAL, SURFACE MOUNTED WITH SURFACE MOUNTED CONDUIT. EXACT REQUIREMENTS SHALL BE FIELD COORDINATED PRIOR TO ROUGH-IN.
3. DEVICES PROVIDED ON ALL WALLS SHALL BE FLUSH MOUNTED WITH CONCEALED CONDUIT UNLESS OTHERWISE APPROVED, IN THE FIELD, BY THE ARCHITECT.
4. FOR ALL MULTIPLE GANG SWITCH LOCATIONS, PROVIDE COMMON FACE PLATE AND REQUIRED METAL INTERIOR BOX BARRIERS.
5. CIRCUIT NUMBERS ARE DIAGRAMMATIC. EXACT NUMBERS SHALL BE DETERMINED IN THE FIELD AND REFLECTED ON AS-BUILT DOCUMENTATION BY THE ELECTRICAL CONTRACTOR. THE ASSOCIATED CIRCUIT NUMBER AND SWITCH LEG NOMENCLATURE THAT ARE APPLIED TO EACH LIGHTING FIXTURE AND CONTROLLING DEVICE INFER INTERCONNECTING BRANCH CIRCUITRY.
6. VOLTAGE DROP HAS BEEN CONSIDERED IN THE DESIGN OF ALL BRANCH CIRCUIT AND FEEDER SIZES BASED UPON THE ILLUSTRATED EQUIPMENT LAYOUTS AND SHORTEST CONDUCTOR/RACEWAY ROUTING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEVIATIONS TAKEN THAT WILL INCREASE CONDUCTOR/RACEWAY ROUTING LENGTHS. BRANCH CIRCUITS LONGER THAN 75' FOR 120V AND 175' FOR 277V FROM PANEL TO LAST OUTLET SHALL BE INCREASED A MINIMUM OF ONE SIZE ABOVE THAT SPECIFIED TO LIMIT VOLTAGE DROP TO LESS THAN 3%.
7. COORDINATE THE PLACEMENT OF ALL PENDANT, SURFACE OR SEMI-FLUSH FIXTURES AND DEVICES WITH THE FIRE PROTECTION CONTRACTOR TO MAINTAIN NFPA 13 REQUIRED SEPARATION BETWEEN SPRINKLER HEADS AND OBSTRUCTIONS.
8. BRANCH CIRCUITRY SHALL BE INSTALLED IN CONDUIT WHERE EXPOSED. LIGHTING BRANCH CIRCUITRY MAY BE TYPE MC CABLE WHERE CONCEALED ABOVE SUSPENDED CEILINGS OR IN METAL STUD WALLS.
9. PANELBOARDS SHALL BE FIELD MARKED TO WARN QUALIFIED PERSONS OF POTENTIAL ELECTRIC ARC FLASH HAZARDS. THE MARKING SHALL BE LOCATED SO AS TO BE CLEARLY VISIBLE TO QUALIFIED PERSONS BEFORE EXAMINATION, ADJUSTMENT, SERVICING, OR MAINTENANCE OF THE EQUIPMENT.
10. MAINTAIN CONTINUITY OF BRANCH CIRCUITRY ASSOCIATED WITH ALL EXISTING LIGHTING AND POWER TO REMAIN.

SPECIAL PURPOSE RECEPTACLE SCHEDULE

TAG	NEMA CONF.	RATING	CIRCUIT BREAKER	BRANCH CIRCUIT
1	5-30R	30A, 125V, 2P, 3W	30A-1P	2#10 & 1#10G. - 3/4"C.
2	5-50R	50A, 125V, 2P, 3W	50A-1P	2#6 & 1#10G. - 3/4"C.
3	6-15R	15A, 250V, 2P, 3W	15A-2P	2#12 & 1#12G. - 3/4"C.
4	6-20R	20A, 250V, 2P, 3W	20A-2P	2#12 & 1#12G. - 3/4"C.
5	6-30R	30A, 250V, 2P, 3W	30A-2P	2#10 & 1#10G. - 3/4"C.
6	6-50R	50A, 250V, 2P, 3W	50A-2P	2#6 & 1#10G. - 3/4"C.
7	14-20R	20A, 125/250V, 3P, 4W	20A-2P	3#12 & 1#12G. - 3/4"C.
8	14-30R	30A, 125/250V, 3P, 4W	30A-2P	3#10 & 1#10G. - 3/4"C.
9	14-50R	50A, 125/250V, 3P, 4W	50A-2P	3#6 & 1#10G. - 3/4"C.
10	14-60R	60A, 125/250V, 3P, 4W	60A-2P	3#6 & 1#10G. - 3/4"C.
11	15-20R	20A, 250V, 3P, 4W	20A-3P	3#12 & 1#12G. - 3/4"C.
12	15-30R	30A, 250V, 3P, 4W	30A-3P	3#10 & 1#10G. - 3/4"C.
13	15-50R	50A, 250V, 3P, 4W	50A-3P	3#6 & 1#10G. - 3/4"C.
14	15-60R	60A, 250V, 3P, 4W	60A-3P	3#6 & 1#10G. - 3/4"C.
15	L5-15R	15A, 125V, 2P, 3W	15A-1P	2#12 & 1#12G. - 3/4"C.
16	L5-20R	20A, 125V, 2P, 3W	20A-1P	2#12 & 1#12G. - 3/4"C.
17	L5-30R	30A, 125V, 2P, 3W	30A-1P	2#10 & 1#10G. - 3/4"C.
18	L6-15R	15A, 250V, 2P, 3W	15A-2P	2#12 & 1#12G. - 3/4"C.
19	L6-20R	20A, 250V, 2P, 3W	20A-2P	2#12 & 1#12G. - 3/4"C.
20	L6-30R	30A, 250V, 2P, 3W	30A-2P	2#10 & 1#10G. - 3/4"C.
21	L14-20R	20A, 125/250V, 3P, 4W	20A-2P	3#12 & 1#12G. - 3/4"C.
22	L14-30R	30A, 125/250V, 3P, 4W	30A-2P	3#10 & 1#10G. - 3/4"C.
23	L15-20R	20A, 250V, 3P, 4W	20A-3P	3#12 & 1#12G. - 3/4"C.
24	L15-30R	30A, 250V, 3P, 4W	30A-3P	3#10 & 1#10G. - 3/4"C.
25	L16-20R	20A, 480V, 3P, 4W	20A-3P	3#12 & 1#12G. - 3/4"C.
26	L16-30R	30A, 480V, 3P, 4W	30A-3P	3#10 & 1#10G. - 3/4"C.
27	L21-20R	20A, 208V, 4P, 5W	20A-3P	4#12 & 1#12G. - 3/4"C.
28	L21-30R	30A, 208V, 4P, 5W	30A-3P	4#10 & 1#10G. - 3/4"C.
29	L22-20R	20A, 480V, 4P, 5W	20A-3P	4#12 & 1#12G. - 3/4"C.
30	L22-30R	30A, 480V, 4P, 5W	30A-3P	4#10 & 1#10G. - 3/4"C.

NOTES:

1. DEVICE NEMA CONFIGURATION SHALL BE CONFIRMED PRIOR TO INSTALLATION. MATCH CONFIGURATION OF EQUIPMENT CORD CAP. NOTIFY OWNER'S REPRESENTATIVE OF RATING DISCREPANCY.
2. CONDUCTOR SIZES ARE THE MINIMUM ALLOWED BASED UPON NEC TABLE 310-15(B)(16) WITH NO GREATER THAN THREE CURRENT CARRYING CONDUCTORS PER RACEWAY IN AN AMBIENT NOT TO EXCEED 30 DEGREES C.
3. VOLTAGE DROP IS NOT CONSIDERED IN BRANCH CIRCUIT SIZES. ALL BRANCH CIRCUITS WHICH EXCEED 75 FEET SHALL BE INCREASED A MINIMUM OF ONE SIZE TO LIMIT VOLTAGE DROP TO LESS THAN 3%.
4. RACEWAY SIZES ARE THE MINIMUM ALLOWED BASED UPON NEC TABLE C1 FOR THHN/THWN CONDUCTORS IN EMT. RACEWAY SIZES SHALL BE INCREASED TO ACCOMMODATE DIFFERING INSULATION SYSTEMS AND RACEWAY TYPES TO LIMIT RACEWAY FILL TO LESS THAN 40%.

SCOPE OF WORK:

1. UNLESS OTHERWISE NOTED, THE INTENT OF THIS SCOPE OF WORK IS TO REPLACE ALL ELECTRICAL EQUIPMENT INCLUDING, BUT NOT LIMITED TO, PANELBOARDS, CIRCUIT BREAKERS, DEVICES, LIGHTING, BRANCH CIRCUIT WIRING, ETC DUE TO EXPOSURE TO FLOOD/ROOF LEAKS. REUSE OF EXISTING RACEWAYS WHERE INDICATED IS ACCEPTABLE.

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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
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ELECTRICAL LEGENDS, NOTES AND ABBREVIATIONS

PROJECT NUMBER 19431.01
DESIGNED BY: MVM
DRAWN BY: MVM
CHECKED BY: GM
DATE: March 03, 2014
SCALE: NONE

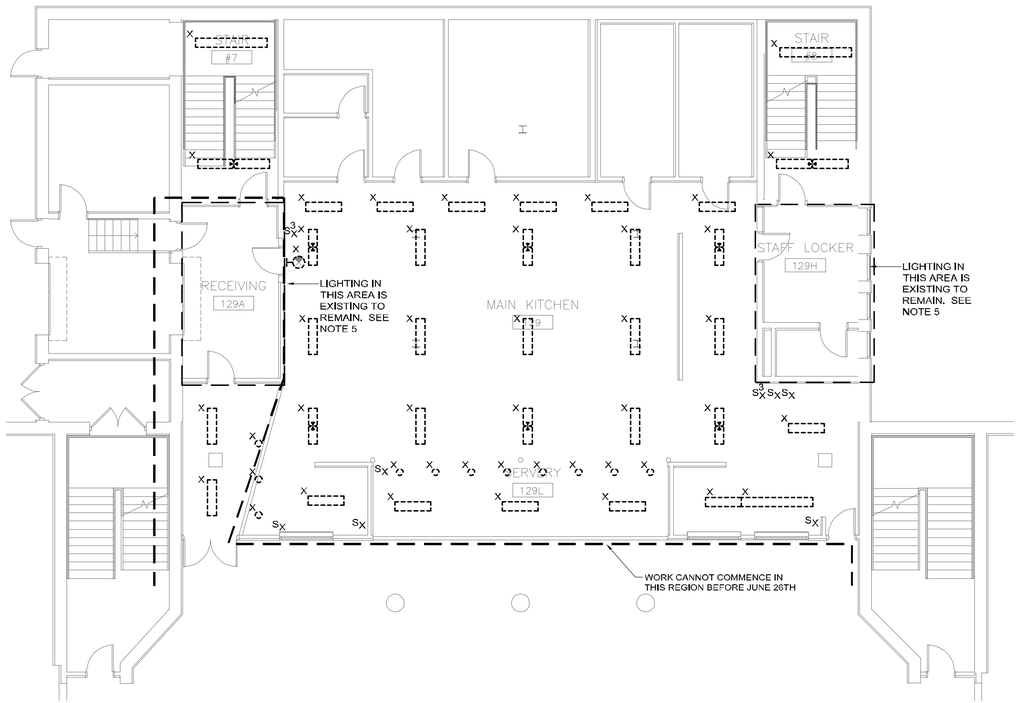
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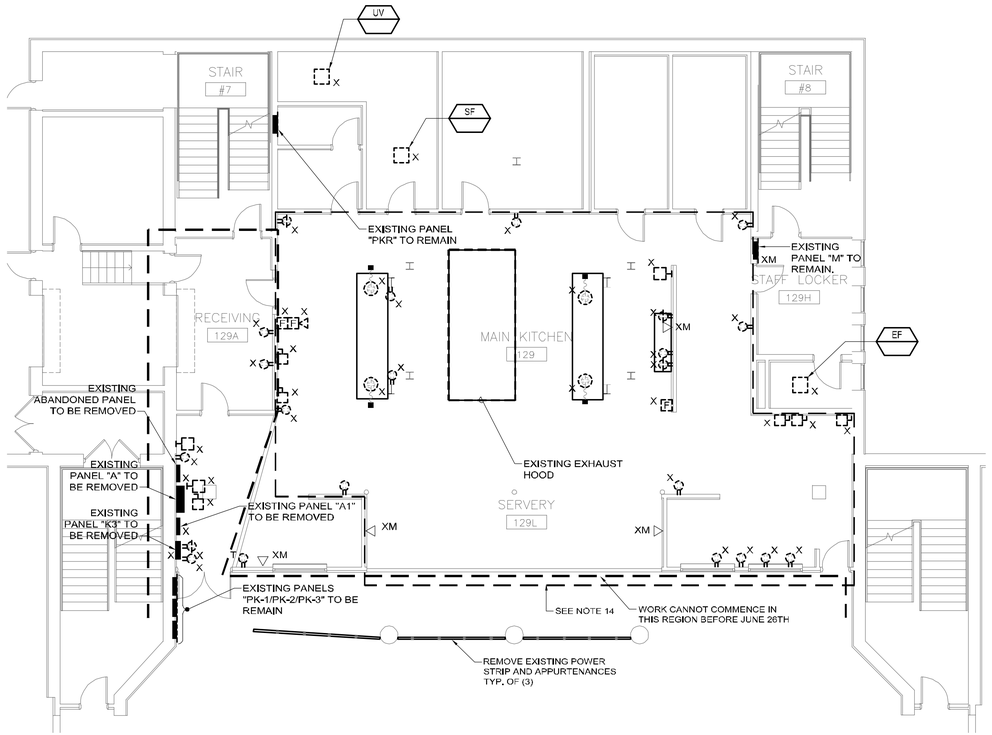
SHEET 40 **OF** 61

ELEC | MECH | FIRE | PLUM | STRU | ARCH | REVIEWED BY: CIVIL

G:\2013\13031\31 - Somerville High School Auditorium\200 Drawings\204 Electrical\Drawings\13031 E000 ELECTRICAL LEGEND, NOTES AND ABBREVIATIONS.dwg [Mark] March 03, 2014 - 2:43pm dfranek



1 ED101 1/8" = 1'-0"
ELECTRICAL LIGHTING CAFETERIA/KITCHEN DEMOLITION FLOOR PLAN



2 ED101 1/8" = 1'-0"
ELECTRICAL POWER AND FIRE ALARM CAFETERIA/KITCHEN DEMOLITION FLOOR PLAN

DEMOLITION NOTES:

1. REFER TO DRAWING ED000 FOR LEGEND, SYMBOLS AND GENERAL NOTES.

2. REFER TO THE ARCHITECTURAL DRAWINGS FOR THE FULL EXTENT OF THE SCOPE OF DEMOLITION. DISCONNECT AND MAKE SAFE ALL ELECTRICAL EQUIPMENT IDENTIFIED FOR REMOVAL ON THE HVAC, PLUMBING AND FIRE PROTECTION PLANS. THE ELECTRICAL SCOPE MAY EXTEND BEYOND THE AREA DEFINED BY THE ARCHITECTURAL DEMOLITION LIMITS TO FULLY COMPLY WITH VARIOUS REQUIREMENTS DEFINED BY THESE NOTES.

3. THE ELECTRICAL DEMOLITION PLANS AND DETAILS INDICATE THE GENERAL INTENT AND ARE NOT INTENDED TO SHOW ALL ITEMS TO BE REMOVED OR RETAINED. THE ELECTRICAL CONTRACTOR SHALL VISIT THE SITE PRIOR TO THE SUBMISSION OF BIDS TO BECOME FAMILIAR WITH THE ACTUAL CONDITIONS AND EXTENT OF WORK. DEVICES AND EQUIPMENT LOCATED ON WALLS AND/OR CEILINGS TO BE REMOVED SHALL BE DISCONNECTED AND MADE SAFE. THE ELECTRICAL CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE OF ANY UNANTICIPATED HIDDEN CONDITIONS ENCOUNTERED DURING DEMOLITION.

4. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OF ALL SYSTEMS OR BUILDING COMPONENTS DAMAGED DURING THE EXECUTION OF THE WORK. DAMAGE SHALL INCLUDE BUT NOT BE LIMITED TO DESTRUCTION OR DISPOSAL OF ITEMS INTENDED TO REMAIN OR TO BE SALVAGED.

5. THE ELECTRICAL CONTRACTOR SHALL CIRCUIT TRACE AND LABEL ALL EXISTING BRANCH CIRCUITS AND FEEDERS WITHIN THE AREA OF DEMOLITION SCOPE PRIOR TO DE-ENERGIZING AND DISCONNECTION. ALL CIRCUITS WITHIN PANELBOARDS IDENTIFIED FOR REMOVAL SHALL BE TRACED AND LABELED TO ENSURE THAT NO AREA OUTSIDE THE DEMOLITION SCOPE LIMIT IS AFFECTED. BRANCH CIRCUITS SERVING EQUIPMENT IN AREAS OUTSIDE OF DEMOLITION SCOPE SHALL BE TEMPORARILY REFED FROM EXISTING PANELBOARD INDICATED TO REMAIN WITHIN DEMOLITION SCOPE OF WORK OR FROM CLOSEST PANEL LOCATED OUTSIDE OF AREA. FIELD VERIFICATION BY CONTRACTOR IS REQUIRED.

6. THE ELECTRICAL CONTRACTOR SHALL IDENTIFY ALL BRANCH CIRCUITS, FEEDERS AND SYSTEM COMPONENTS, WHICH ARE TO REMAIN WITHIN THE AREA OF DEMOLITION SCOPE. THERE SHALL BE NO INTERRUPTION OF SERVICE TO ANY AREA OUTSIDE THE SCOPE LIMITS WITHOUT APPROVAL FROM THE OWNER'S REPRESENTATIVE. EXISTING EQUIPMENT TO REMAIN SHALL BE LEFT IN A CODE COMPLIANT MANNER.

7. THE ELECTRICAL CONTRACTOR SHALL DE-ENERGIZE AND REMOVE ALL CONDUCTORS AND RACEWAYS TO THEIR POINTS OF ORIGIN WITHIN THE AREA OF DEMOLITION SCOPE. . ITEMS IDENTIFIED FOR DEMOLITION SHALL NOT BE ABANDONED IN PLACE. RACEWAYS THAT ENTER MASONRY WALLS AND FLOORS SHALL BE RETAINED FOR REUSE.

8. THE ELECTRICAL CONTRACTOR SHALL TEMPORARILY SUPPORT ALL ITEMS TO REMAIN THAT ARE AFFECTED BY THE DEMOLITION OF BUILDING STRUCTURAL COMPONENTS (WALLS, CEILINGS, ETC.). TEMPORARILY SUPPORTED ITEMS SHALL BE PERMANENTLY SUPPORTED AND INSTALLED WHEN FINALIZED STRUCTURES ARE IN PLACE.

9. ALL REMOVED ITEMS SHALL BE LEGALLY DISPOSED OF UNLESS IDENTIFIED FOR REUSE. THE OWNER'S REPRESENTATIVE SHALL INSPECT ALL RETAINED ITEMS PRIOR TO PLACEMENT IN THE IDENTIFIED STORAGE LOCATION BY THE ELECTRICAL CONTRACTOR.

10. THE EXISTING FIRE ALARM SYSTEM SHALL REMAIN FULLY FUNCTIONAL DURING THE ENTIRE DEMOLITION AND CONSTRUCTION PERIOD. REUSE OF EXISTING FIRE ALARM SYSTEM RACEWAYS SHALL NOT BE ALLOWED. ALL REQUIRED SYSTEM SHUTDOWNS SHALL BE COORDINATED WITH AND APPROVED BY THE OWNER'S REPRESENTATIVE AND THE AUTHORITY HAVING JURISDICTION. DEMOLITION OF THE EXISTING SYSTEM SHALL NOT COMMENCE UNTIL THE NEW SYSTEM HAS BEEN COMPLETELY INSTALLED, TESTED AND APPROVED BY THE AUTHORITY HAVING JURISDICTION.

11. ALL DEMOLITION SCOPE ASSOCIATED WITH LOW VOLTAGE SYSTEMS INCLUDING BUT NOT LIMITED TO TELEPHONE, DATA, SECURITY, PAGING, CCTV, ETC. SHALL BE INCLUDED IN THIS CONTRACT.

12. REMOVED FLUORESCENT AND HID LAMPS AND BATTERIES SHALL BE RECYCLED BY A FACILITY APPROVED BY THE OWNER'S REPRESENTATIVE. A UNIFORM HAZARDOUS WASTE MANIFEST SHALL BE PREPARED FOR ALL DISPOSALS AND RETURNED WITH ALL APPLICABLE SIGN OFF'S PRIOR TO APPLICATION FOR FINAL PAYMENT.

13. ALL BALLAST IN LIGHTING FIXTURES TO BE DISPOSED SHALL BE VERIFIED TO BE PCB FREE. ALL BALLAST MANUFACTURED PRIOR TO 1979 AND NOT LABELED AS PCB FREE SHALL BE CONSIDERED TO CONTAIN PCBs. PROVIDE WRITTEN VERIFICATION TO THE OWNER'S REPRESENTATIVE THAT CONFIRMS PCB FREE WASTE. WHERE PCB FREE WASTE CANNOT BE VERIFIED, BALLAST SHALL BE RECYCLED BY A FACILITY APPROVED BY THE OWNER'S REPRESENTATIVE, WITH PCB COMPONENTS ELIMINATED BY A HIGH TEMPERATURE INCINERATION. A UNIFORM HAZARDOUS WASTE MANIFEST SHALL BE PREPARED FOR ALL DISPOSALS AND RETURNED WITH ALL APPLICABLE SIGN OFF'S PRIOR TO APPLICATION FOR FINAL PAYMENT. ALL HANDLING SHALL CONFORM TO EPA REQUIREMENTS. PROVIDE BREAKOUT COST FOR THIS SCOPE.

14. ALL BRANCH CIRCUIT WIRING/DEVICES FEEDING KITCHEN EQUIPMENT SHALL BE DISCONNECTED AND REMOVED BACK TO SOURCE. ALL CONDUIT RUN IN FLOOR SLAB SHALL BE CUT BACK FLUSH WITH THE FINISHED FLOOR, FILLED WITH CONCRETE AND ABANDONED IN PLACE. SEE KITCHEN EQUIPMENT SCHEDULE ON DRAWING ED104 FOR ADDITIONAL INFORMATION.

REVIEWED BY: OWNER ARCH STRU PLUM FIRE MECH ELEC

G:\2013\13031301 - Somerville High School Auditorium\1200 Drawings\1204 Electrical\Plots\13031301 ED201 ELECTRICAL CAFETERIA-KITCHEN DEMO FLOOR PL-Maing (Work) March 03, 2014 - 2:43pm dfranzak

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Number	Description	Date

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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

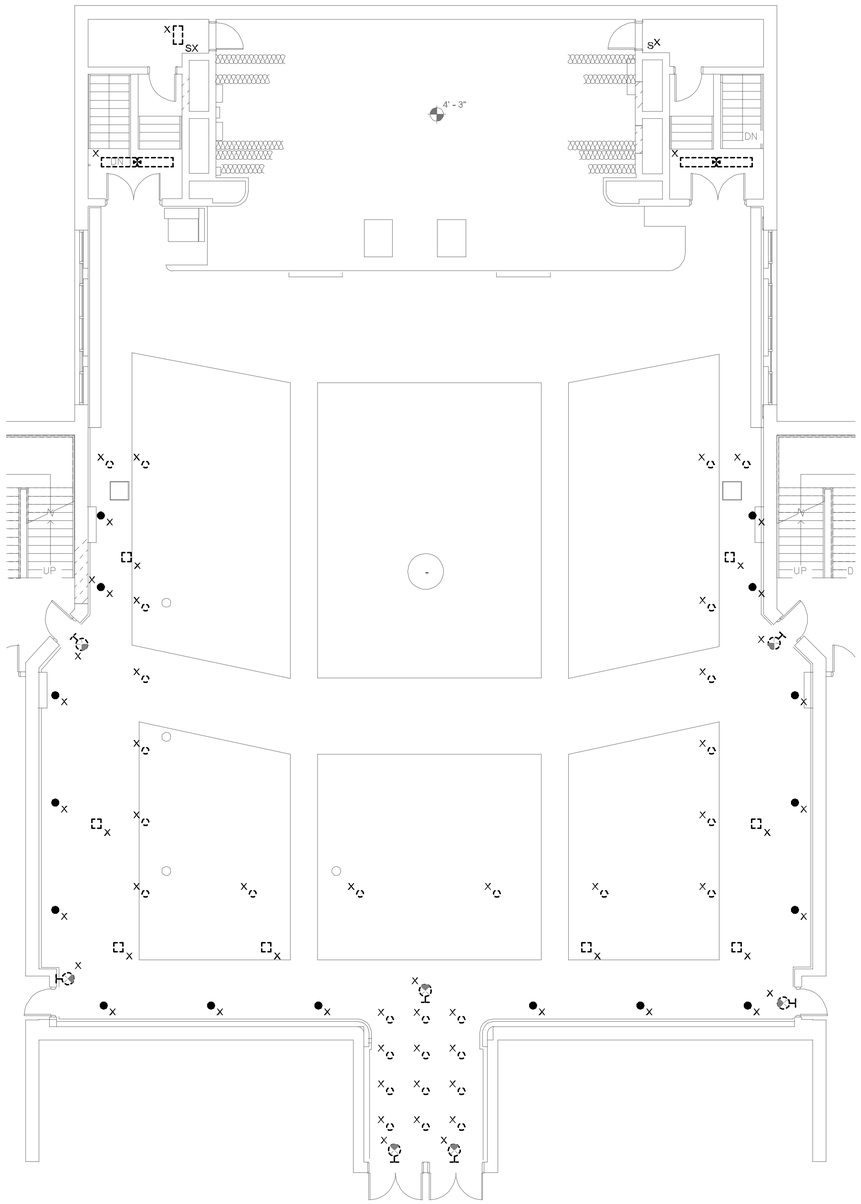
ELECTRICAL CAFETERIA/ KITCHEN DEMO FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: MVM
DRAWN BY: MVM
CHECKED BY: GM
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

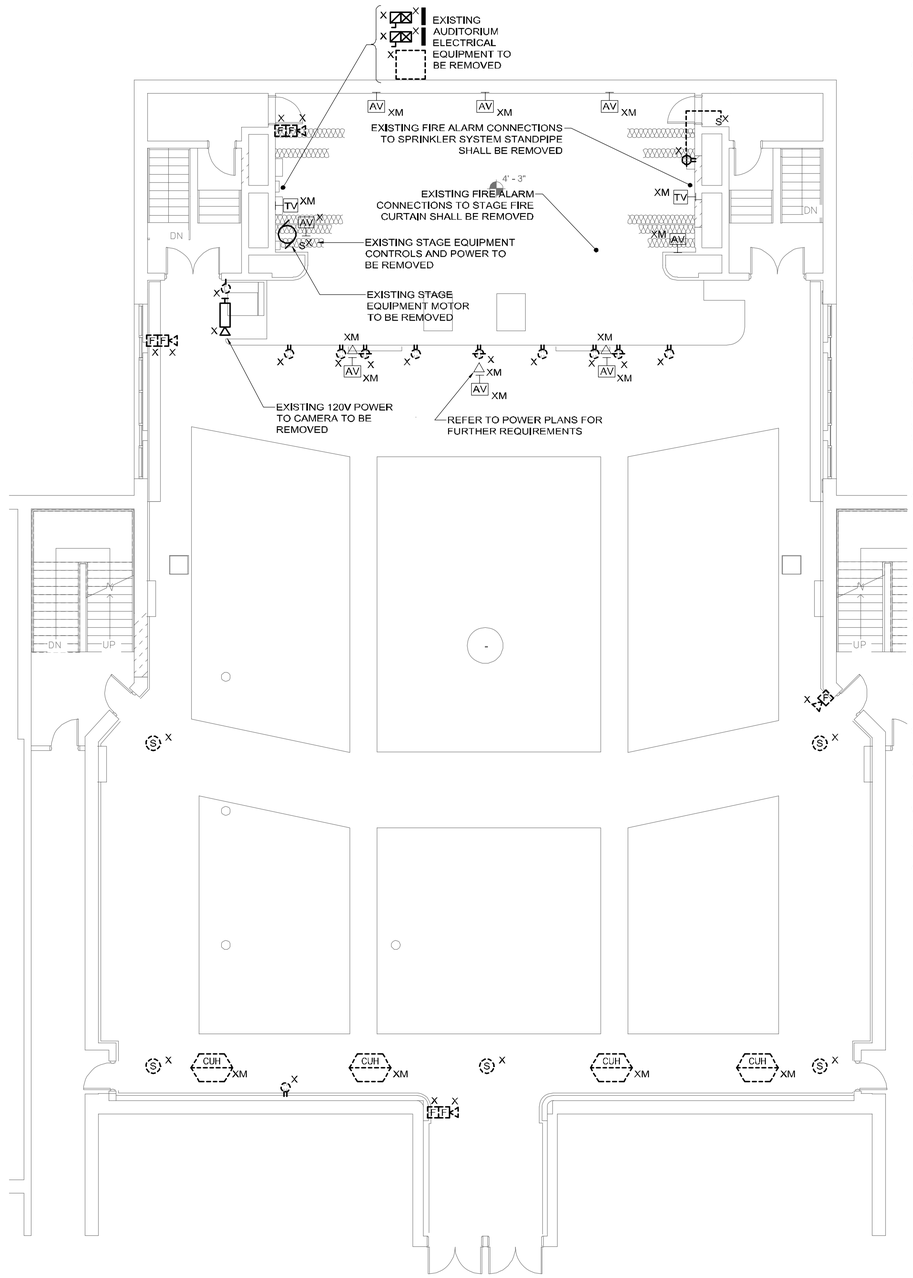
SHEET NUMBER:

ED201

SHEET 41 **OF** 61



1 ED102 ELECTRICAL LIGHTING AUDITORIUM DEMOLITION FLOOR PLAN
1/8" = 1'-0"



2 ED102 ELECTRICAL POWER AND FIRE ALARM AUDITORIUM DEMOLITION FLOOR PLAN
1/8" = 1'-0"

DEMOLITION NOTES:

1. REFER TO DRAWING ED000 FOR LEGEND, SYMBOLS AND GENERAL NOTES.

2. REFER TO THE ARCHITECTURAL DRAWINGS FOR THE FULL EXTENT OF THE SCOPE OF DEMOLITION. DISCONNECT AND MAKE SAFE ALL ELECTRICAL EQUIPMENT IDENTIFIED FOR REMOVAL ON THE HVAC, PLUMBING AND FIRE PROTECTION PLANS. THE ELECTRICAL SCOPE MAY EXTEND BEYOND THE AREA DEFINED BY THE ARCHITECTURAL DEMOLITION LIMITS TO FULLY COMPLY WITH VARIOUS REQUIREMENTS DEFINED BY THESE NOTES.

3. THE ELECTRICAL DEMOLITION PLANS AND DETAILS INDICATE THE GENERAL INTENT AND ARE NOT INTENDED TO SHOW ALL ITEMS TO BE REMOVED OR RETAINED. THE ELECTRICAL CONTRACTOR SHALL VISIT THE SITE PRIOR TO THE SUBMISSION OF BIDS TO BECOME FAMILIAR WITH THE ACTUAL CONDITIONS AND EXTENT OF WORK. DEVICES AND EQUIPMENT LOCATED ON WALLS AND/OR CEILINGS TO BE REMOVED SHALL BE DISCONNECTED AND MADE SAFE. THE ELECTRICAL CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE OF ANY UNANTICIPATED HIDDEN CONDITIONS ENCOUNTERED DURING DEMOLITION.

4. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OF ALL SYSTEMS OR BUILDING COMPONENTS DAMAGED DURING THE EXECUTION OF THE WORK. DAMAGE SHALL INCLUDE BUT NOT BE LIMITED TO DESTRUCTION OR DISPOSAL OF ITEMS INTENDED TO REMAIN OR TO BE SALVAGED.

5. THE ELECTRICAL CONTRACTOR SHALL CIRCUIT TRACE AND LABEL ALL EXISTING BRANCH CIRCUITS AND FEEDERS WITHIN THE AREA OF DEMOLITION SCOPE PRIOR TO DE-ENERGIZING AND DISCONNECTION. ALL CIRCUITS WITHIN PANELBOARDS IDENTIFIED FOR REMOVAL SHALL BE TRACED AND LABELED TO ENSURE THAT NO AREA OUTSIDE THE DEMOLITION SCOPE LIMIT IS AFFECTED.

6. THE ELECTRICAL CONTRACTOR SHALL IDENTIFY ALL BRANCH CIRCUITS, FEEDERS AND SYSTEM COMPONENTS, WHICH ARE TO REMAIN WITHIN THE AREA OF DEMOLITION SCOPE. THERE SHALL BE NO INTERRUPTION OF SERVICE TO ANY AREA OUTSIDE THE SCOPE LIMITS WITHOUT APPROVAL FROM THE OWNER'S REPRESENTATIVE. EXISTING EQUIPMENT TO REMAIN SHALL BE LEFT IN A CODE COMPLIANT MANNER.

7. THE ELECTRICAL CONTRACTOR SHALL DE-ENERGIZE AND REMOVE ALL CONDUCTORS AND RACEWAYS TO THEIR POINTS OF ORIGIN WITHIN THE AREA OF DEMOLITION SCOPE. . ITEMS IDENTIFIED FOR DEMOLITION SHALL NOT BE ABANDONED IN PLACE. RACEWAYS THAT ENTER MASONRY WALLS AND FLOORS SHALL BE RETAINED FOR REUSE.

8. THE ELECTRICAL CONTRACTOR SHALL TEMPORARILY SUPPORT ALL ITEMS TO REMAIN THAT ARE AFFECTED BY THE DEMOLITION OF BUILDING STRUCTURAL COMPONENTS (WALLS, CEILINGS, ETC.). TEMPORARILY SUPPORTED ITEMS SHALL BE PERMANENTLY SUPPORTED AND INSTALLED WHEN FINALIZED STRUCTURES ARE IN PLACE.

9. ALL REMOVED ITEMS SHALL BE LEGALLY DISPOSED OF UNLESS IDENTIFIED FOR REUSE. THE OWNER'S REPRESENTATIVE SHALL INSPECT ALL RETAINED ITEMS PRIOR TO PLACEMENT IN THE IDENTIFIED STORAGE LOCATION BY THE ELECTRICAL CONTRACTOR.

10. THE EXISTING FIRE ALARM SYSTEM SHALL REMAIN FULLY FUNCTIONAL DURING THE ENTIRE DEMOLITION AND CONSTRUCTION PERIOD. REUSE OF EXISTING FIRE ALARM SYSTEM RACEWAYS SHALL NOT BE ALLOWED. ALL REQUIRED SYSTEM SHUTDOWNS SHALL BE COORDINATED WITH AND APPROVED BY THE OWNER'S REPRESENTATIVE AND THE AUTHORITY HAVING JURISDICTION. DEMOLITION OF THE EXISTING SYSTEM SHALL NOT COMMENCE UNTIL THE NEW SYSTEM HAS BEEN COMPLETELY INSTALLED, TESTED AND APPROVED BY THE AUTHORITY HAVING JURISDICTION.

11. ALL DEMOLITION SCOPE ASSOCIATED WITH LOW VOLTAGE SYSTEMS INCLUDING BUT NOT LIMITED TO TELEPHONE, DATA, SECURITY, PAGING, CCTV, ETC. SHALL BE INCLUDED IN THIS CONTRACT.

12. REMOVED FLUORESCENT AND HID LAMPS AND BATTERIES SHALL BE RECYCLED BY A FACILITY APPROVED BY THE OWNER'S REPRESENTATIVE. A UNIFORM HAZARDOUS WASTE MANIFEST SHALL BE PREPARED FOR ALL DISPOSALS AND RETURNED WITH ALL APPLICABLE SIGN OFF'S PRIOR TO APPLICATION FOR FINAL PAYMENT.

13. ALL BALLAST IN LIGHTING FIXTURES TO BE DISPOSED SHALL BE VERIFIED TO BE PCB FREE. ALL BALLAST MANUFACTURED PRIOR TO 1979 AND NOT LABELED AS PCB FREE SHALL BE CONSIDERED TO CONTAIN PCBs. PROVIDE WRITTEN VERIFICATION TO THE OWNER'S REPRESENTATIVE THAT CONFIRMS PCB FREE WASTE. WHERE PCB FREE WASTE CANNOT BE VERIFIED, BALLAST SHALL BE RECYCLED BY A FACILITY APPROVED BY THE OWNER'S REPRESENTATIVE. WITH PCB COMPONENTS ELIMINATED BY A HIGH TEMPERATURE INCINERATION. A UNIFORM HAZARDOUS WASTE MANIFEST SHALL BE PREPARED FOR ALL DISPOSALS AND RETURNED WITH ALL APPLICABLE SIGN OFF'S PRIOR TO APPLICATION FOR FINAL PAYMENT. ALL HANDLING SHALL CONFORM TO EPA REQUIREMENTS. PROVIDE BREAKOUT COST FOR THIS SCOPE.

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ELECTRICAL AUDITORIUM DEMO FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: MVM
DRAWN BY: MVM
CHECKED BY: GM
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

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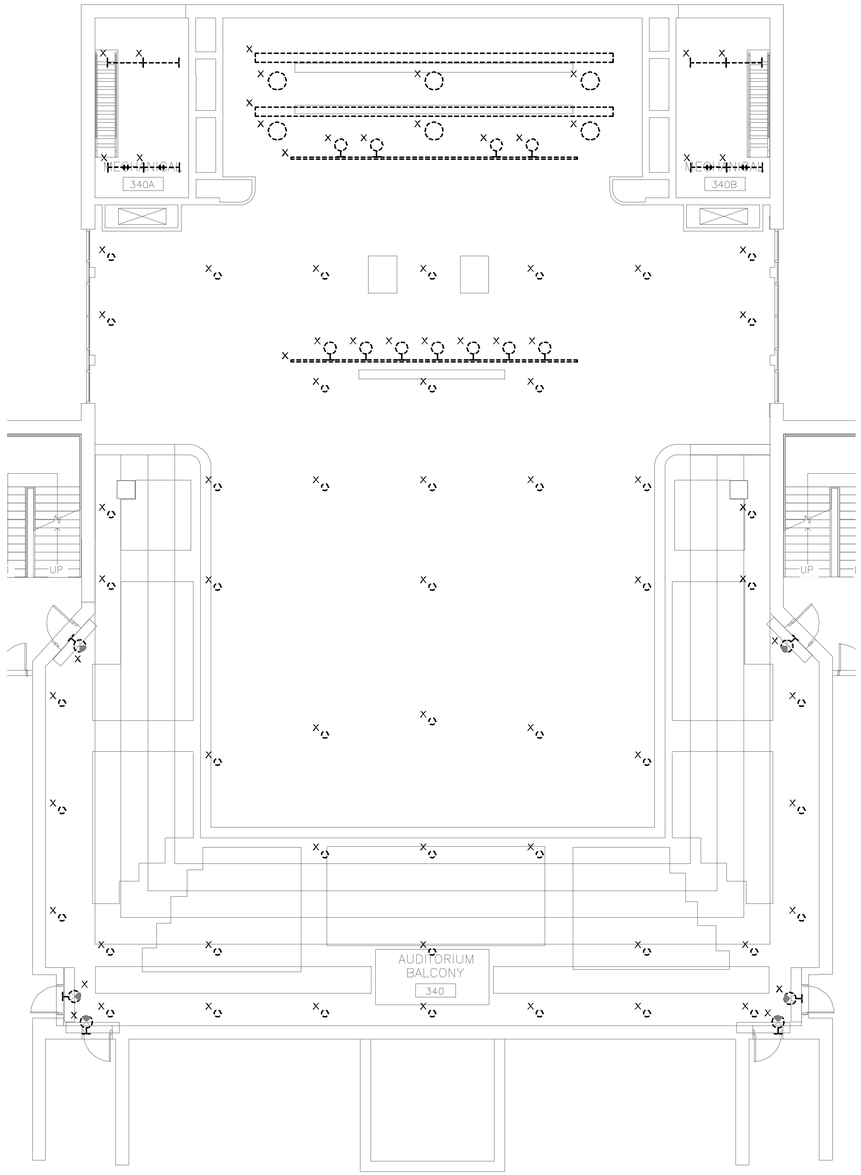
ED202

SHEET 42 **OF** 61

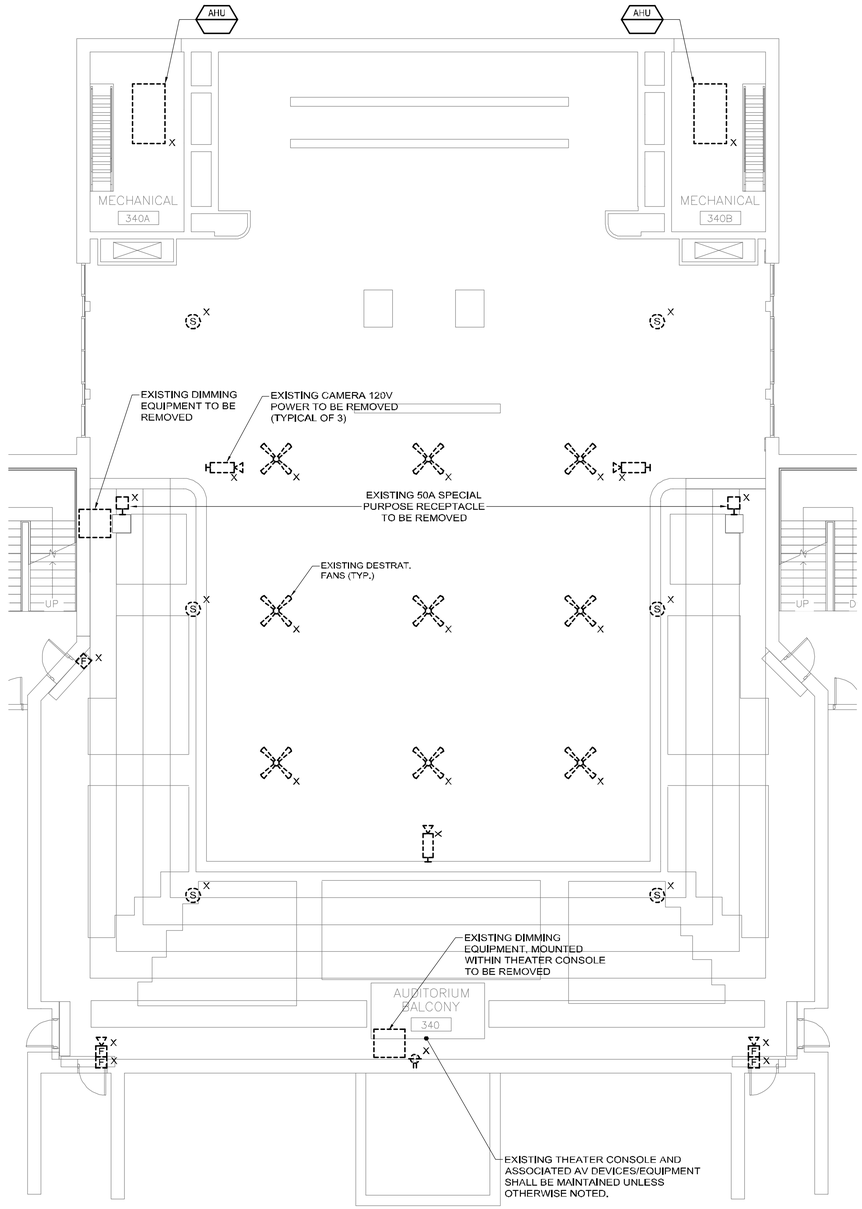
REVIEWED BY: OWNER: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

G:\2013\2013031 - Somerville High School Auditorium\1200 Drawings\1204 Electrical\Revit\2013031 ED202 ELECTRICAL AUDITORIUM DEMO FLOOR PLAN.rvt by jones March 03, 2014 - 2:49pm dfranek

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:



1 ED103 ELECTRICAL LIGHTING AUDITORIUM BALCONY DEMOLITION FLOOR PLAN
1/8" = 1'-0"



2 ED103 ELECTRICAL POWER AND FIRE ALARM AUDITORIUM BALCONY DEMOLITION FLOOR PLAN
1/8" = 1'-0"

DEMOLITION NOTES:

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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

ELECTRICAL AUDITORIUM BALCONY DEMO FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: MVM
DRAWN BY: MVM
CHECKED BY: GM
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

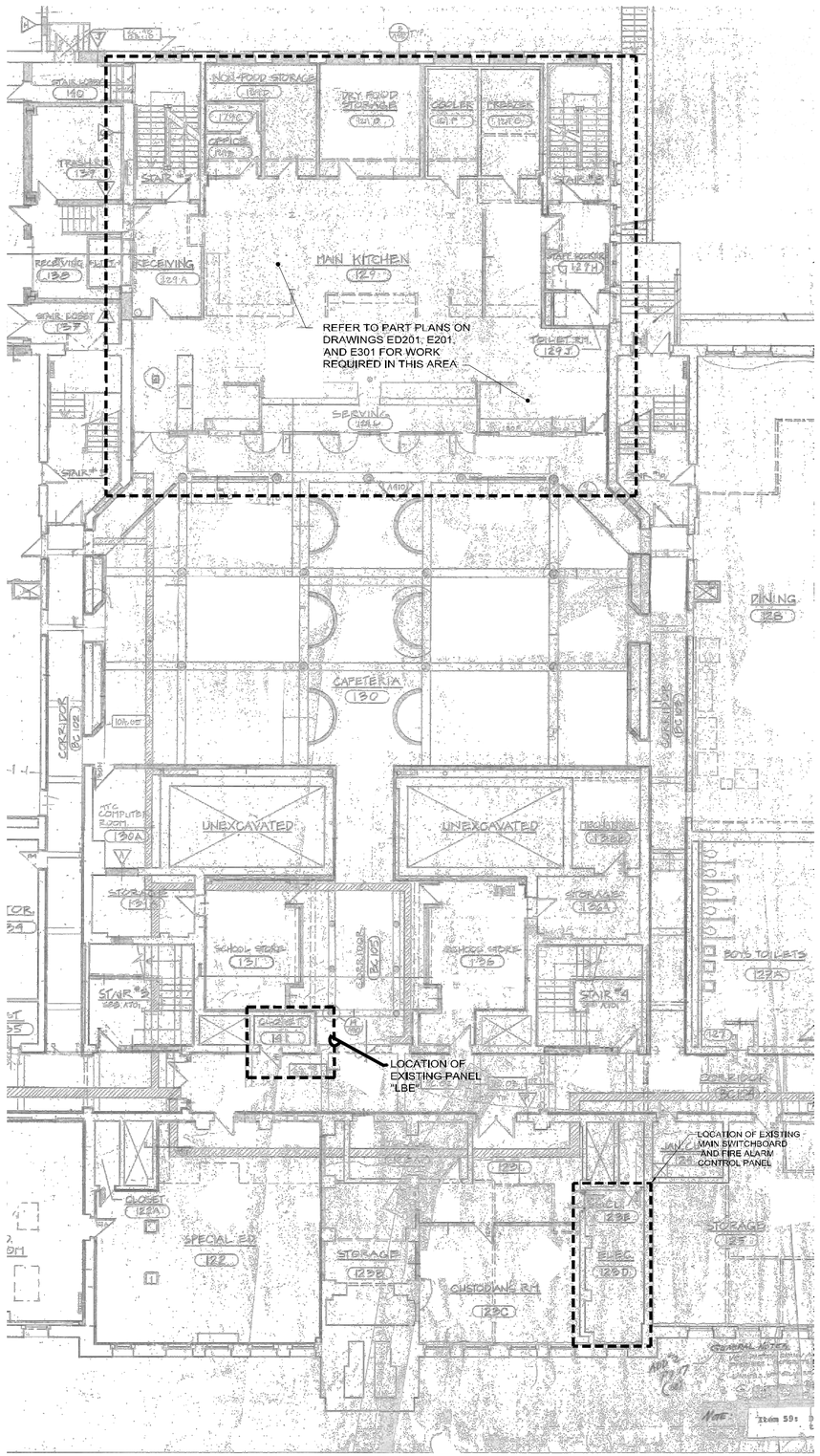
SHEET NUMBER:

ED203

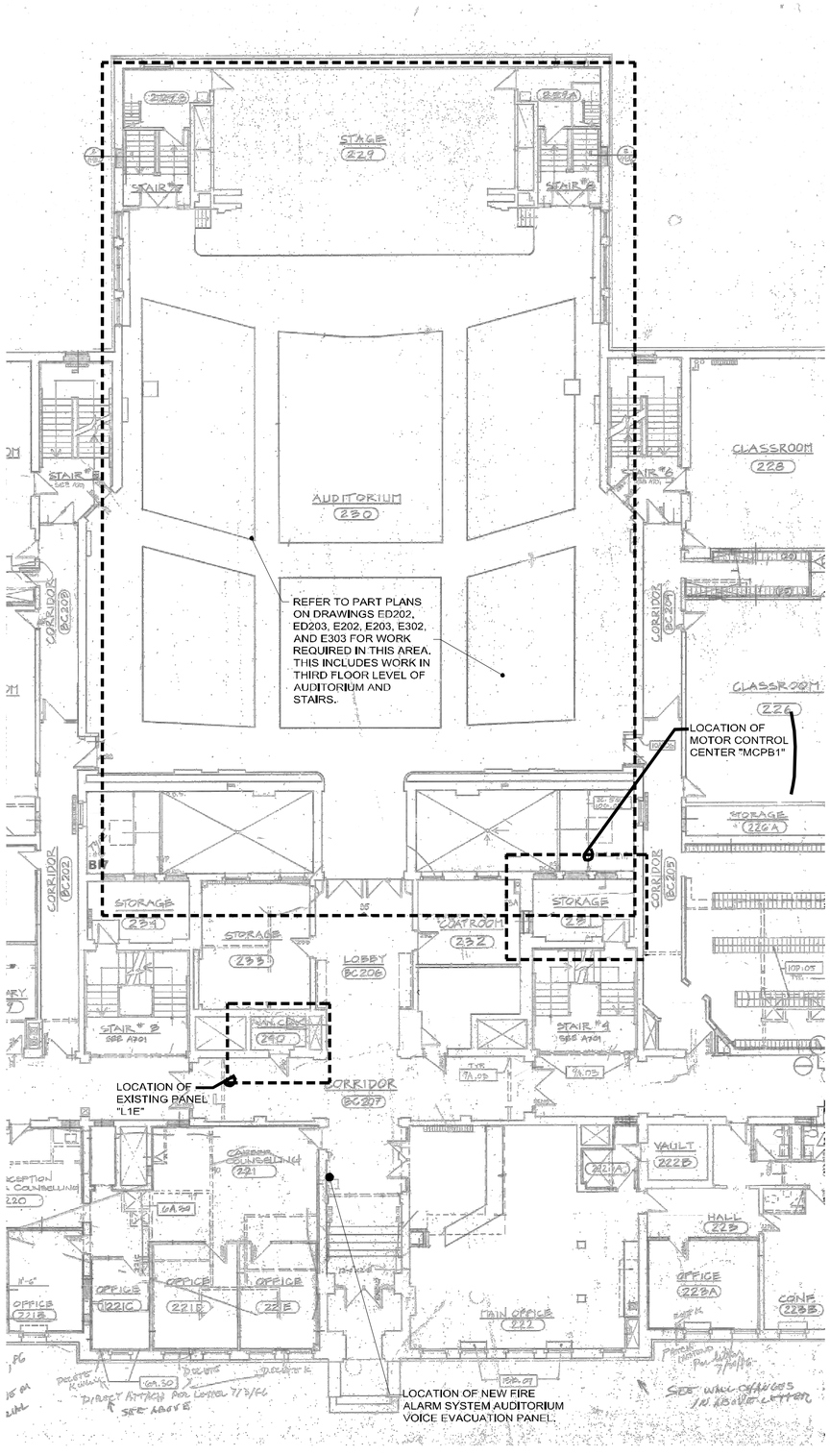
SHEET 43 **OF** 61

Q:\2013\19431\01 - Somerville High School Auditorium\200 Drawings\204 Electrical\Revit Files\19431-ED203 ELECTRICAL AUDITORIUM BALCONY DEMO FLOOR PLAN.dwg [Viewed March 03, 2014 - 3:43pm dfranzek

REVIEWED BY: OWNER _____ ARCH _____ STRUC _____ PLUMB _____ FIRE _____ MECH _____ ELEC _____



1 E100 ELECTRICAL FIRST FLOOR PLAN
3/32" = 1'-0"



2 E100 ELECTRICAL SECOND FLOOR PLAN
3/32" = 1'-0"

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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

ELECTRICAL KITCHEN AND AUDITORIUM ROUTING PLANS

PROJECT NUMBER 19431.01
DESIGNED BY: MM
DRAWN BY: JW
CHECKED BY: GM
DATE: March 03, 2014
SCALE: 3/32" = 1'-0"

SHEET NUMBER:

E100

SHEET 44 OF 61

G:\2013\13019391 • Somerville High School Auditorium\1200 Drawings\1204 Electrical\Revit Files\13019391 E100 ELECTRICAL OVERALL PLANS.rvt Mon Mar 03, 2014 - 3:44pm dthorsen

ELEC: MECH: FIRE: PLUM: STRU: ARCH: REVIEWED BY: OWN:

LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURERS	CATALOG NUMBER	DESCRIPTION	LAMPS				BALLAST				INPUT		REMARKS
				QTY	TYPE	COLOR	CRI	QTY	BF	LUMENS	TYPE	WATTS	VOLTS	
FP1	LITHONIA	DMW332MVOLTGEB10IS	SURFACE/PENDANT MOUNTED FLUORESCENT WET LOCATION FIXTURE (KITCHEN)	3	F32T8 735	3500K	85	1	0.88	7920		78	120	NOTE 12
FP2/ FS2	LITHONIA	FVF4232N1D20MVOLTGEB10I SLP830	SURFACE/PENDANT INDUSTRIAL FLUORESCENT (STAGE WORK LIGHTS)	2	F32T8 735	3500K	85	1	0.88			62	120	
FS1	LITHONIA	FVF8232N1D20MVOLTGEB10I SLP830	SURFACE FLUORESCENT ACRYLIC WRAP AROUND (KITCHEN AND STAIR)	2	F32T8 735	3500K	85	1	0.88			62	120	NOTE 12
FS3	LITE CONTROL	W-D-4424T8BWELB1CWQ120	4' WALL MOUNT LINEAR FLUORESCENT FIXTURE (AUDITORIUM DIMMING)	2	F32T8 735	3500K	85	1	0.77	4500		54	120	SEE NOTES 5 + 11
LR1	GOTHAM	ICO30/206AR20120	RECESSED LED DOWNLIGHT (AUDITORIUM DIMMING)	1	LED	3000K	-	-	0.9	3864	-	57	120	
LR2	GOTHAM	ICO30/206AR70120	RECESSED LED DOWNLIGHT (AUDITORIUM DIMMING)	1	LED	3000K	-	-	0.9	2000	-	39	120	
LR3	GOTHAM	ICO30/506AR70120	RECESSED LED DOWNLIGHT (AUDITORIUM DIMMING)	1	LED	3000K	-	-	0.9	5000	-	93	120	
EW1A	LITHONIA	EXRLEL-M6	WALL MOUNTED LED SINGLE FACE EXIT SIGN - SELF CONTAINED											
A1	COOPER	1211-OA-CF9-120-CS	RECESSED MOUNTED STEP LIGHT	1	F9TT	3500K	-	1	-	900		9	120	
A2	TIVOLI	SA-CE-WW06-C-8.0+PSU	AISLE FLOOR STRIP LIGHTING		LED	3100K	-	-	-	-	-	0.48 W/FT.	120	

NOTES:

1. NOTES 2-9 APPLY TO ALL APPLICABLE LIGHTING FIXTURES. THE REMARKS COLUMN SHALL NOTE ADDITIONAL REQUIREMENTS.
2. FIXTURES SPECIFIED WITH CATALOG NUMBERS ESTABLISH QUALITY LEVEL FOR EQUAL FIXTURES FROM MANUFACTURERS LISTED WITHOUT CATALOG NUMBERS.
3. VERIFY EXACT MOUNTING CONDITIONS AND PROVIDE APPROPRIATE ACCESSORIES AND HARDWARE TO ACCOMMODATE REQUIREMENTS.
4. FIXTURE TYPE INDICATED ONCE ON A CONTINUOUS ROW SHALL BE TYPICAL OF ALL FIXTURES IN THE ROW UNLESS NOTED OTHERWISE.
5. CONTINUOUS ROWS OF FIXTURES SHALL BE PROVIDED WITH ALL NECESSARY HARDWARE AND FILLERS TO PROVIDE THE EXACT LENGTHS AS INDICATED ON THE PLANS. FIXTURES IN SOFFITS SHALL BE CONTINUOUS END TO END.
6. PROVIDE ALL FLUORESCENT FIXTURES WITH ELECTRONIC BALLASTS WITH MAXIMUM THD OF 10%, PF GREATER THAN 97% AND BF GREATER THAN 0.88. BALLASTS SHALL BE PROGRAMMED RAPID START WITH END-OF-LAMP-LIFE PROTECTION UNLESS NOTED OTHERWISE. BALLASTS SHALL BE UL LISTED AND MANUFACTURED BY ADVANCE ELECTRIC, GE, OSRAM SYLVANIA OR UNIVERSAL.
7. BALLAST EFFICIENCY SHALL BE GREATER THAN THAT REQUIRED TO ENSURE THAT THE VALUE LISTED FOR INPUT WATTS IS NOT EXCEEDED.
8. FLUORESCENT LAMPS SHALL HAVE A MINIMUM CRI OF 82. LAMP SHALL BE MANUFACTURED BY OSRAM SYLVANIA, GE OR PHILLIPS.
9. PROVIDE EXIT SIGNS WITH ARROWS AND MOUNTING ACCESSORIES AS INDICATED ON THE PLANS.
10. FLUORESCENT DIMMING BALLAST SHALL HAVE FULL RANGE ENERGY MANAGEMENT CAPABILITIES FROM 10% TO 100% EQUAL TO LUTRON.
11. FLUORESCENT DIMMING BALLAST SHALL HAVE FULL RANGE ARCHITECTURAL CAPABILITIES FROM 1% TO 100% EQUAL TO LUTRON HILUME SERIES. COORDINATE SPECIFIED DIMMER CONTROL TO MATCH REQUIREMENTS FOR OPTIMAL CONTROL OF THE SUPPLIED SYSTEM.
12. BATTERY BACKED FLUORESCENT BALLASTS SHALL PROVIDE 600-1325 LUMENS OF ILLUMINATION FROM (1) STDN OR HO T5/T8 LAMP FOR 90 MINUTES. BALLAST SHALL UL LISTED, COMPATIBLE TO THE SPECIFIED LAMPS AND BE EQUAL TO TYPE LP600 BY BODINE.

LIGHTING CONTROL CABINET

PANEL: KLCC RELAY: 8

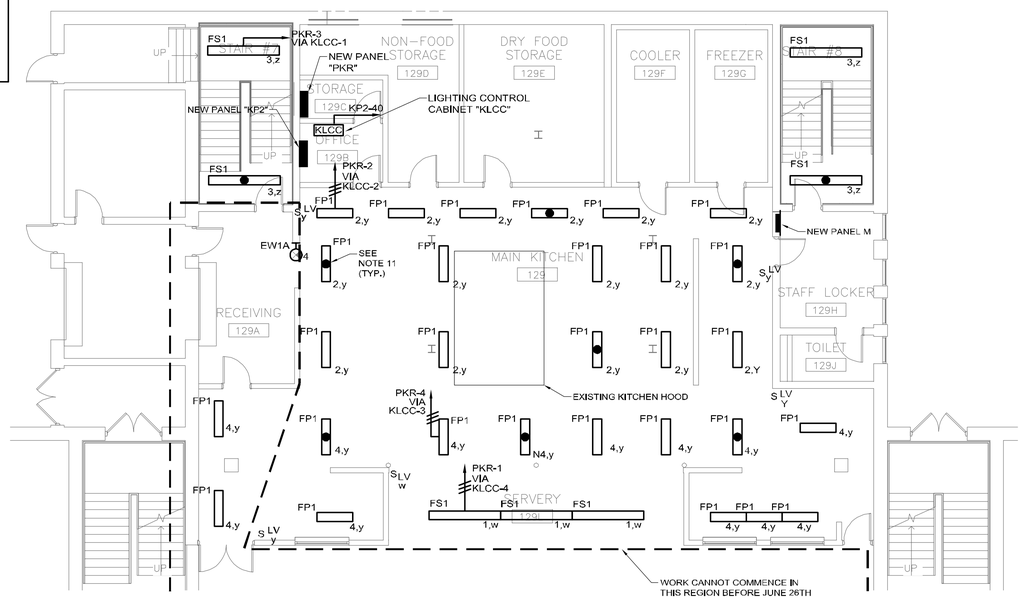
RELAY	ZONE	SERVICE	CIRCUIT	CONTROL
1	Z	STAIRS	PKR-3	NOTE 2
2	Y	KITCHEN	PKR-2	NOTE 3
3	Y	KITCHEN	PKR-4	NOTE 3
4	W	SERVERY	PKR-1	NOTE 3
5	-	SPARE		
6	-	SPARE		
7	-	SPARE		
8	-	SPARE		

NOTES:

1. "ZONE" INDICATES SWITCH CONTROL ASSOCIATION.
2. LIGHTING ENERGIZED CONTINUOUSLY.
3. LIGHTING ON/OFF VIA SWITCH INPUT, OFF VIA TIMED SWEEP.
4. LIGHTING ON/OFF VIA PHOTOCELL.
5. LIGHTING ON VIA PHOTOCELL, OFF VIA TIME CLOCK.

LIGHTING NOTES:

1. REFER TO DRAWING E000 FOR LEGEND, SYMBOLS AND GENERAL NOTES.
2. REFER TO ARCHITECTURAL DRAWINGS, INCLUDING BUT NOT LIMITED TO, REFLECTED CEILING PLANS AND ELEVATIONS FOR ASSOCIATED NOTES, MOUNTING DETAILS AND EXACT LOCATIONS OF ALL LIGHTING FIXTURES.
3. PROVIDE COMMON FACE PLATE AND REQUIRED METAL INTERIOR BOX BARRIERS FOR ALL MULTIPLE GANG SWITCH LOCATIONS.
4. CIRCUIT NUMBERS ARE DIAGRAMMATIC. EXACT NUMBERS SHALL BE DETERMINED IN THE FIELD AND REFLECTED ON AS-BUILT DOCUMENTATION BY THE ELECTRICAL CONTRACTOR. THE ASSOCIATED CIRCUIT NUMBER AND SWITCH LEG NOMENCLATURE THAT ARE APPLIED TO EACH LIGHTING FIXTURE AND CONTROLLING DEVICE INFER INTERCONNECTING BRANCH CIRCUITRY.
5. VOLTAGE DROP HAS BEEN CONSIDERED IN THE DESIGN OF ALL BRANCH CIRCUIT AND FEEDER SIZES BASED UPON THE ILLUSTRATED EQUIPMENT LAYOUTS AND SHORTEST CONDUCTOR/RACEWAY ROUTING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEVIATIONS TAKEN THAT WILL INCREASE CONDUCTOR/RACEWAY ROUTING LENGTHS. BRANCH CIRCUITS LONGER THAN 75' FOR 120V AND 175' FOR 277V FROM PANEL TO LAST OUTLET SHALL BE INCREASED A MINIMUM OF ONE SIZE ABOVE THAT SPECIFIED TO LIMIT VOLTAGE DROP TO LESS THAN 3%.
6. COORDINATE THE PLACEMENT OF ALL PENDENT, SURFACE OR SEMI-FLUSH FIXTURES AND DEVICES WITH THE FIRE PROTECTION CONTRACTOR TO MAINTAIN NFPA 13 REQUIRED SEPARATION BETWEEN SPRINKLER HEADS AND OBSTRUCTIONS.
7. PROVIDE CONSTANTLY ENERGIZED (UNSWITCHED) BRANCH CIRCUIT TO ALL EXIT SIGNS AND EGRESS LIGHTS FROM THE DESIGNATED SOURCE.
8. LIGHTING BRANCH CIRCUITRY SHALL BE INSTALLED IN CONDUIT FROM THE PANELBOARD TO THE FIRST OUTLET AND/OR WHERE EXPOSED. LIGHTING BRANCH CIRCUITRY MAY BE TYPE MC CABLE WHERE CONCEALED ABOVE SUSPENDED CEILINGS OR IN METAL STUD WALLS.
9. MAINTAIN CONTINUITY OF BRANCH CIRCUITRY ASSOCIATED WITH ALL EXISTING LIGHTING TO REMAIN.
10. REFER TO DRAWING E100 FOR LOCATION OF EXISTING PANEL 'LBE'. BRANCH CIRCUIT WIRING SHALL BE ROUTED ABOVE ACCESSIBLE CEILING IN CORRIDOR BC102.
11. FIXTURE SHALL BE EQUIPPED WITH EMERGENCY BATTERY BALLAST. REFER TO FIXTURE SCHEDULE FOR ADDITIONAL INFORMATION.



1 E201 ELECTRICAL LIGHTING FIRST FLOOR NEW PLAN 1/8" = 1'-0"

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ISSUED FOR BID

Somerville Public Schools — Education • Inspiration • Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

ELECTRICAL LIGHTING CAFETERIA/ KITCHEN PLAN

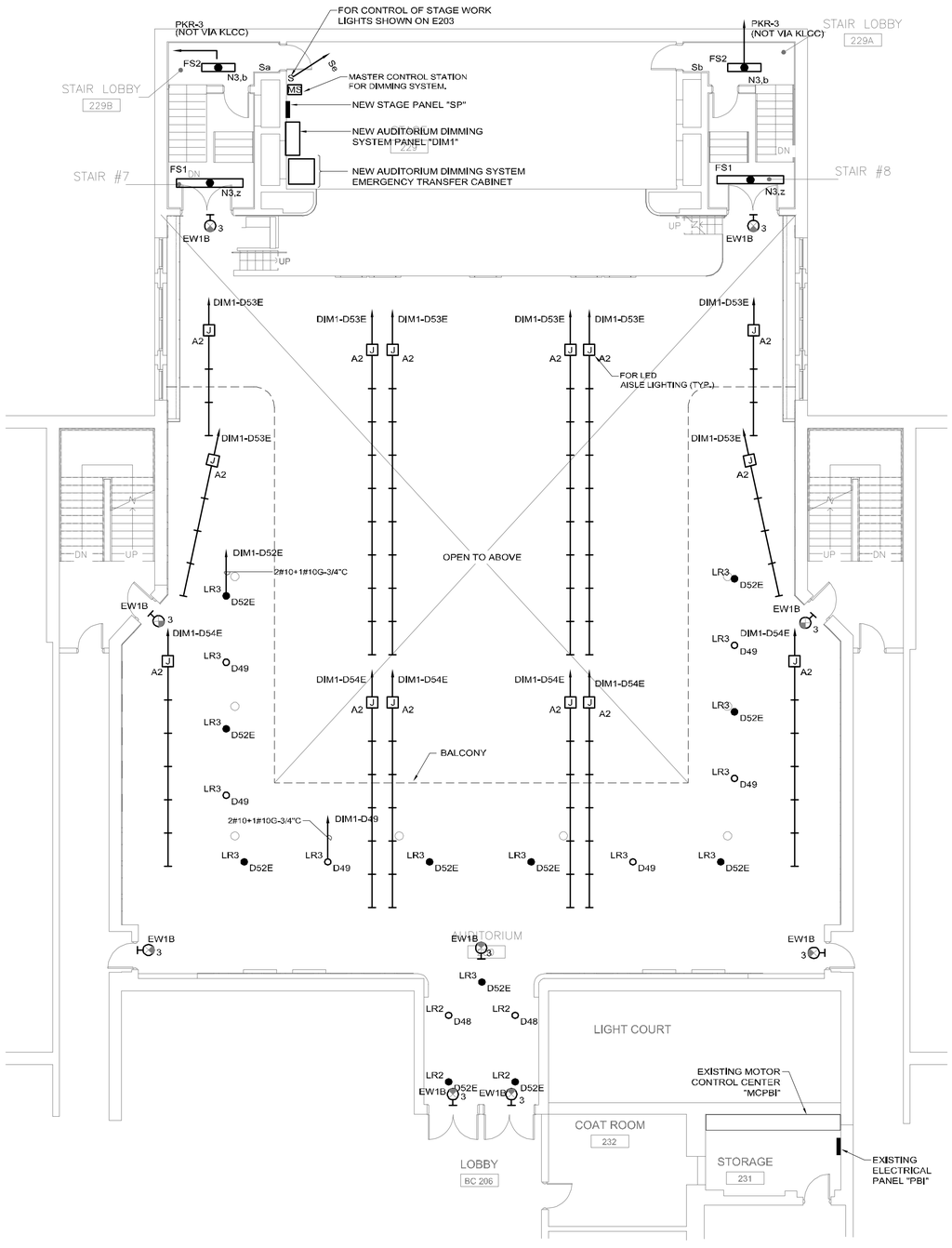
PROJECT NUMBER 19431.01
DESIGNED BY: MVM
DRAWN BY: MVM
CHECKED BY: GM
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

E201

SHEET 45 **OF** 61

G:\2013\13031 - Somerville High School Auditorium\300 Drawings\Plans\13031 E201 ELECTRICAL LIGHTING CAFETERIA-KITCHEN FLOOR PLAN.dwg [Vivian] March 03, 2014 - 3:44pm dfranzak



LIGHTING NOTES:

1. REFER TO DRAWING E000 FOR LEGEND, SYMBOLS AND GENERAL NOTES.

2. REFER TO ARCHITECTURAL DRAWINGS, INCLUDING BUT NOT LIMITED TO, REFLECTED CEILING PLANS AND ELEVATIONS FOR ASSOCIATED NOTES, MOUNTING DETAILS AND EXACT LOCATIONS OF ALL LIGHTING FIXTURES.

3. PROVIDE COMMON FACE PLATE AND REQUIRED METAL INTERIOR BOX BARRIERS FOR ALL MULTIPLE GANG SWITCH LOCATIONS.

4. CIRCUIT NUMBERS ARE DIAGRAMMATIC. EXACT NUMBERS SHALL BE DETERMINED IN THE FIELD AND REFLECTED ON AS-BUILT DOCUMENTATION BY THE ELECTRICAL CONTRACTOR. THE ASSOCIATED CIRCUIT NUMBER AND SWITCH LEG NOMENCLATURE THAT ARE APPLIED TO EACH LIGHTING FIXTURE AND CONTROLLING DEVICE INFER INTERCONNECTING BRANCH CIRCUITRY.

5. VOLTAGE DROP HAS BEEN CONSIDERED IN THE DESIGN OF ALL BRANCH CIRCUIT AND FEEDER SIZES BASED UPON THE ILLUSTRATED EQUIPMENT LAYOUTS AND SHORTEST CONDUCTOR/RACEWAY ROUTING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEVIATIONS TAKEN THAT WILL INCREASE CONDUCTOR/RACEWAY ROUTING LENGTHS. BRANCH CIRCUITS LONGER THAN 75' FOR 120V FROM PANEL TO LAST OUTLET SHALL BE INCREASED A MINIMUM OF ONE SIZE ABOVE THAT SPECIFIED TO LIMIT VOLTAGE DROP TO LESS THAN 3%.

6. COORDINATE THE PLACEMENT OF ALL PENDENT, SURFACE OR SEMI-FLUSH FIXTURES AND DEVICES WITH THE FIRE PROTECTION CONTRACTOR TO MAINTAIN NFPA 13 REQUIRED SEPARATION BETWEEN SPRINKLER HEADS AND OBSTRUCTIONS.

7. PROVIDE CONSTANTLY ENERGIZED (UNSWITCHED) BRANCH CIRCUIT TO ALL EXIT SIGNS AND EGRESS LIGHTS FROM THE DESIGNATED SOURCE.

8. LIGHTING BRANCH CIRCUITRY SHALL BE INSTALLED IN CONDUIT FROM THE PANELBOARD TO THE FIRST OUTLET AND/OR WHERE EXPOSED. LIGHTING BRANCH CIRCUITRY MAY BE TYPE MC CABLE WHERE CONCEALED ABOVE SUSPENDED CEILINGS OR IN METAL STUD WALLS.

9. MAINTAIN CONTINUITY OF BRANCH CIRCUITRY ASSOCIATED WITH ALL EXISTING LIGHTING TO REMAIN.

CDR MAGUIRE
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ELECTRICAL LIGHTING AUDITORIUM FLOOR PLAN

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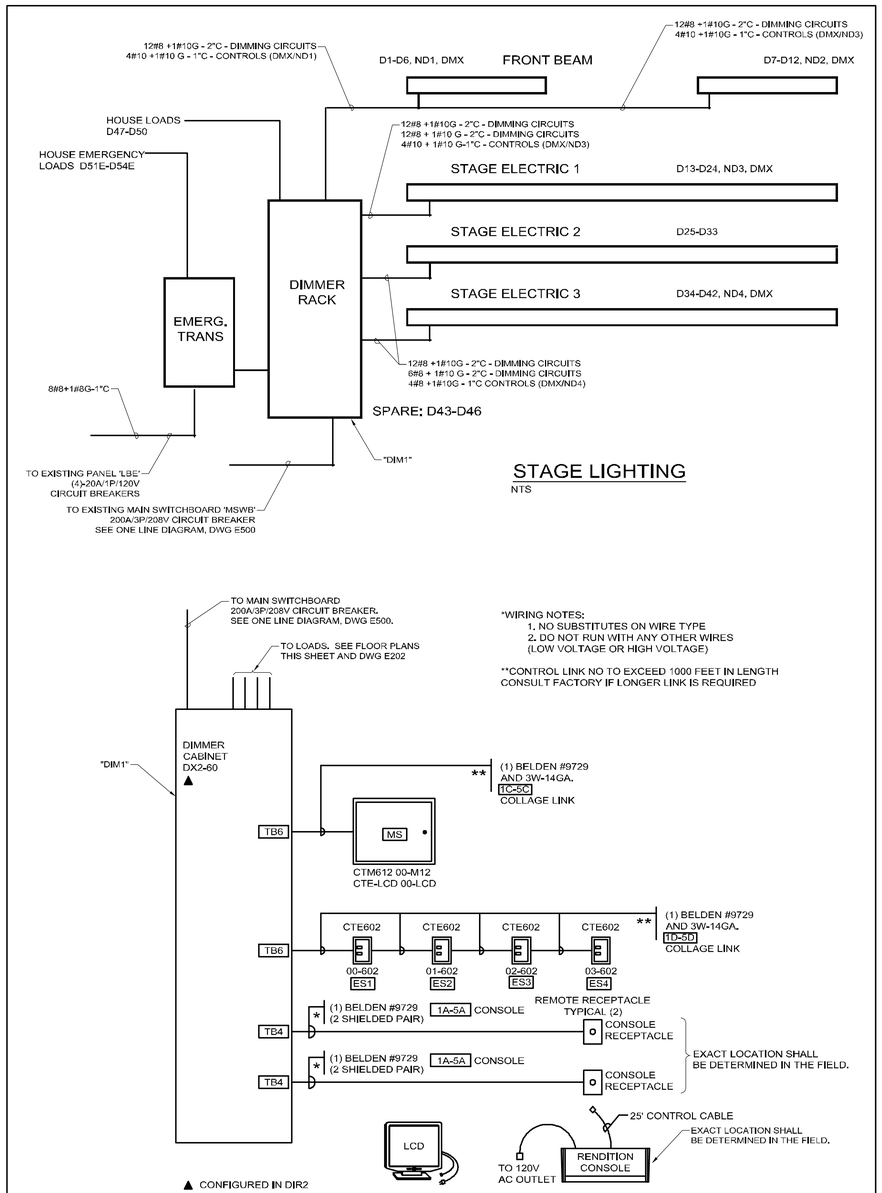
SHEET NUMBER:

E202

SHEET 46 **OF** 61

REVIEWED BY: CIVIL: ELEC: MECH: FIRE: PLUM: STRU: ARCH:

G:\2013\2013031 • Somerville High School Auditorium\1300 Drawings\1304 Electrical\Revit Files\2013031 E202 ELECTRICAL LIGHTING AUDITORIUM FLOOR PLAN.rvt Wed, March 05, 2014 - 2:49pm gfranzak



STAGE LIGHTING

NTS

*WIRING NOTES:
1. NO SUBSTITUTES ON WIRE TYPE
2. DO NOT RUN WITH ANY OTHER WIRES (LOW VOLTAGE OR HIGH VOLTAGE)

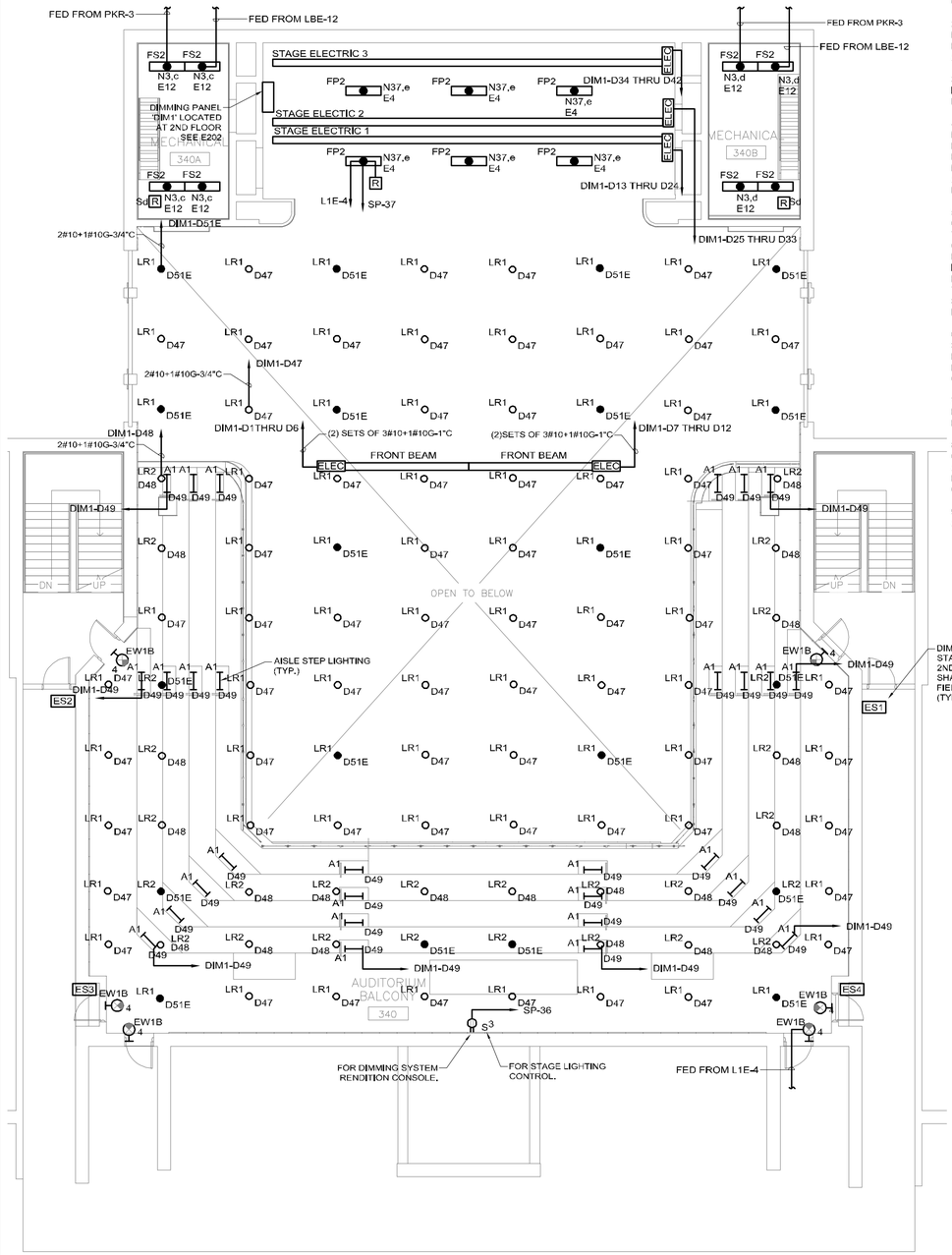
**CONTROL LINK NO TO EXCEED 1000 FEET IN LENGTH
CONSULT FACTORY IF LONGER LINK IS REQUIRED

STAGE DIMMING SYSTEM WIRING DIAGRAM

NTS

NOTES:

1. REFER TO SPECIFICATION SECTION 25561 FOR DIMMING SYSTEM REQUIREMENTS. CONTRACTOR SHALL PROVIDE ALL COMPONENTS, CABLING AND ACCESSORIES AS REQUIRED FOR A COMPLETE SYSTEM.
2. PROVIDE INTERFACE MODULE TO BRING THE AUDITORIUM LIGHTING SYSTEM TO FULL BRIGHT UPON SIGNAL FROM THE FIRE ALARM SYSTEM.
3. PROVIDE INTERFACE MODULE TO BRING THE AUDITORIUM EMERGENCY LIGHTING SYSTEM TO FULL BRIGHT UPON LOSS OF NORMAL POWER.



LIGHTING NOTES:

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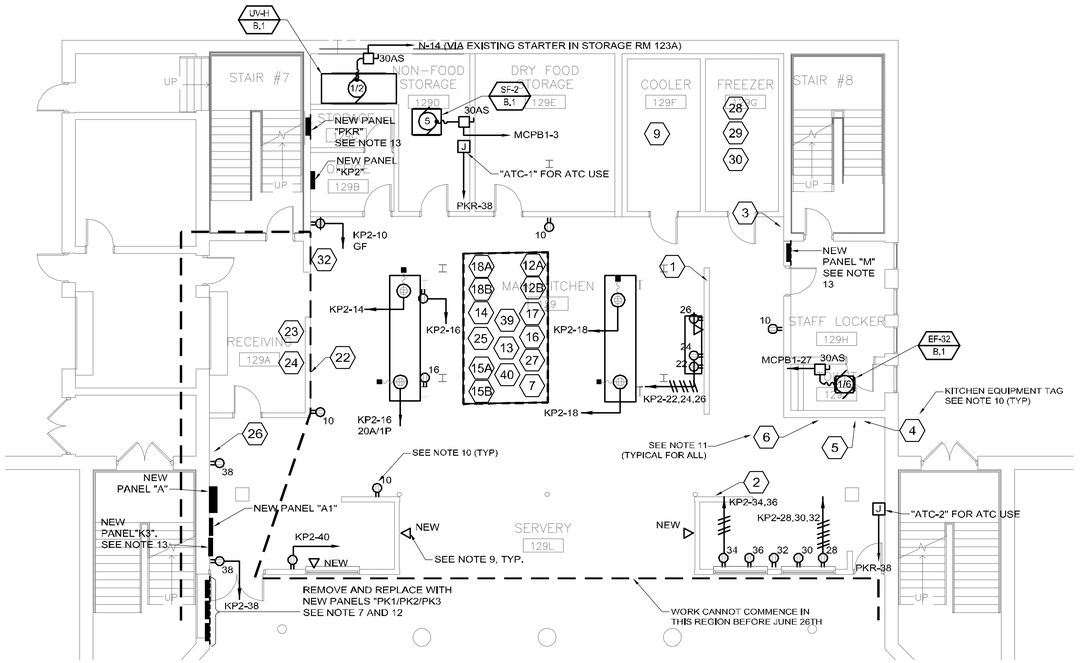
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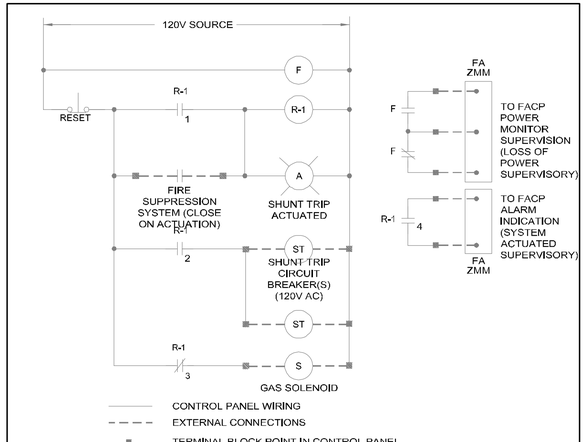
Q:\2013\13031351 • Somerville High School Auditorium\300 Drawings\Revit\13031351 E203 ELECTRICAL LIGHTING AUDITORIUM BALCONY FLOOR PLAN.rvt by MVM1 March 03, 2014 - 3:44pm dhancock

KITCHEN EQUIPMENT SCHEDULE

EQUIP TAG	DESCRIPTION	MANUFACTURER	LOAD HP	LOAD AMP	LOAD KVA	VOLT	PH	POWER SOURCE WIRE	POWER SOURCE PANEL	POWER SOURCE C/B	BRANCH CIRCUIT	CONNECTION FLEX	CONNECTION JB	CONNECTION REC	CONNECTION DISC	REMARKS
1	REFRIGERATOR	TRAULSEN		11.27		120	1	3	K3-2	20A-1P/GF	(2)#12 & (1)#12G IN 3/4"C			X		
2	REFRIGERATOR	VIMCO				120	1	3	K3-6	20A-1P/GF	(2)#12 & (1)#12G IN 3/4"C			X		
3	FREEZER	CROSLEY				120	1	3	PK3-6	20A-1P/GF	(2)#12 & (1)#12G IN 3/4"C			X		
4	DISPOSER	SALVAJOR		6.6		208	3	4	PK2-18	30A-3P	(3)#12 & (1)#12G IN 3/4"C	X			X	
5	TRAY WASHER	HOBART		24.9		208	3	3	PK2-24	30A-3P	(3)#10 & (1)#10G IN 3/4"C	X			X	NEMA3R DISCONNECT
6	HOT WATER BOOSTER	HATCO		33.3	12.0	208	3	3	PK2-25	40A-3P	(3)#8 & (1)#10G IN 3/4"C	X			X	
7	OVEN (RECEPT)	CARTER HOFFMAN		26.6	6.0	208	1	3	K2P-37	20A-2P/ST	(2)#12 & (1)#12G IN 3/4"C			X		NOTE 5,8
8	MEAT SLICER	BIZERBA		2.9		120	1	3	PK3-6	20A-2P	(2)#12 & (1)#12G IN 3/4"C			X		
9	REFRIGERATOR	TRAULSEN			7.8	208	1	3	PK1-9	20A-2P/GF	(2)#12 & (1)#12G IN 3/4"C	X			X	
10	MIXER	HOBART	1/3	8.2		120	1	3	PK3-21	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
11	CAN OPENER	EDLUND		1.2		120	1	3	PK3-4	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
12A	CONVECTION OVEN	BLOGETT		10	1.2	120	1	3	KP2-29	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		NOTE 5,8
12B	CONVECTION OVEN	BLOGETT		10	1.2	120	1	3	KP2-33	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		NOTE 5,8
13	COOKER	MARKET FORGE		6		120	1	3	PK3-10	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		
14	TILTING SKILLET	MARKET FORGE		0.4		120		3	KP2-1	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		NOTE 5,8
15A	CONVECTION OVEN	BLOGETT		10	1.2	120	1	3	KP2-17	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		NOTE 5,8
15B	CONVECTION OVEN	BLOGETT		10	1.2	120	1	3	KP2-21	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		NOTE 5,8
16	COOKER	MARKET FORGE		2		120	1	3	KP2-25	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		NOTE 5,8
17	STEAM COOKER	MARKET FORGE		6		120	1	3	KP2-5	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		NOTE 5,8
18A	CONVECTION OVEN	BLOGETT		10	1.2	120	1	3	KP2-9	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		NOTE 5,8
18B	CONVECTION OVEN	BLOGETT		10	1.2	120	1	3	KP2-13	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		NOTE 5,8
19	CAN OPENER	EDLUND		1.2		120	1	3	PK3-12	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
20	JUICER	DEAN			5.9	120	1	3	PK3-14	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
21	WRAPPER	BESELER				120	1	3	PK3-16	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
22	DISPOSER	HOBART		16.6		208	3	3	PK2-8	20A-3P	(2)#12 & (1)#12G IN 3/4"C	X			X	
23	REFRIGERATOR	TRAULSEN		11.4		120	1	3	K3-12	20A-1P/GF	(2)#12 & (1)#12G IN 3/4"C			X		
24	REFRIGERATOR	TRAULSEN		11.4		120	1	3	20/1	20A-1P/GF	(2)#12 & (1)#12G IN 3/4"C			X		
25	GAS STOVE CONTROL					120	1	3	PK3-18	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		
26	TOASTER	MERCO SAVORY		15.4		208	1	3	PK3-20	20A-2P	(2)#12 & (1)#12G IN 3/4"C			X		
27	COOKER					120	1	3	KP2-4	20A-2P/ST	(2)#12 & (1)#12G IN 3/4"C			X		
28	COOLER DOOR HEATER					120	1	3	PK1-7	20A/1P	(2)#12 & (1)#12G IN 3/4"C			X		
29	LIGHT/FREEZER DOOR HTR					120	1	3	PK1-5	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
30	COOLER FANS					208	1	3	PK1-1	20A-2P	(2)#12 & (1)#12G IN 3/4"C	X			X	
31	COOLER EVAP					208	3	4	PK2-1	30A-3P	(3)#10 & (1)#10G IN 3/4"C	X			X	
32	ANSUL SYSTEM					120	1	3	PK2-9	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
33	CUTTER/MIXER					208	3	4	PK2-11	20A-3P	(3)#12 & (1)#12G IN 3/4"C	X			X	
34	CUTTER/MIXER					208	3	4	PK2-17	40A-3P	(3)#8& (1)#10G IN 3/4"C	X			X	
35	VENDING MACHINE					120	1	3	PK2-237	20A-1P/GF	(2)#12 & (1)#12G IN 3/4"C			X		
36	FREEZER CONDENSER					208	3	4	PK2-2	20A-3P	(3)#8 & (1)#8G IN 3/4"C	X			X	NEMA3R DISCONNECT
37	HOOD LIGHTS					120	1	3	KP2-1	20A-1P/ST	(2)#12 & (1)#12G IN 3/4"C			X		
38	CHILLER					208	1	3	PK2-14	20A-2P	(2)#12 & (1)#12G IN 3/4"C	X			X	
39	STEAM KETTLE					208	1	3	PK3-1	20A-2P/ST	(2)#12 & (1)#12G IN 3/4"C	X			X	
40	STEAM KETTLE					208	1	3	PK3-5	20A-2P/ST	(2)#12 & (1)#12G IN 3/4"C	X			X	
41	COOL TABLE CORNER UNIT					120	1	3	PK3-9	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
42	OASIS DISPLAY CASE					208	1	3	PK3-11	20A-2P	(2)#12 & (1)#12G IN 3/4"C	X			X	
43	COOL WELL MAIN SERV. LINE					120	1	3	PK3-15	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
44	TEACHER'S SERVING TABLE					208	1	3	PK3-17	30A-2P	(2)#10 & (1)#10G IN 3/4"C	X			X	
45	SANDWICH WARMER					208	1	3	PK3-21	20A-2P	(2)#12 & (1)#12G IN 3/4"C			X		
46	WARMING CABINET					208	1	3	K3-1	20A-2P	(2)#12 & (1)#12G IN 3/4"C			X		
47	HOT FOOD COUNTER					208	3	4	K3-3	20A-3P	(3)#12 & (1)#12G IN 3/4"C	X			X	
48	JUICE DISPENSER					120	1	3	K3-11	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
49	HOT FOOD COUNTER					208	1	3	K3-13	20A-2P	(2)#12 & (1)#12G IN 3/4"C	X			X	
50	HOT FOOD COUNTER					208	1	3	K3-17	30A-2P	(2)#10 & (1)#10G IN 3/4"C	X			X	
51	WARMING CABINET					208	1	3	K3-21	20A-2P	(2)#12 & (1)#12G IN 3/4"C			X		
52	JUICE DISPENSER					120	1	3	K3-25	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
53	COLD FOOD COUNTER					120	1	3	K3-2	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
54	HOT FOOD COUNTER					208	1	3	K3-8	30A-2P	(2)#10 & (1)#10G IN 3/4"C			X		
55	SHRINK WRAP DROP					120	1	3	K3-14	30A-1P	(2)#10 & (1)#10G IN 3/4"C			X		
56	3 TIER WARMER					208	3	4	K3-16	20A-3P	(3)#12 & (1)#12G IN 3/4"C	X			X	
57	FOOD WARMER					120	1	3	A1-1	30A-2P	(2)#10 & (1)#10G IN 3/4"C	X			X	
58	SANDWICH REFRIG					120	1	3	A1-5	30A-1P/GF	(2)#10 & (1)#10G IN 3/4"C			X		
59	FOOD WARMER					120	1	3	A1-7	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
60	BUNOMATIC COFFEE MAKER					208	1	3	A1-9	30A-2P	(2)#10 & (1)#10G IN 3/4"C			X		
61	TRUE MILK/DAIRY DISPENSER					120	1	3	A1-13	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		
62	HOT CHOCOLATE MACHINE					120	1	3	A1-15	20A-1P	(2)#12 & (1)#12G IN 3/4"C			X		

NOTES:
1. BRANCH CIRCUIT WIRING METHODS SHALL BE AS NOTED ON THE DRAWINGS FOR THE APPLICABLE LOCATION.
2. "FLEX" - DENOTES THAT THE FINAL THREE FEET (MAXIMUM) OF RACEWAY SHALL BE FLEXIBLE METAL OR LIQUIDTIGHT FLEXIBLE METAL CONDUIT. LIQUIDTIGHT FLEXIBLE METAL CONDUIT SHALL BE USED FOR ALL APPLICATIONS BELOW COUNTER HEIGHT.
3. "JB" - JUNCTION BOX DENOTES FINAL CONNECTION TO BOX OR CONTROL PANEL PRE-WIRED TO THE EQUIPMENT. BOX SHALL BE FS TYPE.
4. "REC" - RECEPTACLE IN THE NEMA CONFIGURATION NOTED. ALL COVERS BELOW COUNTER HEIGHT SHALL BE WP TYPE. ALL OTHER PLATES SHALL BE SMOOTH STAINLESS STEEL. REFER TO DETAILS AND SPECIFICATIONS FOR LABELING REQUIREMENTS.
5. "ST" INDICATES SHUNT TRIP ACCESSORY FOR COOKING EQUIPMENT UNDER EXHAUST HOODS WITH FIRE SUPPRESSION SYSTEMS. REFER TO THE ASSOCIATED DETAIL FOR REQUIRED INTERFACES.
6. ALL 15 AND 20A, 120V CIRCUITS SHALL BE GFCI PROTECTED.
7. DISCONNECTING MEANS FOR APPLIANCES SHALL BE IN ACCORDANCE WITH NEC 422.31. PROVIDE LOCKING PROVISIONS ON THE ASSOCIATED CIRCUIT BREAKER WHERE RECEPTACLE CONNECTIONS OR A STAND-ALONE DISCONNECT ARE NOT SPECIFIED. LOCKING PROVISIONS SHALL BE UL LISTED AND REMAIN IN PLACE WITH OR WITHOUT THE LOCK.
8. PROVIDE NEW BRANCH CIRCUIT WIRING/CONDUIT TO PANEL AS INDICATED. EXISTING CONDUIT IN FLOOR SLAB SHALL BE CAPPED/FILLED AND ABANDONNED IN PLACE.





NOTES:
1. ALL WIRING SHALL BE #10 AWG IN EMT.
2. HEAVY DUTY POWER RELAYS SHALL BE RATED 10 AMPS AT 600V. CONTACTS SHALL BE FIELD REVERSIBLE FROM N.C. TO N.O. COIL SHALL BE 120V. RELAY SHALL BE EQUAL TO SQUARE D TYPE X-CLASS 8501.
3. PROVIDE QUANTITY OF RELAYS AND SHUNT TRIP CIRCUIT BREAKERS AS REQUIRED
4. PUSH BUTTONS ARE MOMENTARY CONTACT, EQUAL TO SQUARE D TYPE K, WITH K60 COVER.
5. LAMPS ARE 120V LED PUSH TO TEST EQUAL TO SQUARE D TYPE K.
6. ALL COMPONENTS TO BE INSTALLED IN A HINGED COVER ENCLOSURE, NEMA TYPE AS INDICATED ON PLANS. SHOP DRAWINGS SHALL ILLUSTRATE COMPONENT LAYOUT AND POINT-TO-POINT WIRING DETAILS. ASSEMBLY SHALL BE SHOP FABRICATED AND BE UL LABELED.
   NOTE TO USER: ILLUSTRATE TOTAL QUANTITY OF SHUNT TRIP CIRCUIT BREAKER(S). DO NOT PUT >3 ON CIRCUIT.

RDK

TYPICAL KITCHEN EQUIPMENT HOOD SHUTDOWN SCHEMATIC

E307

POWER NOTES:

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2. REFER TO ARCHITECTURAL DRAWINGS FOR ASSOCIATED NOTES, MOUNTING DETAILS, HEIGHTS AND EXACT LOCATIONS OF ALL DEVICES.
3. CIRCUIT NUMBERS ARE DIAGRAMMATIC. EXACT NUMBERS SHALL BE DETERMINED IN THE FIELD AND REFLECTED ON AS-BUILT DOCUMENTATION BY THE ELECTRICAL CONTRACTOR. THE ASSOCIATED CIRCUIT NUMBERS THAT ARE APPLIED TO EACH DEVICE AND PIECE OF EQUIPMENT INFERS INTERCONNECTING BRANCH CIRCUITRY. INTERCONNECTING BRANCH WIRING SHALL BE SIZED EQUAL TO THE HOMERUN UNLESS NOTED OTHERWISE.
4. VOLTAGE DROP HAS BEEN CONSIDERED IN THE DESIGN OF ALL BRANCH CIRCUITRY AND FEEDER SIZES BASED UPON THE ILLUSTRATED EQUIPMENT LAYOUTS AND SHORTEST CONDUCTOR/RACEWAY ROUTING. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR DEVIATIONS TAKEN THAT WILL INCREASE CONDUCTOR/RACEWAY ROUTING LENGTHS. BRANCH CIRCUITS LONGER THAN 75' FOR 120V FROM PANEL TO LAST OUTLET SHALL BE INCREASED A MINIMUM OF ONE SIZE ABOVE THAT SPECIFIED TO LIMIT VOLTAGE DROP TO LESS THAN 3%. FEEDERS SHALL FOLLOW SIMILAR GUIDELINES AND BE LIMITED TO 2% DROP.
5. POWER BRANCH CIRCUITRY SHALL BE INSTALLED IN CONDUIT FROM THE PANEL TO THE FIRST DEVICE AND/OR WHERE EXPOSED. POWER BRANCH CIRCUITRY MAY BE TYPE MC CABLE WHERE CONCEALED ABOVE SUSPENDED CEILINGS AND IN METAL STUD WALLS.
6. MAINTAIN CONTINUITY OF BRANCH CIRCUITRY ASSOCIATED WITH ALL EXISTING POWER DEVICES TO REMAIN.
7. PANELBOARDS, SHALL BE FIELD MARKED TO WARN QUALIFIED PERSONS OF POTENTIAL ELECTRIC ARC FLASH HAZARDS. THE MARKING SHALL BE LOCATED SO AS TO BE CLEARLY VISIBLE TO QUALIFIED PERSONS BEFORE EXAMINATION, ADJUSTMENT, SERVICING, OR MAINTENANCE OF THE EQUIPMENT.
8. EXISTING DEVICE/BRANCH CIRCUIT WIRING SERVING KITCHEN EQUIPMENT SHALL BE REPLACED WITH NEW. RELATED CONDUIT RUN IN FLOOR SLAB SHALL BE REUSED. CONTRACTOR SHALL FIELD VERIFY EXISTING DEVICE/CONDUCTOR SIZES AND PROVIDE NEW TO MATCH EXISTING CONDITIONS.
9. PROVIDE NEW CAT 6 CABLING. PROVIDE NEW FACPLATE AND CAT 6 CONNECTORS WITH LEVEL 3 TESTING. LOCATION OF EXISTING HEADEND EQUIPMENT/BACKBOARD SHALL BE DETERMINED IN THE FIELD.
10. ALL 15 AND 20A, 125V DEVICES SHALL BE GFCI PROTECTED TYPE UNLESS OTHERWISE INDICATED.
11. PROVIDE POWER CONNECTION TO ALL KITCHEN EQUIPMENT INDICATED IN EQUIPMENT SCHEDULE, THIS SHEET. CONTRACTOR SHALL FIELD VERIFY EXACT LOCATION OF EXISTING EQUIPMENT NOT ILLUSTRATED ON THE FLOOR PLAN.
12. PROVIDE CUSTOM BUILT EXTENSION OF EXISTING WIREWAY MOUNTED BELOW PANELBOARDS AND NEW SURFACE MOUNTED WIREWAY ABOVE PANELBOARD TO ENABLE INSTALLATION OF NEW BRANCH CIRCUIT WIRING/FEEDERS.
13. EXISTING WALL SHALL BE CUT TO ENABLE INSTALLATION OF NEW FEEDER AND BRANCH CIRCUIT WIRING TO NEW FLUSH MOUNTED PANELBOARD. UPON COMPLETION OF WORK, WALL SHALL BE PATCHED TO MATCH ADJACENT CONDITIONS.

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Number	Description	Date

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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

ELECTRICAL POWER CAFETERIA/ KITCHEN PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: MVM
DRAWN BY: MVM
CHECKED BY: GM
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

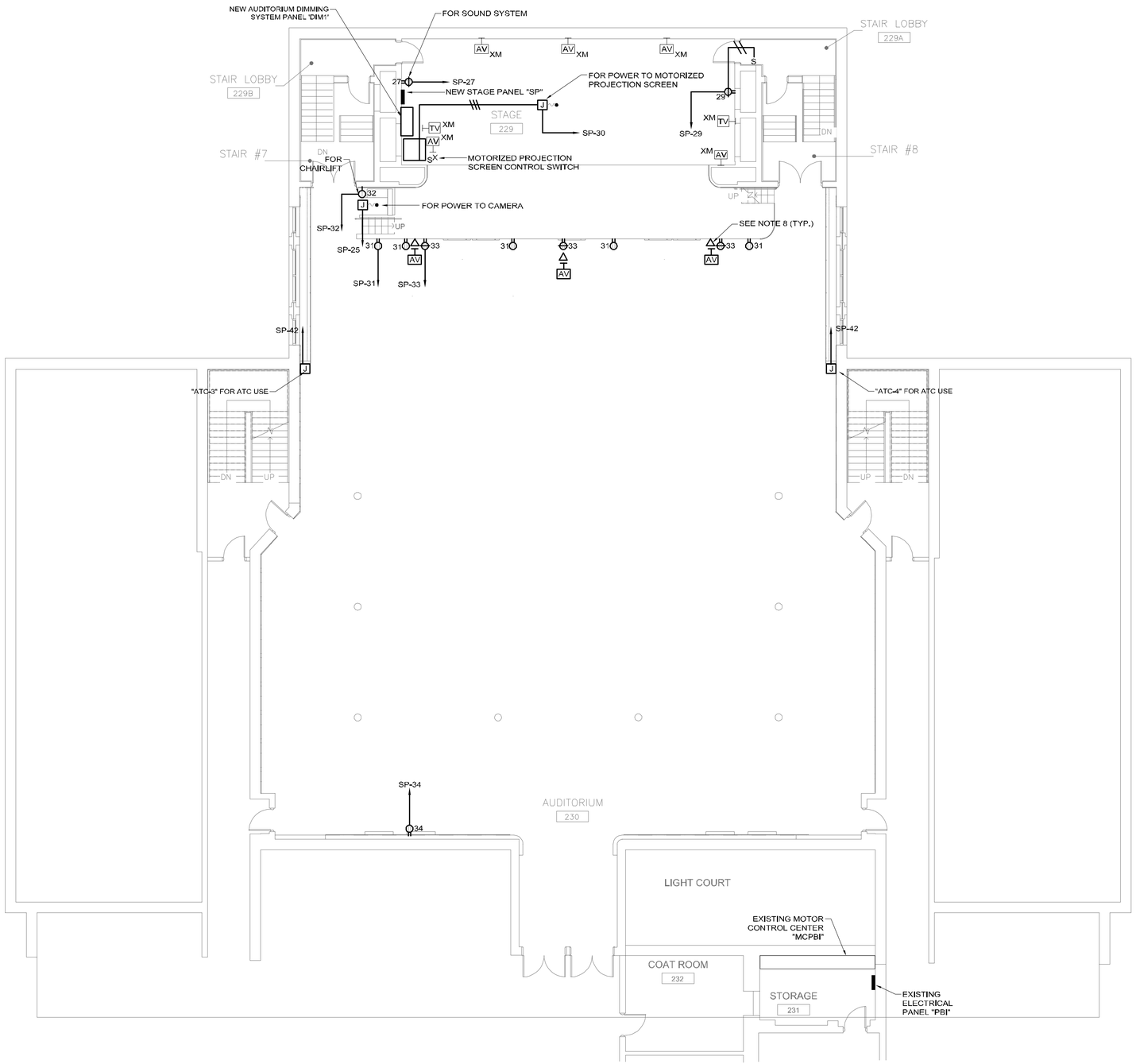
SHEET NUMBER:

E301

SHEET 48 **OF** 61

REVIEWED BY: CIVIL | ARCH | STRU | PLUM | FIRE | MECH | ELEC

G:\2013\19431.01 - Somerville High School Auditorium\100 Drawings\104 Electrical\Revit\19431.01 E301 ELECTRICAL POWER CAFETERIA-KITCHEN FLOOR PLAN.rvt by [Mary] March 03, 2014 - 3:44:44 pm Marcia



POWER NOTES:

1. REFER TO DRAWING E000 FOR LEGEND, SYMBOLS AND GENERAL NOTES.
2. REFER TO ARCHITECTURAL DRAWINGS FOR ASSOCIATED NOTES, MOUNTING DETAILS, HEIGHTS AND EXACT LOCATIONS OF ALL DEVICES.
3. CIRCUIT NUMBERS ARE DIAGRAMMATIC. EXACT NUMBERS SHALL BE DETERMINED IN THE FIELD AND REFLECTED ON AS-BUILT DOCUMENTATION BY THE ELECTRICAL CONTRACTOR. THE ASSOCIATED CIRCUIT NUMBERS THAT ARE APPLIED TO EACH DEVICE AND PIECE OF EQUIPMENT INFERS INTERCONNECTING BRANCH CIRCUITRY. INTERCONNECTING BRANCH WIRING SHALL BE SIZED EQUAL TO THE HOMERUN UNLESS NOTED OTHERWISE.
4. VOLTAGE DROP HAS BEEN CONSIDERED IN THE DESIGN OF ALL BRANCH CIRCUITRY AND FEEDER SIZES BASED UPON THE ILLUSTRATED EQUIPMENT LAYOUTS AND SHORTEST CONDUCTOR/RACEWAY ROUTING. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR DEVIATIONS TAKEN THAT WILL INCREASE CONDUCTOR/RACEWAY ROUTING LENGTHS. BRANCH CIRCUITS LONGER THAN 75' FOR 120V FROM PANEL TO LAST OUTLET SHALL BE INCREASED A MINIMUM OF ONE SIZE ABOVE THAT SPECIFIED TO LIMIT VOLTAGE DROP TO LESS THAN 3%. FEEDERS SHALL FOLLOW SIMILAR GUIDELINES AND BE LIMITED TO 2% DROP.
5. POWER BRANCH CIRCUITRY SHALL BE INSTALLED IN CONDUIT FROM THE PANEL TO THE FIRST DEVICE AND/OR WHERE EXPOSED. POWER BRANCH CIRCUITRY MAY BE TYPE MC CABLE WHERE CONCEALED ABOVE SUSPENDED CEILINGS AND IN METAL STUD WALLS.
6. MAINTAIN CONTINUITY OF BRANCH CIRCUITRY ASSOCIATED WITH ALL EXISTING POWER DEVICES TO REMAIN.
7. PANELBOARDS SHALL BE FIELD MARKED TO WARN QUALIFIED PERSONS OF POTENTIAL ELECTRIC ARC FLASH HAZARDS. THE MARKING SHALL BE LOCATED SO AS TO BE CLEARLY VISIBLE TO QUALIFIED PERSONS BEFORE EXAMINATION, ADJUSTMENT, SERVICING, OR MAINTENANCE OF THE EQUIPMENT.
8. PROVIDE NEW CAT 6 CABLING, FACEPLATE AND CONNECTIONS WITH LEVEL 3 TESTING. CONTRACTOR SHALL FIELD VERIFY LOCATION OF EXISTING HEADEND EQUIPMENT/BACKBOARD PRIOR TO SUBMISSION OF BID.

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ELECTRICAL POWER AUDITORIUM FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: MVM
DRAWN BY: MVM
CHECKED BY: GM
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

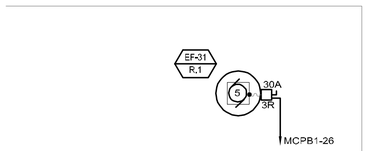
SHEET NUMBER:

E302

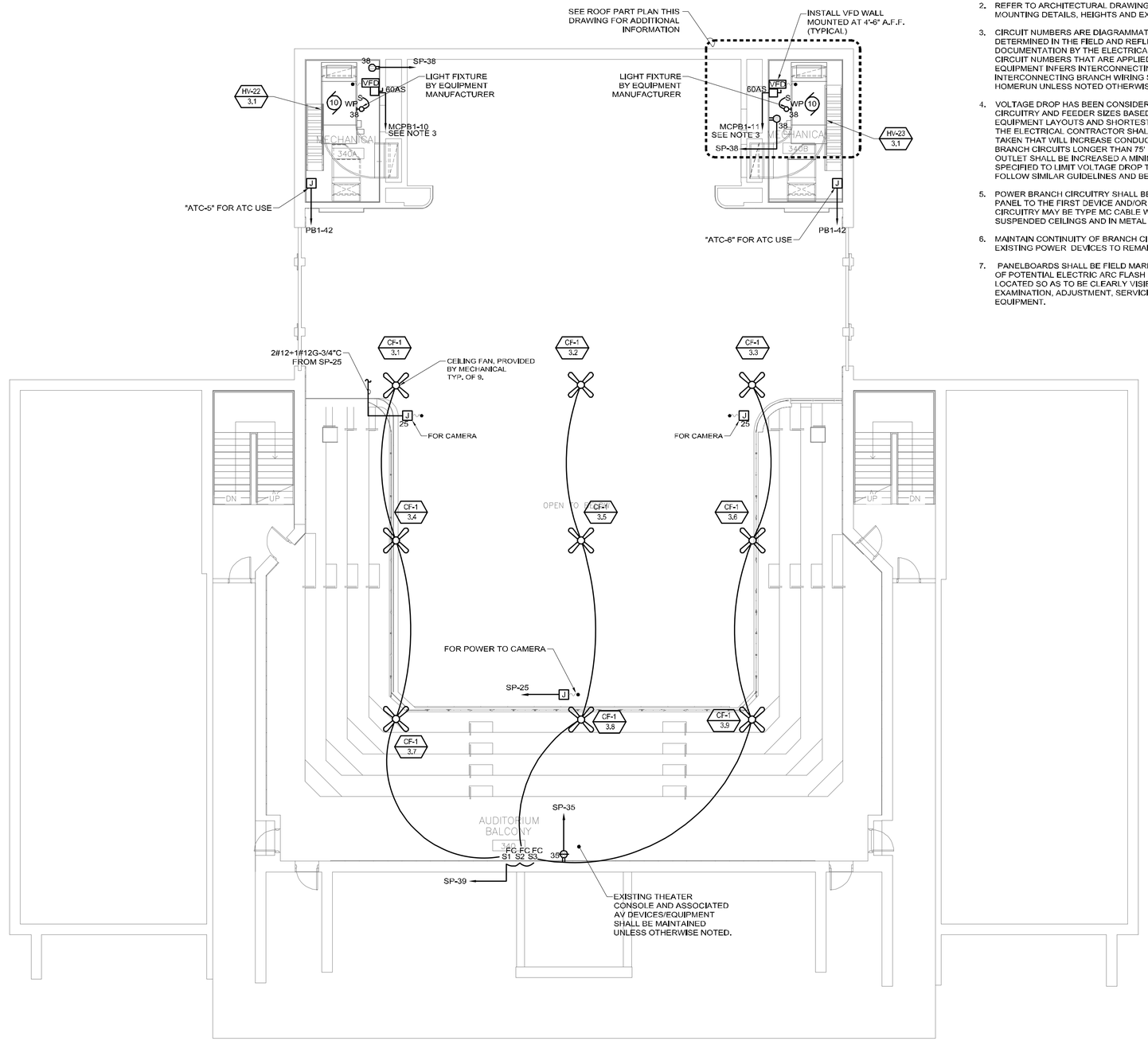
SHEET 49 OF 61

REVIEWED BY: CIVIL | ARCH | STRUC | PLUMB | FIRE | MECH | ELEC

G:\2013\2013013\01 - Somerville High School Auditorium\1200 Drawings\1204 Electrical\Revit Files\2013013001 E302 ELECTRICAL POWER AUDITORIUM FLOOR PLAN.dwg (Work) March 03, 2014 - 2:42pm dhancock



ROOF PART PLAN
1/8" = 1'-0"



POWER NOTES:

1. REFER TO DRAWING E000 FOR LEGEND, SYMBOLS AND GENERAL NOTES.
2. REFER TO ARCHITECTURAL DRAWINGS FOR ASSOCIATED NOTES, MOUNTING DETAILS, HEIGHTS AND EXACT LOCATIONS OF ALL DEVICES.
3. CIRCUIT NUMBERS ARE DIAGRAMMATIC. EXACT NUMBERS SHALL BE DETERMINED IN THE FIELD AND REFLECTED ON AS-BUILT DOCUMENTATION BY THE ELECTRICAL CONTRACTOR. THE ASSOCIATED CIRCUIT NUMBERS THAT ARE APPLIED TO EACH DEVICE AND PIECE OF EQUIPMENT INFERS INTERCONNECTING BRANCH CIRCUITRY. INTERCONNECTING BRANCH WIRING SHALL BE SIZED EQUAL TO THE HOMERUN UNLESS NOTED OTHERWISE.
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Number	Description	Date

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Somerville, MA 02143

ELECTRICAL POWER AUDITORIUM BALCONY PLAN

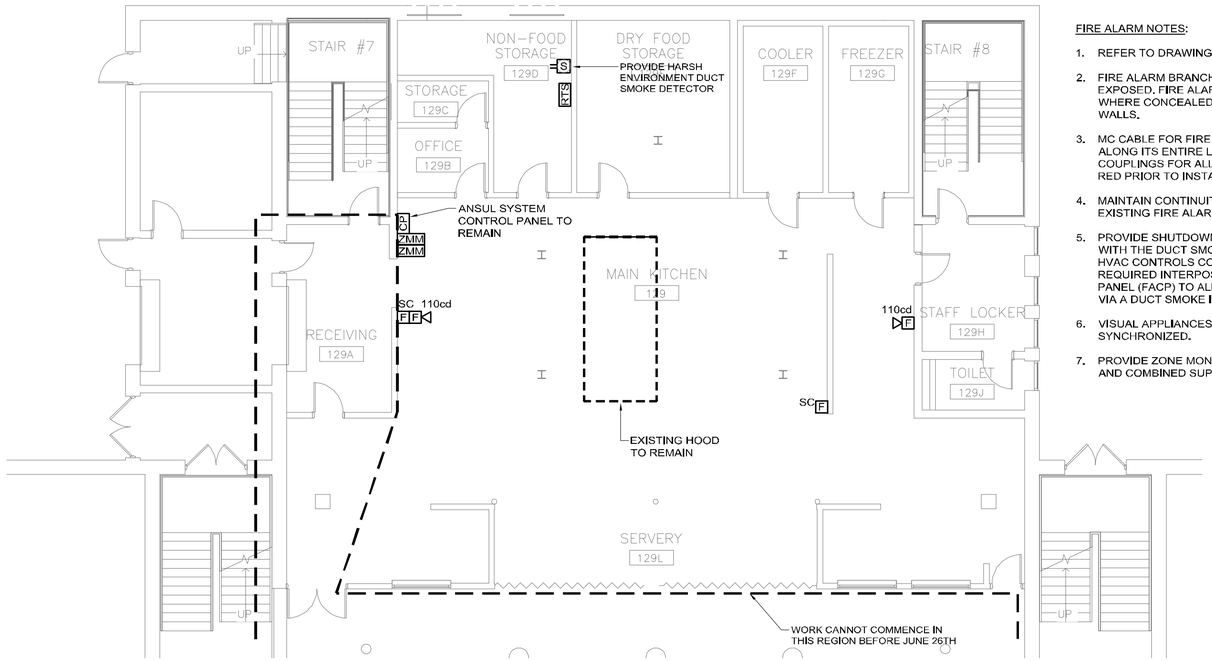
PROJECT NUMBER 19431.01
DESIGNED BY: MVM
DRAWN BY: MVM
CHECKED BY: GM
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

E303

SHEET 50 **OF** 61

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:
G:\2013\2013031 - Somerville High School Auditorium\2300 Drawings\2304 Electrical\Revit Files\2013031 E303 ELECTRICAL POWER AUDITORIUM BALCONY FLOOR PLAN.rvt, Plot: March 03, 2014 - 3:42pm dfranzek



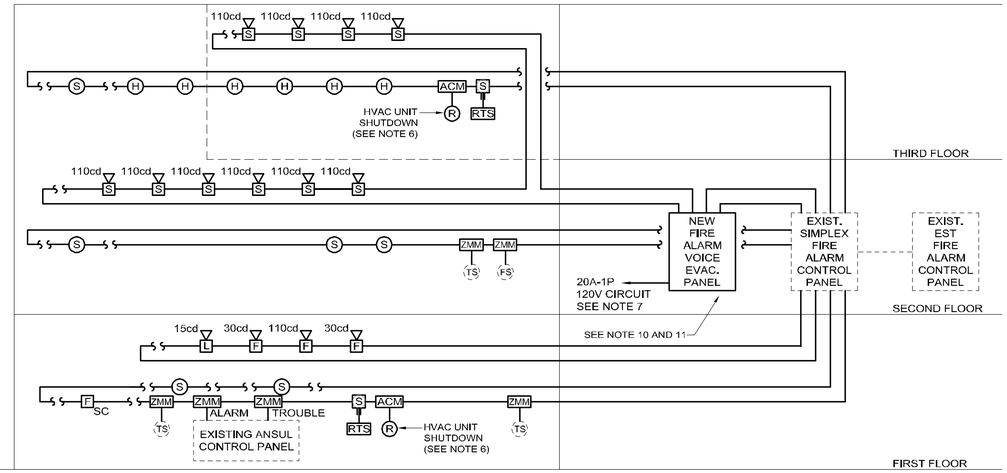
1 E401 ELECTRICAL FIRE ALARM FIRST FLOOR NEW PLAN
1/8" = 1'-0"

FIRE ALARM NOTES:

1. REFER TO DRAWING E000 FOR LEGEND, SYMBOLS AND GENERAL NOTES.
2. FIRE ALARM BRANCH CIRCUITRY SHALL BE INSTALLED IN CONDUIT WHERE EXPOSED. FIRE ALARM BRANCH CIRCUITRY MAY BE TYPE MC CABLE WHERE CONCEALED ABOVE SUSPENDED CEILINGS AND IN METAL STUD WALLS.
3. MC CABLE FOR FIRE ALARM SERVICE SHALL HAVE A RED IDENTIFIER ALONG ITS ENTIRE LENGTH. JUNCTION BOX COVERS AND CONDUIT COUPLINGS FOR ALL FIRE ALARM WIRING RACEWAYS SHALL BE PAINTED RED PRIOR TO INSTALLATION.
4. MAINTAIN CONTINUITY OF BRANCH CIRCUITRY ASSOCIATED WITH ALL EXISTING FIRE ALARM DEVICES TO REMAIN.
5. PROVIDE SHUTDOWN SIGNAL TO THE AIR HANDLING UNIT ASSOCIATED WITH THE DUCT SMOKE DETECTOR IN ALARM. COORDINATE WITH THE HVAC CONTROLS CONTRACTOR. REFER TO DETAIL EF002 FOR THE REQUIRED INTERPOSING RELAY. PROVIDE HOA AT FIRE ALARM CONTROL PANEL (FACP) TO ALLOW MANUAL BYPASS OF EACH HVAC COMPONENT VIA A DUCT SMOKE INTERFACE.
6. VISUAL APPLIANCES WITHIN SAME ROOM OF FIELD OF VIEW SHALL BE SYNCHRONIZED.
7. PROVIDE ZONE MONITORING OF THE SUPPRESSION SYSTEM FOR ALARM AND COMBINED SUPERVISORY/TROUBLE CONDITIONS.

FIRE ALARM LEGEND

FACP	FIRE ALARM CONTROL PANEL
110cd S	FIRE ALARM AUDIBLE (SPEAKER) AND VISUAL DEVICE, NUMERAL INDICATES CANDELA VALUE
110cd F	FIRE ALARM AUDIBLE (HORN) AND VISUAL DEVICE. NUMERAL INDICATES CANDELA VALUE
S	DUCT MOUNTED SMOKE DETECTOR
F SC	FIRE ALARM MANUAL PULL STATION "SC" INDICATES STOPPER COVER
TS	SPRINKLER TAMPER FLOW SWITCH
FS	SPRINKLER WATER FLOW SWITCH
PS	SPRINKLER LOW PRESSURE SWITCH
RAI	REMOTE ALARM INDICATOR
RTS	REMOTE TEST STATION
ACM	INDIVIDUAL ADDRESSABLE CONTROL MODULE
ZMM	ZONE MONITORING MODULE
S	FIRE ALARM SMOKE DETECTOR, PHOTO ELECTRIC UNLESS NOTED OTHERWISE
H	FIRE ALARM HEAT DETECTOR, 135° FIXED TEMPERATURE UNLESS NOTED OTHERWISE. DETECTOR SHALL BE RATED FOR INSTILLATION AT UP TO 70 FOOT SPACING.



NOTES:

1. THIS DRAWING IS INTENDED TO ILLUSTRATE MAJOR EQUIPMENT AND THE INTENDED INTERCONNECTIONS. REFER TO THE FLOOR PLANS FOR EXACT LOCATIONS AND QUANTITIES OF DEVICES. REFER TO THE MANUFACTURER'S WIRING DIAGRAMS FOR INTERCONNECTION REQUIREMENTS. INTERCONNECTION DETAILS SHALL BE INCLUDED IN THE SHOP DRAWINGS WITH COMPONENT CUT SHEETS FOR REVIEW AND APPROVAL.
2. ALL FINAL CONNECTIONS INTO THE EXISTING FIRE ALARM SYSTEM SHALL BE PERFORMED BY THE OWNER'S FIRE ALARM MAINTENANCE CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL CARRY ALL ASSOCIATED COSTS FOR FINAL CONNECTION AND ASSOCIATED TESTING.
3. ALL NEW FIRE ALARM DEVICES SHALL MATCH EXISTING MANUFACTURER AND BE CROSSED LISTED FOR CONNECTION TO THE EXISTING SYSTEM.
4. EXISTING SMOKE DETECTORS, PULL STATIONS, AUDIO/VISUAL DEVICES, HEAT DETECTORS, ETC. WITHIN THE BUILDING SHALL BE MAINTAINED, UNLESS OTHERWISE NOTED. DEVICES IDENTIFIED FOR REMOVAL SHALL BE RETAINED UNTIL NEW SYSTEM OPERATIONAL AND APPROVED. PROVIDE CONTROL MODULES, WIRING, PROGRAMMING OF SYSTEM AS REQUIRED TO MAINTAIN SYSTEM OPERATION OF EXISTING DEVICES. REPROGRAM SYSTEM AND MODIFY EXISTING ANNUNCIATOR(S) TO ACCOMMODATE THE NEW DEVICES AND FUNCTIONS.
5. FIRE ALARM SYSTEM MODIFICATION SHALL BE IN CONFORMANCE WITH THE LATEST FIRE DEPARTMENT RULES AND REGULATIONS.
6. PROVIDE AMPLIFIERS AND POWER BOOSTERS SIZED TO ACCOMMODATE THE AUDITORIUM NOTIFICATION APPLIANCE QUANTITIES ILLUSTRATED WITH 25% ADDITIONAL SPARE CAPACITY.
7. PROVIDE UL LISTED LOCKING DEVICE FOR POWER SOURCE CIRCUIT BREAKER AND LABEL AS "FIRE ALARM CONTROL CIRCUIT" IN THE PANELBOARD DIRECTORY. REFER TO FLOOR PLAN FOR CIRCUIT DESIGNATION.
8. VISUAL APPLIANCES WITHIN SAME ROOM OR FIELD OF VIEW SHALL BE SYNCHRONIZED.
9. PROVIDE ALL REQUIRED INTERFACE WITH THE EXISTING FIRE ALARM CONTROL PANEL TO ENABLE THE ADDITION OF NEW VOICE EVACUATION PANEL AS INDICATED. CONTRACTOR SHALL CONFIRM EXACT REQUIREMENTS WITH MANUFACTURER PRIOR TO SUBMISSION OF BID AND CARRY ALL ASSOCIATED COSTS FOR INTERFACE INCLUDING REPROGRAMMING/RETESTING OF EXISTING EQUIPMENT, ETC.
10. PROVIDE MICROPHONE PA FOR MANUAL EVACUATION SIGNAL AND AUTO/OFF SWITCH FOR EACH AUDITORIUM AIR HANDLING UNIT.
11. PROVIDE INTERFACE WITH SOUND SYSTEM TO SILENCE AND BRING DIMMING SYSTEM TO FULL BRIGHT UPON SIGNAL FROM THE FIRE ALARM CONTROL PANEL.

RDK

FIRE ALARM RISER

E801

SYSTEM OUTPUTS

SYSTEM INPUTS

		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
		ACTUATE COMMON ALARM SIGNAL INDICATOR	ACTUATE AUDIBLE ALARM SIGNAL	ACTUATE AUDIBLE SUPERVISORY SIGNAL INDICATOR	ACTUATE AUDIBLE SUPERVISORY SIGNAL	ACTUATE COMMON TROUBLE SIGNAL INDICATOR	ACTUATE COMMON TROUBLE SIGNAL	VISUALLY INDICATE DEVICE ADDRESS	ACTUATE BUILDING EVACUATION SIGNALS	DISPLAY/PRINT CHANGE OF STATUS	TRANSMIT FIRE ALARM SIGNAL TO SUPERVISING STATION	TRANSMIT SUPERVISORY SIGNAL TO SUPERVISING STATION	TRANSMIT TROUBLE SIGNAL TO SUPERVISORY STATION	EXISTING CONTROL FUNCTION	SHUT DOWN ALL ASSOCIATED AIR HANDLING EQUIPMENT		
1	MANUAL FIRE ALARM PULL STATION	●	●					●	●	●	●			●			1
2	SMOKE DETECTORS - GENERAL	●	●					●	●	●	●			●			2
3	DUCT SMOKE DETECTOR	●	●					●	●	●	●				●		3
4	HEAT DETECTOR	●	●					●	●	●	●			●			4
5	SPRINKLER FLOW SWITCH	●	●					●	●	●	●			●			5
6	SPRINKLER TAMPER SWITCH			●	●			●				●					6
7	SPRINKLER PRESSURE SWITCH			●	●			●				●					7
8	FIRE ALARM AC POWER FAILURE					●	●						●				8
9	FIRE ALARM SYSTEM LOW BATTERY					●	●						●				9
10	OPEN CIRCUIT					●	●						●				10
11	GROUND FAULT					●	●						●				11
12	NOTIFICATION APPLIANCE CIRCUIT SHORT					●	●					●	●				12
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
		FIRE ALARM CONTROL PANEL ANNUNCIATION							NOTIFICATION					REQUIRED FIRE SAFETY CONTROL			

SYSTEM OUTPUTS

FIRE ALARM SEQUENCE OF OPERATION MATRIX

N.T.S

FA MATRIX NOTES:

1. DEVELOP SPECIFIC MATRIX FOR EACH DEVICE AND CROSS REFERENCE TO DEVICE ADDRESS NUMBER FOR ENGINEER'S APPROVAL.
2. SHOP DRAWINGS SHALL INCLUDE FLOOR PLANS WITH DEVICE LAYOUT. EACH DEVICE SHALL HAVE ITS ASSOCIATED ADDRESS ILLUSTRATED AND CROSS REFERENCED TO THE SEQUENCE OF OPERATIONS MATRIX SHOP DRAWING SHALL ILLUSTRATE ALL REQUIRED

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Number	Description	Date

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81 Highland Avenue, Somerville, MA 02143

ELECTRICAL FIRE ALARM CAFETERIA/ KITCHEN PLAN

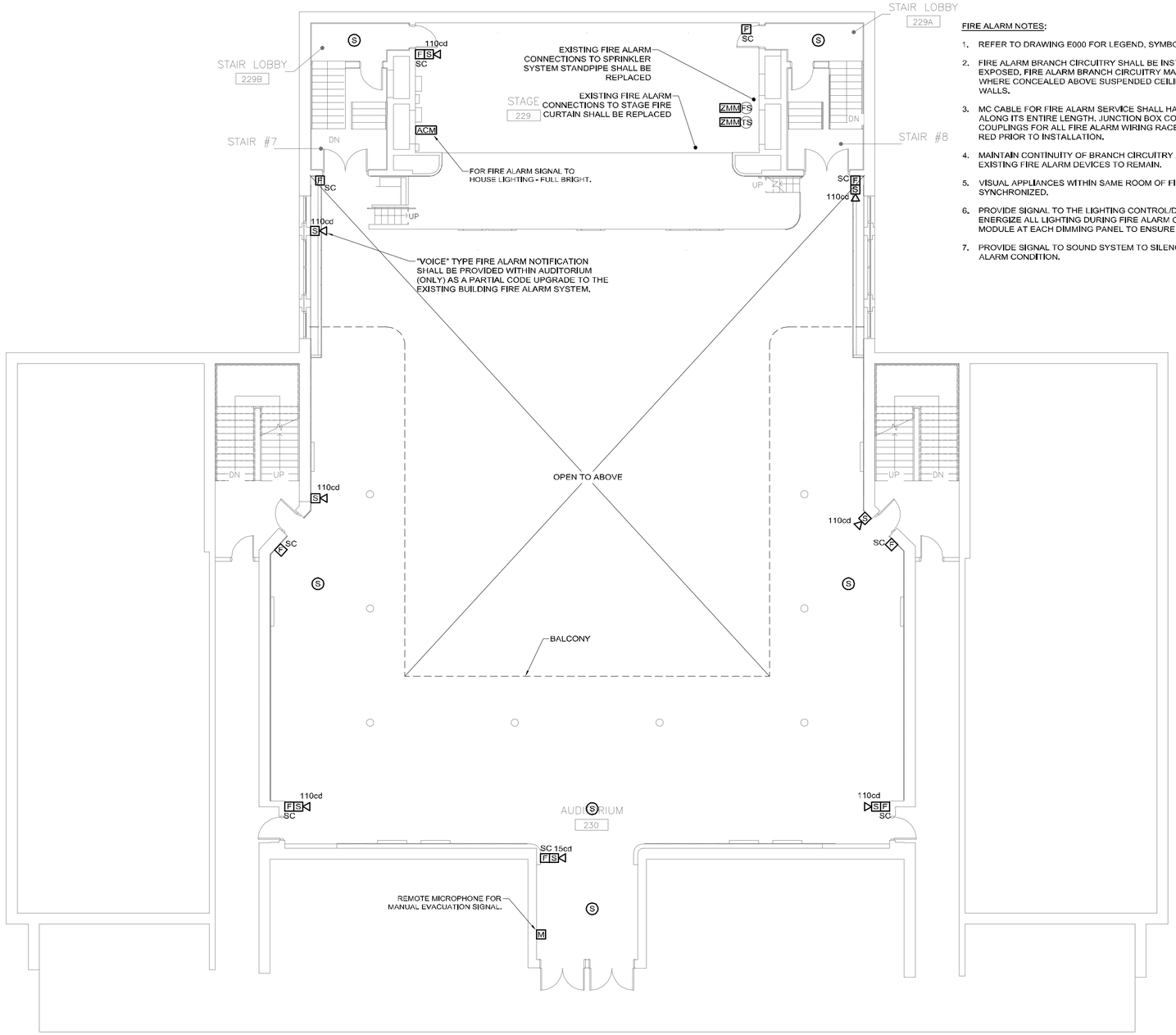
PROJECT NUMBER 19431.01
DESIGNED BY: SH
DRAWN BY: SH
CHECKED BY: GM
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

E401

SHEET 51 **OF** 61

REVIEWED BY: CIVIL | ARCH | STRU | PLUM | FIRE | MECH | ELEC
G:\2013\19431.01 - Somerville High School Auditorium\300 Drawings\Arch\Revit Files\19431.01 E401 ELECTRICAL FIRE ALARM CAFETERIA+KITCHEN PLAN_May 03, 2014.rvt 3:42:54 PM cmarsik



FIRE ALARM NOTES:

1. REFER TO DRAWING E000 FOR LEGEND, SYMBOLS AND GENERAL NOTES.
2. FIRE ALARM BRANCH CIRCUITRY SHALL BE INSTALLED IN CONDUIT WHERE EXPOSED. FIRE ALARM BRANCH CIRCUITRY MAY BE TYPE MC CABLE WHERE CONCEALED ABOVE SUSPENDED CEILINGS AND IN METAL STUD WALLS.
3. MC CABLE FOR FIRE ALARM SERVICE SHALL HAVE A RED IDENTIFIER ALONG ITS ENTIRE LENGTH. JUNCTION BOX COVERS AND CONDUIT COUPLINGS FOR ALL FIRE ALARM WIRING RACEWAYS SHALL BE PAINTED RED PRIOR TO INSTALLATION.
4. MAINTAIN CONTINUITY OF BRANCH CIRCUITRY ASSOCIATED WITH ALL EXISTING FIRE ALARM DEVICES TO REMAIN.
5. VISUAL APPLIANCES WITHIN SAME ROOM OF FIELD OF VIEW SHALL BE SYNCHRONIZED.
6. PROVIDE SIGNAL TO THE LIGHTING CONTROL/DIMMING PANELS TO ENERGIZE ALL LIGHTING DURING FIRE ALARM CONDITION. PROVIDE MODULE AT EACH DIMMING PANEL TO ENSURE OPERATION.
7. PROVIDE SIGNAL TO SOUND SYSTEM TO SILENCE OUTPUT DURING FIRE ALARM CONDITION.

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

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81 Highland Avenue, Somerville, MA 02143

ELECTRICAL FIRE ALARM AUDITORIUM FLOOR PLAN

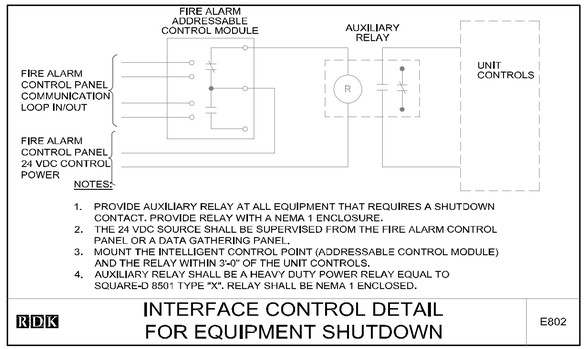
PROJECT NUMBER 19431.01
DESIGNED BY: MVM
DRAWN BY: MVM
CHECKED BY: GM
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

E402

SHEET 52 OF 61

G:\2013\13031303\1 - Somerville High School Auditorium\1200 Drawings\1204 Electrical\Revit\13031303 ELECTRICAL FIRE ALARM AUDITORIUM FLOOR PLAN.dwg [Print] March 03, 2014 - 2:42pm dfrederick



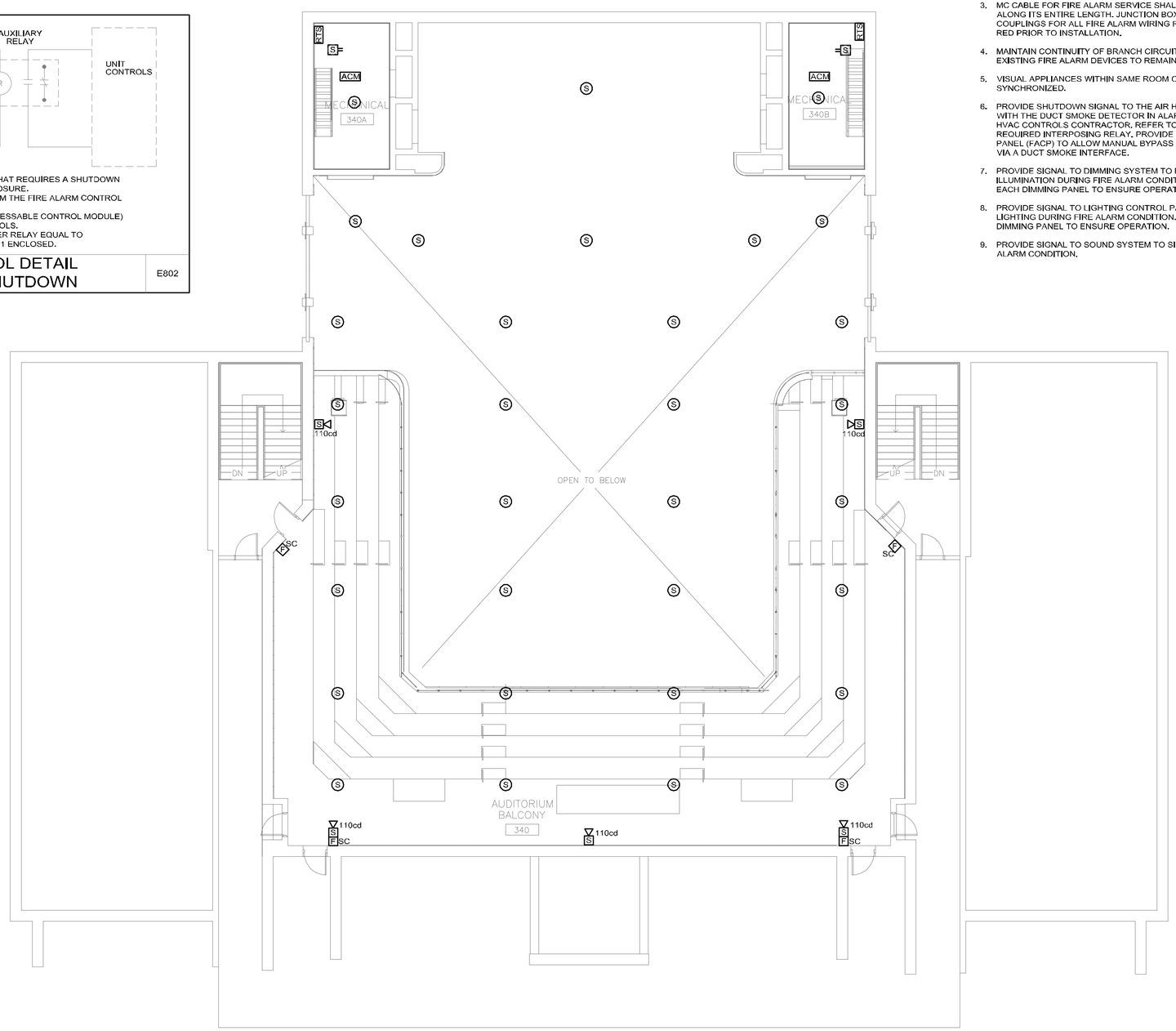
NOTES:

1. PROVIDE AUXILIARY RELAY AT ALL EQUIPMENT THAT REQUIRES A SHUTDOWN CONTACT. PROVIDE RELAY WITH A NEMA 1 ENCLOSURE.
2. THE 24 VDC SOURCE SHALL BE SUPERVISED FROM THE FIRE ALARM CONTROL PANEL OR A DATA GATHERING PANEL.
3. MOUNT THE INTELLIGENT CONTROL POINT (ADDRESSABLE CONTROL MODULE) AND THE RELAY WITHIN 3'-0" OF THE UNIT CONTROLS.
4. AUXILIARY RELAY SHALL BE A HEAVY DUTY POWER RELAY EQUAL TO SQUARE-D 8501 TYPE "X". RELAY SHALL BE NEMA 1 ENCLOSED.

RDK

INTERFACE CONTROL DETAIL FOR EQUIPMENT SHUTDOWN

E802



FIRE ALARM NOTES:

1. REFER TO DRAWING E000 FOR LEGEND, SYMBOLS AND GENERAL NOTES.
2. FIRE ALARM BRANCH CIRCUITRY SHALL BE INSTALLED IN CONDUIT WHERE EXPOSED. FIRE ALARM BRANCH CIRCUITRY MAY BE TYPE MC CABLE WHERE CONCEALED ABOVE SUSPENDED CEILINGS AND IN METAL STUD WALLS.
3. MC CABLE FOR FIRE ALARM SERVICE SHALL HAVE A RED IDENTIFIER ALONG ITS ENTIRE LENGTH. JUNCTION BOX COVERS AND CONDUIT COUPLINGS FOR ALL FIRE ALARM WIRING RACEWAYS SHALL BE PAINTED RED PRIOR TO INSTALLATION.
4. MAINTAIN CONTINUITY OF BRANCH CIRCUITRY ASSOCIATED WITH ALL EXISTING FIRE ALARM DEVICES TO REMAIN.
5. VISUAL APPLIANCES WITHIN SAME ROOM OF FIELD OF VIEW SHALL BE SYNCHRONIZED.
6. PROVIDE SHUTDOWN SIGNAL TO THE AIR HANDLING UNIT ASSOCIATED WITH THE DUCT SMOKE DETECTOR IN ALARM. COORDINATE WITH THE HVAC CONTROLS CONTRACTOR. REFER TO DETAIL EF002 FOR THE REQUIRED INTERPOSING RELAY. PROVIDE HOA AT FIRE ALARM CONTROL PANEL (FACP) TO ALLOW MANUAL BYPASS OF EACH HVAC COMPONENT VIA A DUCT SMOKE INTERFACE.
7. PROVIDE SIGNAL TO DIMMING SYSTEM TO BRING LIGHTING TO FULL ILLUMINATION DURING FIRE ALARM CONDITION. PROVIDE MODULE AT EACH DIMMING PANEL TO ENSURE OPERATION.
8. PROVIDE SIGNAL TO LIGHTING CONTROL PANELS TO ENERGIZE ALL LIGHTING DURING FIRE ALARM CONDITION. PROVIDE MODULE AT EACH DIMMING PANEL TO ENSURE OPERATION.
9. PROVIDE SIGNAL TO SOUND SYSTEM TO SILENCE OUTPUT DURING FIRE ALARM CONDITION.

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REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools
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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue,
Somerville, MA 02143

ELECTRICAL FIRE ALARM AUDITORIUM BALCONY PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: MVM
DRAWN BY: MVM
CHECKED BY: GM
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

E403

SHEET 53 **OF** 61

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:
D:\2013\13035\1 • Somerville High School Auditorium\1200 Drawings\1204 Electrical\Revit\13035 E403 ELECTRICAL FIRE ALARM AUDITORIUM BALCONY FLOOR PLAN.dwg [Mvm] March 03, 2014 - 3:42pm dfrancis

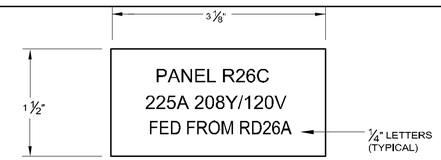
WARNING

ARC FLASH AND SHOCK HAZARD
APPROPRIATE PPE REQUIRED

NOTES:

1. REFER TO SPECIFICATIONS FOR ADDITIONAL NAMEPLATE REQUIREMENTS.
2. PROVIDE ON ALL IN-LINE METER SOCKETS, SWITCHBOARDS, DISTRIBUTION PANELS, PANELBOARDS AND MOTOR CONTROL CENTERS IN ACCORDANCE WITH NEC 110.16.

RDK | TYPICAL FLASH PROTECTION WARNING LABEL | E305



NOTES:
1. REFER TO SPECIFICATIONS FOR ADDITIONAL NAMEPLATE REQUIREMENTS.
2. NAMEPLATE TO BE 1/16" THICK PLASTIC WITH WHITE CENTER LAMINATION. FACE SHALL BE BLACK, ENGRAVED LETTERS SHALL BE WHITE.
3. SECURE NAMEPLATE TO SURFACES WITH HIGH STRENGTH ADHESIVE CEMENT. UTILIZE MECHANICAL FASTENERS FOR ALL EXTERIOR LOCATIONS.
4. TYPICAL FOR MOUNTING ON "SWITCHBOARDS", "PANELBOARDS", "STARTERS", "DISCONNECTS", AND "TRANSFORMERS".

RDK | TYPICAL ENGRAVED PLASTIC NAMEPLATE DETAIL | E303

MECHANICAL EQUIPMENT SCHEDULE

LOAD TAG	STARTER LOCATION	LOAD HP	LOAD FLA	LOAD KVA	LOAD VOLT	LOAD PH	STARTER NEMA SIZE	STARTER TYPE	OVERCURRENT CB	OVERCURRENT RK1 FUSE	OVERCURRENT MCP	PB	HOA	INDICATING LIGHTS R	INDICATING LIGHTS G	INDICATING LIGHTS A	AUXILIARY CPT	AUXILIARY CONTACTS NO	AUXILIARY CONTACTS NC	POWER SOURCE PANEL	POWER SOURCE C/B	CONNECTION FLEX	CONNECTION JB	CONNECTION REC	CONNECTION DISC AS	CONNECTION DISC AF	CONNECTION DISC NEMA	BRANCH CIRCUIT	REMARKS	LOAD TAG
HV-22 (3.1)	3RD FLOOR	10	30.80	11.1	208	3	-	VFD	-	-	50	-	X	X	X	-	-	2	2	MCPB1-10	70A/1P	X	-	-	60	-	1	(4)#8 & (1)#8G - 3/4"C	NOTE 10	HV-22 (3.1)
HV-23 (3.1)	3RD FLOOR	10	30.80	11.1	208	3	-	VFD	-	-	50	-	X	X	X	-	-	2	2	MCPB1-11	70A/1P	X	-	-	60	-	1	(4)#8 & (1)#8G - 3/4"C	NOTE 10	HV-23 (3.1)
UV-H (B.1)	KITCHEN	1/2	5.40	1.1	208	1	1	FVNR	-	-	7	-	X	X	X	-	-	-	-	N-14	-	X	-	-	30	-	1	(2)#12 & (1)#12G - 3/4"C	NOTE 12	UV-H (B.1)
SF-2 (B.1)	KITCHEN	5	16.70	6.0	208	3	1	FVNR	-	-	15	-	X	X	X	-	-	2	2	MCPB1-3	-	X	-	-	30	-	1	(2)#12 & (1)#12G - 3/4"C	NOTE 12	SF-2 (B.1)
EF-31 (R.1)	ROOF	5	16.70	6.0	208	3	1	FVNR	-	-	15	-	X	X	X	-	-	-	-	MCPB1-26	-	X	-	-	-	-	-	(2)#12 & (1)#12G - 3/4"C	NOTE 12	EF-31 (R.1)
EF-32 (B.1)	KITCHEN	1/6	4.40	0.5	120	1	1	FVNR	-	-	3	-	X	X	X	-	-	-	-	MCPB1-27	-	X	-	-	30	-	1	(2)#12 & (1)#12G - 3/4"C	NOTE 12	EF-32 (B.1)
ATC-1,2	KITCHEN	-	4.20	0.5	120	1	-	NOTE 13	-	-	-	-	-	-	-	-	-	-	-	PK3-38	20A/1P	-	X	-	-	-	-	(2)#12 & (1)#12G - 3/4"C		ATC-1,2
ATC-3,4	AUDITORIUM	-	4.20	0.5	120	1	-	NOTE 13	-	-	-	-	-	-	-	-	-	-	-	SP-42	20A/1P	-	X	-	-	-	-	(2)#12 & (1)#12G - 3/4"C		ATC-3,4
ATC-5,6	3RD FLOOR	-	4.20	0.5	120	1	-	NOTE 13	-	-	-	-	-	-	-	-	-	-	-	PB1-42	20A/1P	-	X	-	-	-	-	(2)#12 & (1)#12G - 3/4"C		
CF-1		1	1.40	0.2	120	1	-	NOTE 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	(2)#12 & (1)#12G - 3/4"C		CF-1

NOTES
1. NOTES 2-6 APPLY TO ALL APPLICABLE LOADS.
2. PROVIDE THERMAL OVERLOAD UNITS FOR ALL STARTERS SIZED TO MATCH LOAD NAMEPLATE AND NEC REQUIREMENTS .
3. BRANCH CIRCUIT WIRING METHODS SHALL BE AS NOTED ON THE DRAWINGS AND/OR SPECIFICATIONS FOR THE APPLICABLE LOCATION. THE FINAL THREE FEET (MAXIMUM) SHALL BE FLEXIBLE METAL OR LIQUIDTIGHT FLEXIBLE METAL CONDUIT.
4. COPPER BRANCH CIRCUIT CONDUCTOR SIZING BASED UPON NEC TABLE 310.15(B)(16). MAKE ADJUSTMENTS TO CONDUCTORS FOR TEMPERATURE OR VOLTAGE DROP THAT EXCEED NEC AND SPECIFICATION CRITERIA.
5. RACEWAY SIZES ARE BASED UPON GRSC AND LFMC WITH THWN CONDUCTORS.
6. VFD SHALL BE CONTROLLED VIA REMOTE 4-20mA OR 0-5V SIGNAL PROVIDED BY THE HVAC ATC CONTRACTOR.
7. REQUIRED DISCONNECT IS PROVIDED INTEGRAL/PREWIRED TO MECHANICAL EQUIPMENT.
8. REQUIRED STARTER IS PROVIDED INTEGRAL/PREWIRED TO MECHANICAL EQUIPMENT.
9. DISCONNECT FOR 2S1W AND 2S2W MOTORS SHALL BE SIX POLE.
10. PROVIDE NEUTRAL FROM SOURCE TO STARTER ONLY FOR 120V CONTROL POWER OF 208V 3PH UNITS.
11. FUSES FOR DISCONNECT SWITCHES SHALL BE CLASS RK5
12. PROVIDE NEW STARTER AND CONTROLS, INSTALL NEW CONDUIT AND WIRING FROM MCC TO NEW EQUIPMENT.
13. PROVIDE JUNCTION BOX FOR ATC USE WITH CIRCUIT TERMINATED IN JUNCTION BOX.

KEY:
- FVNR FULL VOLTAGE NON-REVERSING
- FVR FULL VOLTAGE REVERSING
- 2S1W TWO SPEED SINGLE WINDING
- 2S2W TWO SPEED TWO WINDING
- RVAT REDUCED VOLTAGE AUTOTRANSFORMER
- RVPW REDUCED VOLTAGE PART WINDING
- RVYDOT REDUCED VOLTAGE WYE DELTA OPEN TRANSITION
- RVYDCT REDUCED VOLTAGE WYE DELTA CLOSED TRANSITION
- MMS MANUAL MOTOR STARTER
- CB CIRCUIT BREAKER
- MCP MOTOR CIRCUIT PROTECTOR
- PB START AND STOP PUSH BUTTON
- HOA HAND-OFF-AUTOMATIC SELECTOR SWITCH
- CPT CONTROL POWER TRANSFORMER
- VFD VARIABLE FREQUENCY DRIVE W/O BYPASS
- VFD/B VARIABLE FREQUENCY DRIVE W/ BYPASS
- CNTCR CONTACTOR - NO THERMAL OVERLOAD

SCHEDULE OF PANELBOARDS

PANEL TAG	SERVICE	MAINS MCB	MAINS MLO	MTG	AIC	TOTAL POLES	BRANCH CIRCUIT BREAKERS 1-POLE 15	20	20 ST	20 GF	25	30	40	50	2-POLE 15	20	20 ST	25	30	40	50	3-POLE 15	20	25	30	40	50	60	70	80	90	100	125	150	175	200	REMARKS (REFER TO ASSOCIATED NOTES)
SP	208/120V, 3Ø, 4W	-	100A	S	10K	42		36								3																				
A	208/120V, 3Ø, 4W		400	S	4K	42																									7		1			
A1	208/120V, 3Ø, 4W	100		S	10K	42		12		1						1			2																	
PK1	208/120V, 3Ø, 4W	225		S	10K'	42		4		1						1																				NOTE 4
PK2	208/120V, 3Ø, 4W		225	S	10K	42		14		1		2				1							3		2	2					1				NOTE 4
PK3	208/120V, 3Ø, 4W		225	S	10K	42		22	2	2					3	5	2		1																
KP2	208/120V, 3Ø, 4W	100		S	10K	42		16	10							1																				

NOTES:

1. NOTES 2 & 3 APPLY TO ALL PANELBOARDS.
2. PROVIDE LUGS TO ACCOMMODATE FEEDER SIZES AS IDENTIFIED ON THE RISER DIAGRAM FOR SUPPLY AND ALL LOADS (THIS NOTE IS APPLICABLE TO ALL TERMINATIONS).
3. PANEL SHALL BE FULLY RATED .
4. PROVIDE FEEDTHRU LUGS.

KEY

MCB = MAIN CIRCUIT BREAKER
M.L.O = MAIN LUGS ONLY
S = SURFACE MOUNTED
F = FLUSH MOUNTED
AIC = MINIMUM INTERRUPTING RATING OF CIRCUIT BREAKERS INSTALLED IN REFERENCED PANEL

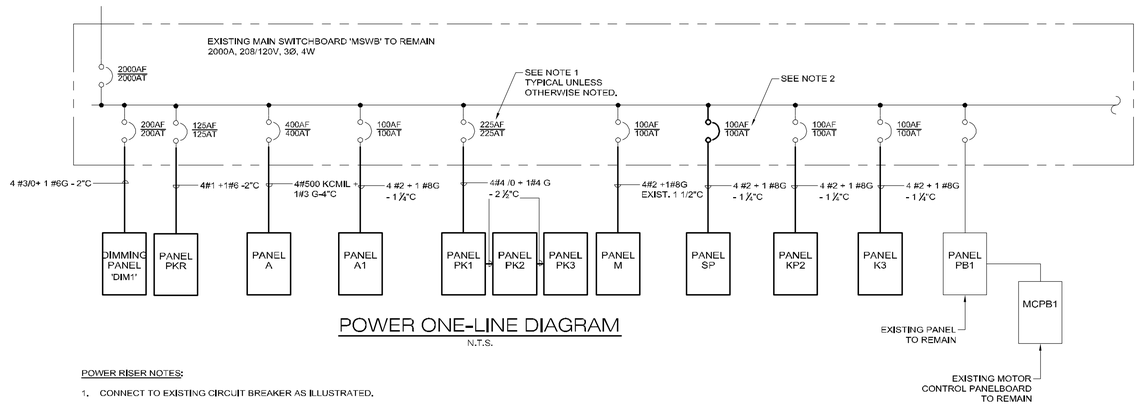
SCHEDULE OF PANELBOARDS

PANEL TAG	LOCATION	SERVICE	MAINS MCB	MAINS MLO	MTG	AIC	TOTAL POLES	BRANCH CIRCUIT BREAKERS 1-POLE 15	20	20 GF	25	30	40	50	2-POLE 15	20	25	30	40	50	3-POLE 15	20	25	30	40	50	60	70	80	90	100	125	150	175	200	REMARKS (REFER TO ASSOCIATED NOTES)
PKR	KITCHEN	208/120V, 3P, 4W		125A	F	10K		15																	1										
M	KITCHEN	208/120V, 3P, 4W		100A	F	10K		30																												
K3	SERVERY	208/120V, 3P, 4W	225		F	10K		10	3		1					3		2				2														
	NOTES:																																			

1. NOTES 2-4 APPLY TO ALL PANELBOARDS.
2. PROVIDE LUGS TO ACCOMMODATE FEEDER SIZES AS IDENTIFIED ON THE RISER DIAGRAM FOR SUPPLY AND ALL LOADS. (THIS NOTE APPLICABLE TO ALL TERMINATIONS.)
3. PANEL SHALL BE FULLY RATED.
4. PROVIDE FEED THROUGH LUGS.

KEY

MCB = MAIN CIRCUIT BREAKER
MLO = MAIN LUGS ONLY
S = SURFACE MOUNTED
F = FLUSH MOUNTED
AIC = MINIMUM INTERRUPTING RATING OF CIRCUIT BREAKERS INSTALLED IN REFERENCED PANEL



POWER ONE-LINE DIAGRAM
N.T.S.

POWER RISER NOTES:

1. CONNECT TO EXISTING CIRCUIT BREAKER AS ILLUSTRATED.
2. PROVIDE NEW CIRCUIT BREAKER IN DISTRIBUTION SECTION 1 AS INDICATED. BREAKER TYPE AND AIC RATING SHALL MATCH EXISTING BREAKERS MANUFACTURED BY SQUARE D. REBALANCE LOADS TO WITHIN 10% PHASE TO PHASE AND PROVIDE ENGRAVED NAMEPLATE TO MATCH EXISTING UPON COMPLETION OF WORK.

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REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools — Education · Inspiration · Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

ELECTRICAL SCHEDULES AND DETAILS

PROJECT NUMBER 19431.01
DESIGNED BY: MVM
DRAWN BY: MVM
CHECKED BY: GM
DATE: March 03, 2014
SCALE: NONE

SHEET NUMBER:

E500

SHEET 54 **OF** 61

G:\2013\13013031 • Somerville High School Auditorium\1300 Drawings\1304 Electrical\Revit\13013031 E500 ELECTRICAL SCHEDULES & DETAILS.dwg [Wed, March 03, 2014 - 3:43pm] dfranek

AUDIOVISUAL COORDINATION LEGEND

	OWNER	FURNITURE CONTRACTOR	TELECOM CONTRACTOR	AUDIOVISUAL CONTRACTOR	ELECTRICAL CONTRACTOR	GENERAL CONTRACTOR
VIDEO:						
CAMERAS			X			
AUDIO: LOUDSPEAKERS AND MICROPHONES			X			
CEILING LOUDSPEAKER FURNISHED BY			X			
CEILING LOUDSPEAKER INSTALLED BY			X			
CABLE REPLACEMENT PROVIDED BY			X			
PROGRAMMING / AV CONTROL:						
AV CONTROL SYSTEMS INSTALLED AND PROGRAMMED BY			X			

GENERAL AUDIOVISUAL ABBREVIATIONS

AC	ALTERNATING CURRENT	NEC	NATIONAL ELECTRICAL CODE
ADA	AMERICANS WITH DISABILITIES ACT	NEXT	NEAR END CROSS TALK
AFF	ABOVE FINISH FLOOR	NIC	NOT IN CONTRACT
AIA	AMERICAN INSTITUTE OF ARCHITECTS	OFE	OWNER FURNISHED EQUIPMENT
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
AWG	AMERICAN WIRE GAUGE	PABX	PRIVATE AUTOMATIC BRANCH EXCHANGE
BICSI	BUILDING INDUSTRY CONSULTING SERVICE INTERNATIONAL	PBX	PRIVATE BRANCH EXCHANGE
BTU	BRITISH THERMAL UNIT	POTS	PLAIN OLD TELEPHONE SERVICE
CATV	CABLE TELEVISION	PR	PAIR
CO	CENTRAL OFFICE	PVC	POLYVINYL CHLORIDE
CODEC	CODER DECODER	RCDD	REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER
CTS	CERTIFIED TECHNOLOGY SPECIALIST	REF	REFERENCE
CPU	CENTRAL PROCESSING UNIT	RFI	RADIO FREQUENCY INTERFERENCE
dB	DECIBEL	RFP	REQUEST FOR PROPOSAL
DC	DIRECT CURRENT	RFQ	REQUEST FOR QUOTE
DEMARC	DEMARCATION POINT	RMS	RACK MOUNT SPACE
EIA	ELECTRONICS INDUSTRIES ASSOCIATION	SP	SERVICE PROVIDER
EMC	ELECTROMAGNETIC COMPATIBILITY	STP	SHIELDED TWISTED-PAIR
EMI	ELECTROMAGNETIC INTERFERENCE	SWB	SWITCHBOARD
EMR	ELECTROMAGNETIC RADIATION	SYS	SYSTEM
EMT	ELECTRIC METALLIC TUBING	TB	TERMINAL BLOCK
FCC	FEDERAL COMMUNICATIONS COMMISSION	TEL	TELEPHONE
FEXT	FAR END CROSS TALK	TELCO	TELEPHONE COMPANY
GEC	GROUNDING ELECTRODE CONDUCTOR	TYP	TYPICAL
GND	GROUND	UG	UNDERGROUND
HC	HORIZONTAL CROSS-CONNECT	UL	UNDERWRITERS LABORATORIES, INC.
HF	HIGH FREQUENCY	UPS	UNINTERRUPTIBLE POWER SUPPLY
HH	HANDHOLE	UTP	UNSHIELDED TWISTED-PAIR
HVAC	HEATING, VENTILATION, AND AIR-CONDITIONING	WA	WORK AREA
Hz	HERTZ	WP	WATERPROOF OUTLET
ICIA	INTERNATIONAL COMMUNICATIONS INDUSTRIES ASSOCIATION, INC.	X	CROSS-CONNECT
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.	RESOLUTION DISPLAY:	
ISDN	INTEGRATED SERVICES DIGITAL NETWORK	VGA 640 x 480	VIDEO RESOLUTION 4:3 ASPECT RATIO
ISO	INTERNATIONAL STANDARDS ORGANIZATION	SVGA 800 x 600	VIDEO RESOLUTION 4:3 ASPECT RATIO
kHz	KILOHERTZ	XGA 1024 x 768	VIDEO RESOLUTION 4:3 ASPECT RATIO
kwh	KILOWATT-HOURS	QVGA 1280 x 800	VIDEO RESOLUTION 4:3 ASPECT RATIO
LAN	LOCAL AREA NETWORK	WXGA 1280 x 960	VIDEO RESOLUTION 16:9 ASPECT RATIO
LCD	LIQUID CRYSTAL DISPLAY	WXGA+ 1440 x 900	VIDEO RESOLUTION 16:9 ASPECT RATIO
LED	LIGHT-EMMITTING DIODE	SXGA 1280 x 1024	VIDEO RESOLUTION 16:9 ASPECT RATIO
MH	MANHOLE	SXGA+ 1400 x 1050	VIDEO RESOLUTION 4:3 ASPECT RATIO
MODEM	MODULATOR DEMODULATOR	UXGA 1600 x 1200	VIDEO RESOLUTION 4:3 ASPECT RATIO
MTT	MAIN TELEPHONE TERMINAL	WSXGA+ 1680 x 1050	VIDEO RESOLUTION 16:9 ASPECT RATIO

GENERAL AUDIOVISUAL NOTES

1. REFER TO ELECTRICAL DRAWINGS FOR PROPOSED PATHWAYS.
2. THIS CONTRACTOR SHALL COORDINATE EXACT MOUNTING HEIGHTS AND LOCATION OF EQUIPMENT WITH ARCHITECT.
3. REFER TO AUDIOVISUAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.
4. THIS CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS FOR ALL AUDIOVISUAL DEVICES PRIOR TO INSTALLATION.
5. ALL VOICE/DATA/VIDEO CABLES SHALL BE PLENUM RATED.
6. VERIFY LABELING STANDARD WITH OWNER. SUBMIT LABELING SCHEME FOR APPROVAL. LABELING SHALL BE IN ACCORDANCE WITH ANSI/EIA/TIA-606A STANDARDS.
7. THIS CONTRACTOR SHALL PROVIDE ALL NECESSARY FITTINGS, PLATES AND INSERTS TO ACCEPT THE CONNECTIVITY PRODUCTS WITHIN THE ELECTRICAL CONTRACTOR PROVIDED FLOOR BOXES, POKE THRU BOXES AND SURFACE RACEWAY.
8. THIS CONTRACTOR SHALL PROVIDE ALL NECESSARY FITTINGS, PLATES AND INSERTS TO ACCEPT THE CONNECTIVITY PRODUCTS WITHIN THE CONFERENCE ROOM CABLE CUBBY DEVICES.

AUDIOVISUAL STANDARD CABLE TYPES

DESIGNATION	APPLICATION	MANUFACTURER	MODEL NUMBER	NOMINAL O.D. (INCHES)	UNIT AREA (INCHES)	CABLE CODED IDENTIFIERS
A	AUDIO/MICROPHONE	WEST PENN	25292	0.143	0.016	MXXX
C	RS-232 CONTROL/CONTACT CLOSURE	WEST PENN	253270	0.183	0.026	CXXX
CT	CRESTRON CRESNET	CRESTRON	CRESNET-P	0.216	0.037	CTXXX
IR	INFRA RED EMITTER PROBE	CRESTRON	IRP2	-	-	IRXXX
NT6	CATEGORY 6	MOHAWK	MS8281	0.208	0.037	NTXXX
P	DC REMOTE POWER	WEST PENN	25224	0.141	0.016	PXXX
QM	QUICK MEDIA CABLE	CRESTRON	CRESCAT-QM-P	0.431	0.146	QMXXX
RGBHV	RGBHV/VGA	EXTRON	22-103-02 (MHR-5P)	0.304	0.072	RGBHXXX
RF	WIRELESS MICROPHONE ANTENNA	BELDEN	88240	0.159	0.019	RFXXX
S	SPEAKER, 70V	WEST PENN	25224	0.141	0.016	SXXX
SS	SPEAKER, 8 OHM	WEST PENN	25227	0.221	0.038	SSXXX
UTP	SKEW FREE A/V TWISTED PAIR	EXTRON	22-142-03 (UTP23SF-4P)	0.240	0.045	UTPXXX
V	COMPOSITE VIDEO	EXTRON	22-146-02 (RG59P)	0.204	0.033	VXXX
YC	S-VIDEO	EXTRON	22-129-02 (MHR-2P)	0.245	0.047	YCXXX
RGB	COMPONENT VIDEO	EXTRON	22-103-02 (MHR-5P)	0.304	0.072	RGBXXX
DM	DIGITAL MEDIA: VIDEO/AUDIO/DATA/CONTROL	CRESTRON	DM-CBL-P	0.580	-	-
8G	DIGITAL MEDIA: VIDEO/AUDIO/DATA/CONTROL	CRESTRON	DM-CBL-8G-P	0.018	-	-

AUDIOVISUAL STANDARD PRE-MADE CABLE TYPES

DESIGNATION	APPLICATION	MANUFACTURER	MODEL NUMBER	
PM1	RGBHV/VGA W/ AUDIO / 12'	EXTRON	26-490-03	
PM2	RGBHV/VGA W/ AUDIO / 3'	EXTRON	26-490-01	
PM3	HDMI M-M/3	EXTRON	26-650-03	
PM4	RGBHV / 5-WAY BNC /6'	EXTRON	26-260-01	
PM5	HDTV / COMPOSITE VIDEO / HDTV RCA/6'	EXTRON	26-645-06	
PM6	S- VIDEO / M TO M 4-PIN /MHR-2P SVM-M/50'	EXTRON	26-522-05	
PM7	COMPOSITE VIDEO / RG6 BNC/6	EXTRON	26-383-12	
PM8	AUDIO 3.5 MM STEREO MALE / 2 RCA STEREO	EXTRON	TRSM-RCAM 6	
PM9	MINI STEREO PLUG TO RCS FEMALE AUDIO ADAPTER	EXTRON	MSR 6	
PM10	MALE 4 PIN S-VIDEO / 2 MALE BNC ADAPTER	EXTRON	26-35-03	
PM11	15 PIN FEMALE TO 5-WAY BNC ADAPTER	EXTRON	26-604-02	
PM12	3.5 MM STEREO AUDIO MALE TO MALE (6')	EXTRON	A MINI/6	
PM13	AV. RCA/6' RCA M TO M VIDEO AND STEREO RCA	EXTRON	26-643-06	
PM14	MALE TO MALE VGA MICRO HR CABLE, W/ AUDIO, 6'	EXTRON	26-566-02	
PM15	DUAL LINK DVI-D MALE TO MALE CABLE, 6'	EXTRON	26-651-06	
PM16	15 PIN MALE TO 5 BNC FEMALE ADAPTER	EXTRON	26-493-01	
PM17	HDMI, MALE TO MALE, 6'	EXTRON	26-650-06	
PM18	MALE TO MALE VGA MOLDED CONNECTOR CABLE, 12'	EXTRON	26-567-03	
PM19	HDMI, MALE TO MALE, 12'	EXTRON	26-650-12	
PM20	DVI-D, MALE TO MALE, 12'	EXTRON	26-649-12	
PM21	MALE TO MALE VGA MOLDED CONNECTOR CABLE, 25'	EXTRON	26-238-03	
PM22	HDMI, MALE TO MALE, 25'	EXTRON	26-650-25	
PM23	DVD-I, MALE TO MALE, 25'	EXTRON	26-649-25	
PM24	MALE TO MALE VGA MOLDED CONNECTOR CABLE, 35'	EXTRON	26-238-17	
PM25	HDMI, MALE TO MALE, 35'	EXTRON	26-650-35	
PM26	DVI-D, MALE TO MALE, 35'	EXTRON	26-649-35	
PM27	15 PIN MALE TO UNTERMINATED CABLE END, 50'	EXTRON	26-515-02	
PM28	HDMI, MALE TO MALE, 50'	EXTRON	26-650-50	
PM29	VGA MOLDED CONNECTOR CABLE, MALE TO MALE, 6'	EXTRON	26-238-01	
PM30	VGA MOLDED CONNECTOR CABLE, MALE TO MALE, 25'	EXTRON	26-515-01	
PM31	3.5 MM STEREO AUDIO MALE TO MALE, 12'	EXTRON	26-571-06	
PM32	RJ-45 TO D-SUB MALE CAMERA CABLE EXTEN. KIT	TANDBERG	1161653	
PM33	SERIAL CABLE, DB9 MALE TO DB9 FEMALE, 2 FEET	EXTRON	26-433-01	
PM34	SERIAL CABLE, DB9 MALE TO DB9 FEMALE, 50 FEET	EXTRON	26-433-08	
PM35	CONNECTING CABLE, SVGA TYPE, 5 FEET	MINICOM	5CB40056	
PM36	CONNECTING CABLE, SERIAL TYPE, 5 FEET	MINICOM	5CB40515	

AUDIOVISUAL LEGEND

- AVXX — MICROPHONE CONNECTION PANEL
  "X" - INDICATES THE NUMBER OF GANGS PER BOX
  "XX" - INDICATES THE MOUNTING HEIGHT IN INCHES AFF
- JX XX — CEILING MOUNTED A/V JUNCTION BOX
  "X" - INDICATES THE NUMBER OF GANGS PER BOX
  "CE" - INDICATES CEILING MOUNTED FOR PROJECTOR
  "PS" - INDICATES CEILING MOUNTED FOR PROJECTION SCREEN
- FB1 — FLOOR MOUNTED A/V BOX WITH DEVICE
  "1" - INDICATES THE TYPE OF BOX
- PT1 — A/V BOX POKE-THRU WITH DEVICE
  "1" - INDICATES THE TYPE OF BOX
- MXX — MICROPHONE OUTLET
  "CE" - INDICATES THE CEILING MOUNTED
  "18" - INDICATES THE WALL MOUNTING HEIGHT IN INCHES AFF
  "TT" - INDICATES TABLE MOUNTED
- SW — SUB WOOFER
- PROJ — CEILING MOUNTED DATA/VIDEO PROJECTOR
- SP — AUDIO SPEAKER, CEILING MOUNTED
  - SEE DRAWING NOTES FOR LOCATIONS TO BE USED FOR SOUND MASKING
- SPX XX — AUDIO SPEAKER, WALL MOUNTED
  "X" - INDICATES THE TYPE OF SPEAKER
  "XX" - INDICATES THE MOUNTING HEIGHT IN INCHES AFF
- SCREEN — PROJECTION SCREEN
  "CM" - INDICATES THE CEILING MOUNTED
  "WM" - INDICATES THE WALL MOUNTED
- LVC — LOW VOLTAGE SCREEN CONTROLLER, INSTALLED BY ELECTRICIAN
- 3/4" PLYWOOD BACKBOARD, INSTALLED BY GENERAL CONTRACTOR
- TV — CATV CABLE DROP, WALL MOUNTED (BY OTHERS)
- TV — CATV CABLE DROP, CEILING MOUNTED (BY OTHERS)
- AVR — AUDIO VIDEO RACK LOCATION, SEE DETAILS
- XX — VIDEO PRESENTATION CAMERA (CEILING MOUNTED)
  "84" - INDICATES THE CEILING MOUNTING HEIGHT IN INCHES AFF
- XX — VIDEO PRESENTATION CAMERA (WALL MOUNTED)
  "72" - INDICATES THE WALL MOUNTING HEIGHT IN INCHES AFF
  "VCC" - INDICATES VIDEO CONFERENCING CAMERA
- SOUND MASKING SPEAKER, MOUNTED ABOVE CEILING
- CC XX — CABLE CUBBY
  XX-INDICATES MODEL #
- CL — CLOCK OUTLET TO POWER DISPLAY, (REFER TO ELECTRICAL PLANS)
- DOC CAM — DOCUMENT CAMERA
- CEILING MOUNTED SPEAKER, HORN TYPE
- LSR — LOCAL SOUND RACK
- COMBINATION CLOCK / SPEAKER UNIT

EXISTING DEVICE LEGEND

XM	EXISTING CABLING AND DEVICE PLATE TO REMAIN
X	EXISTING CABLING AND DEVICE TO BE REMOVED
XR	EXISTING CABLING AND DEVICE TO BE RELOCATED
XN	EXISTING CABLING TO BE REMOVED AND NEW CABLING TO BE INSTALLED IN EXISTING OUTLET
XNL	EXISTING CABLING AND DEVICE TO BE RELOCATED TO THIS LOCATION
XCNE	EXISTING EQUIPMENT AND CABLING TO BE REMOVED AND NEW EQUIPMENT TO BE INSTALLED
	LIMIT OF DEMOLITION

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Number	Description	Date

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Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

AUDIO VISUAL LEGEND, NOTES AND ABBREVIATIONS

PROJECT NUMBER 19431.01
DESIGNED BY: JD
DRAWN BY: JD
CHECKED BY: BP
DATE: March 03, 2014
SCALE: NONE

SHEET NUMBER:

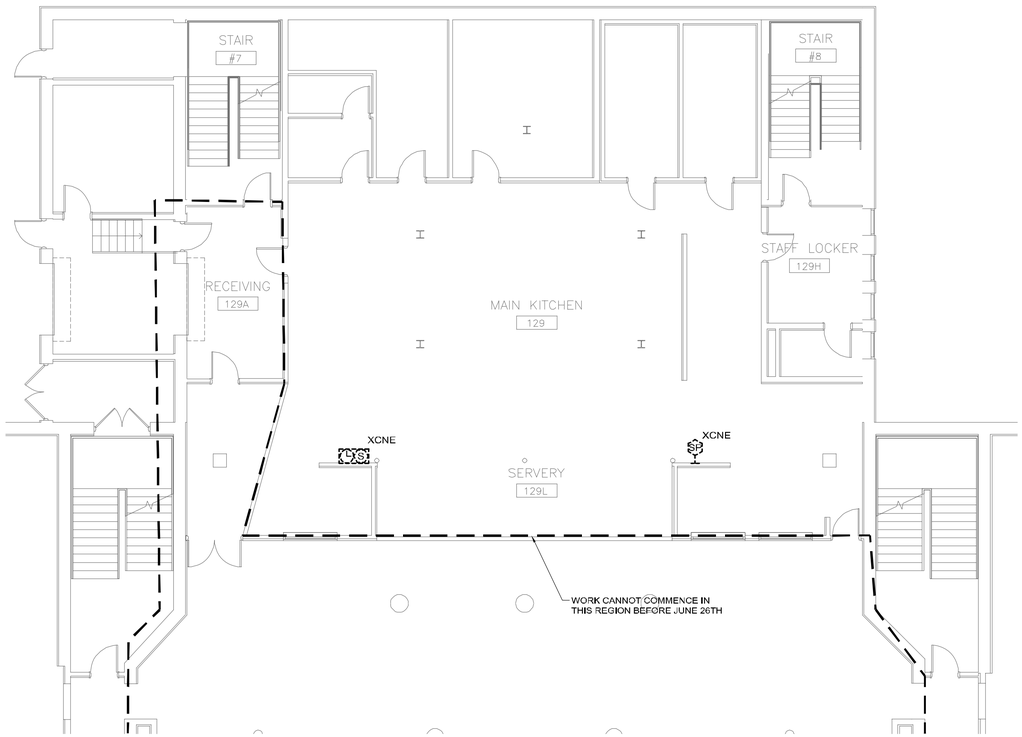
AV000

SHEET 55 **OF** 61

ELEC: MECH: FIRE: PLUM: STRU: ARCH: OWN: REVIEWED BY:

G:\2013\13013031 • Somerville High School Auditorium\1200 Drawings\Revit_Visual\Plot Sheets\13013031 AV000 AUDIO VISUAL LEGEND, NOTES AND ABBREVIATIONS.dwg [Kevin] March 03, 2014 - 4:21 pm dhancek

REVIEWED BY: CIVIL ARCH STRU PLUM FIRE MECH ELEC



1 AVD201 AUDIO VISUAL CAFETERIA/KITCHEN DEMOLITION FLOOR PLAN
1/8" = 1'-0"

DEMOLITION NOTES

1. REFER TO THE ARCHITECTURAL DRAWINGS FOR THE FULL EXTENT OF THE SCOPE OF DEMOLITION. DISCONNECT AND MAKE SAFE ALL AUDIO VISUAL CABLING IDENTIFIED FOR REMOVAL FROM OUTLET COMPLETELY BACK TO SOURCE. THE AUDIO VISUAL SCOPE MAY EXTEND BEYOND THE AREA DEFINED BY THE ARCHITECTURAL DEMOLITION LIMITS TO FULLY COMPLY WITH VARIOUS REQUIREMENTS DEFINED BY THESE NOTES.
2. THE AUDIO VISUAL DEMOLITION PLANS AND DETAILS INDICATE THE GENERAL INTENT AND ARE NOT INTENDED TO SHOW ALL ITEMS TO BE REMOVED OR RETAINED. THE AUDIO VISUAL CONTRACTOR SHALL VISIT THE SITE PRIOR TO THE SUBMISSION OF BIDS TO BECOME FAMILIAR WITH THE ACTUAL CONDITIONS AND EXTENT OF WORK. DEVICES AND EQUIPMENT LOCATED ON WALLS AND/OR CEILINGS TO BE REMOVED SHALL BE DISCONNECTED AND MADE SAFE. THE AUDIO VISUAL CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE OF ANY UNANTICIPATED HIDDEN CONDITIONS ENCOUNTERED DURING DEMOLITION.
3. THE AUDIO VISUAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OF ALL SYSTEMS OR BUILDING COMPONENTS DAMAGED DURING THE EXECUTION OF THE WORK. DAMAGE SHALL INCLUDE BUT NOT BE LIMITED TO DESTRUCTION OR DISPOSAL OF ITEMS INTENDED TO REMAIN OR TO BE SALVAGED.
4. THE AUDIO VISUAL CONTRACTOR SHALL COORDINATE ALL DEMO WITH TELECOM DEPT PRIOR TO DEMO. COORDINATE BETWEEN ELECTRICAL DEMO AND THIS SCOPE. THE AUDIO VISUAL CONTRACTOR SHALL CIRCUIT TRACE AND LABEL ALL EXISTING HORIZONTAL CABLING WITHIN THE AREA OF DEMOLITION SCOPE PRIOR TO DISCONNECTION.
5. THE AUDIO VISUAL CONTRACTOR SHALL IDENTIFY ALL HORIZONTAL CABLING SYSTEM COMPONENTS, WHICH ARE TO REMAIN WITHIN THE AREA OF DEMOLITION SCOPE. THERE SHALL BE NO INTERRUPTION OF SERVICE TO ANY AREA OUTSIDE THE SCOPE LIMITS WITHOUT APPROVAL FROM THE OWNER'S REPRESENTATIVE. EXISTING EQUIPMENT TO REMAIN SHALL BE LEFT IN A CODE COMPLIANT MANNER.
6. THE AUDIO VISUAL CONTRACTOR SHALL REMOVE ALL CABLING TO THEIR POINTS OF ORIGIN WITHIN THE AREA OF DEMOLITION SCOPE. ITEMS IDENTIFIED FOR DEMOLITION SHALL NOT BE ABANDONED IN PLACE. EXISTING CABLING SHALL BE REMOVED BACK TO EACH RESPECTIVE DATA CLOSET.
7. ALL REMOVED ITEMS SHALL BE LEGALLY DISPOSED OF.

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Number	Description	Date

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81 Highland Avenue,
Somerville, MA 02143

AUDIO VISUAL CAFETERIA/ KITCHEN DEMO FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: JD
DRAWN BY: JD
CHECKED BY: BP
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

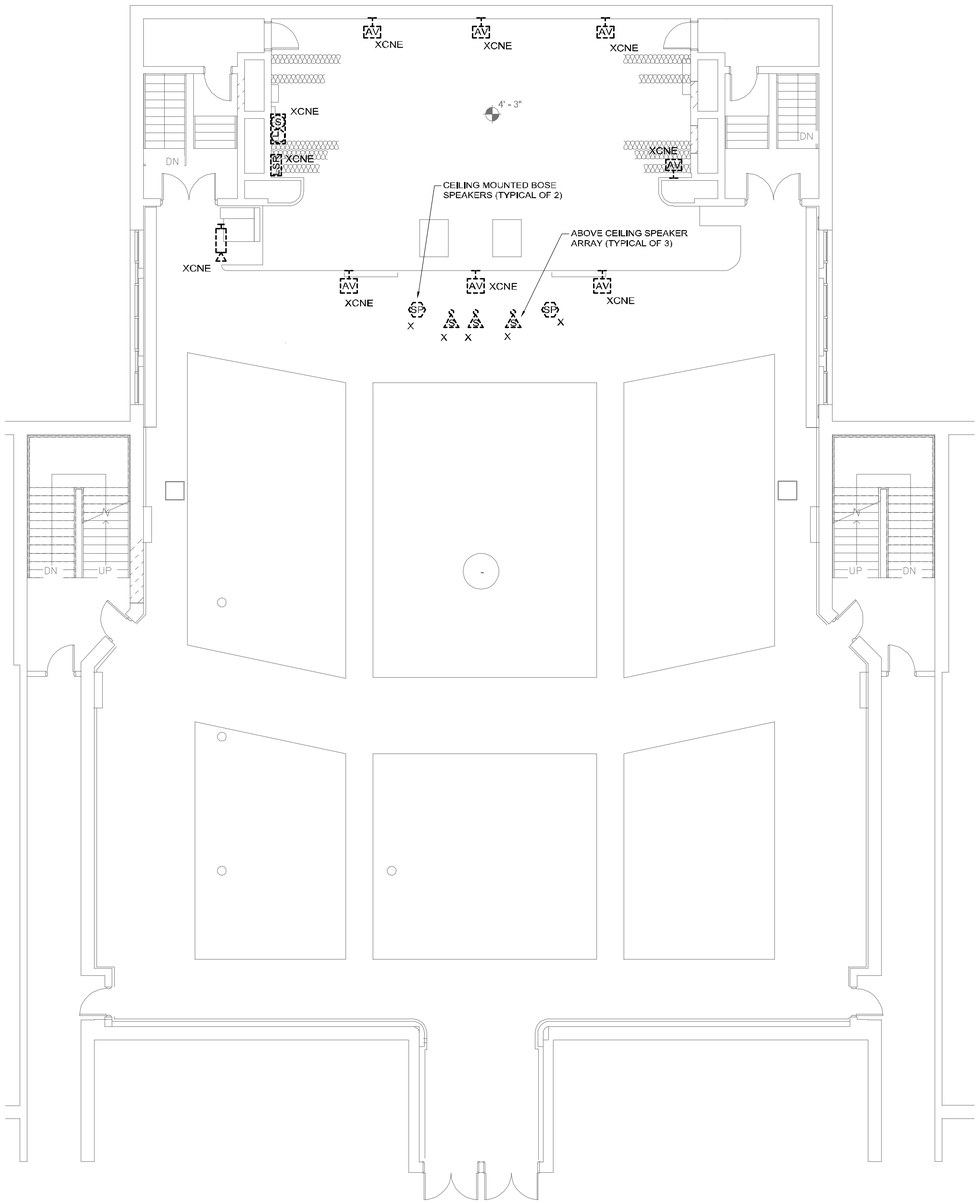
SHEET NUMBER:

AVD201

SHEET 56 OF 61

G:\2013\19431.01\01 - Somerville High School Auditorium\200 Drawings\Audio Visual\Plot Sheets\19431.01 AVD201 AUDIO VISUAL CAFETERIA+KITCHEN DEMO FLOOR PLAN.dwg [Viewed] March 03, 2014 - 4:51pm cfranzak

REVIEWED BY: OWNER: ARCH: STRUC: PLUM: FIRE: MECH: ELEC:



1 AUDIO VISUAL AUDITORIUM DEMOLITION FLOOR PLAN
AVD202 1/8" = 1'-0"

DEMOLITION NOTES

1. REFER TO THE ARCHITECTURAL DRAWINGS FOR THE FULL EXTENT OF THE SCOPE OF DEMOLITION. DISCONNECT AND MAKE SAFE ALL AUDIO VISUAL CABLING IDENTIFIED FOR REMOVAL FROM OUTLET COMPLETELY BACK TO SOURCE. THE AUDIO VISUAL SCOPE MAY EXTEND BEYOND THE AREA DEFINED BY THE ARCHITECTURAL DEMOLITION LIMITS TO FULLY COMPLY WITH VARIOUS REQUIREMENTS DEFINED BY THESE NOTES.

2. THE AUDIO VISUAL DEMOLITION PLANS AND DETAILS INDICATE THE GENERAL INTENT AND ARE NOT INTENDED TO SHOW ALL ITEMS TO BE REMOVED OR RETAINED. THE AUDIO VISUAL CONTRACTOR SHALL VISIT THE SITE PRIOR TO THE SUBMISSION OF BIDS TO BECOME FAMILIAR WITH THE ACTUAL CONDITIONS AND EXTENT OF WORK. DEVICES AND EQUIPMENT LOCATED ON WALLS AND/OR CEILINGS TO BE REMOVED SHALL BE DISCONNECTED AND MADE SAFE. THE AUDIO VISUAL CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE OF ANY UNANTICIPATED HIDDEN CONDITIONS ENCOUNTERED DURING DEMOLITION.

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7. ALL REMOVED ITEMS SHALL BE LEGALLY DISPOSED OF.

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AUDIO VISUAL AUDITORIUM DEMO FLOOR PLAN

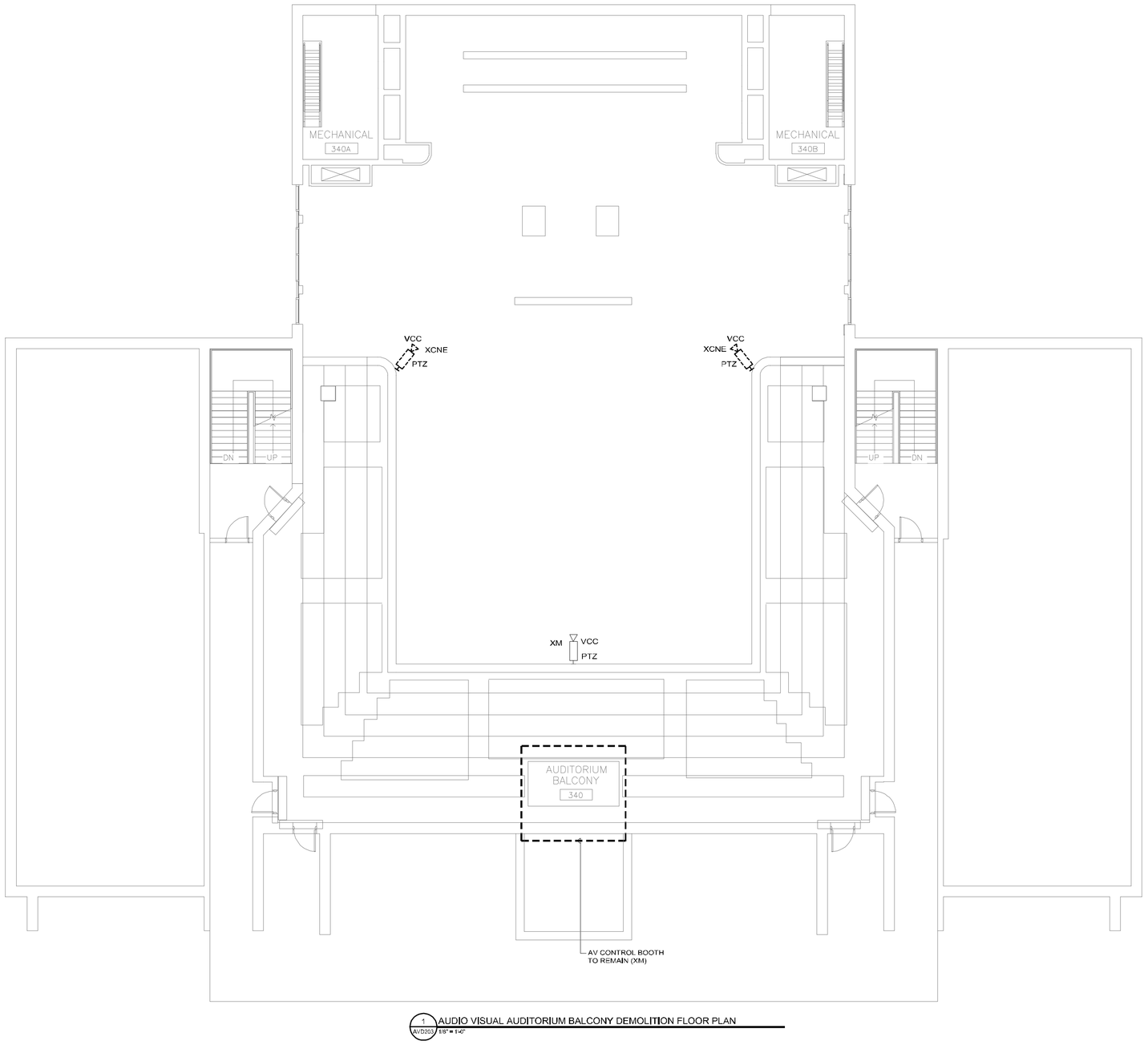
PROJECT NUMBER 19431.01
DESIGNED BY: JD
DRAWN BY: JD
CHECKED BY: BP
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

AVD202

SHEET 57 OF 61

G:\2013\19431.01 - Somerville High School Auditorium\1200 Drawings\Audio Visual\Plot Sheets\19431.01 AVD202 AUDIO - BEVAL AUDITORIUM DEMO FLOOR PLAN.dwg [Plot-X] March 03, 2014 - 4:21:01 pm dfranzek



1 AVD203 AUDIO VISUAL AUDITORIUM BALCONY DEMOLITION FLOOR PLAN
1/8" = 1'-0"

DEMOLITION NOTES

1. REFER TO THE ARCHITECTURAL DRAWINGS FOR THE FULL EXTENT OF THE SCOPE OF DEMOLITION. DISCONNECT AND MAKE SAFE ALL AUDIO VISUAL CABLING IDENTIFIED FOR REMOVAL FROM OUTLET COMPLETELY BACK TO SOURCE. THE AUDIO VISUAL SCOPE MAY EXTEND BEYOND THE AREA DEFINED BY THE ARCHITECTURAL DEMOLITION LIMITS TO FULLY COMPLY WITH VARIOUS REQUIREMENTS DEFINED BY THESE NOTES.

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AUDIO VISUAL AUDITORIUM BALCONY DEMO FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: JD
DRAWN BY: JD
CHECKED BY: BP
DATE: March 03, 2014
SCALE: 1/8" = 1'- 0"

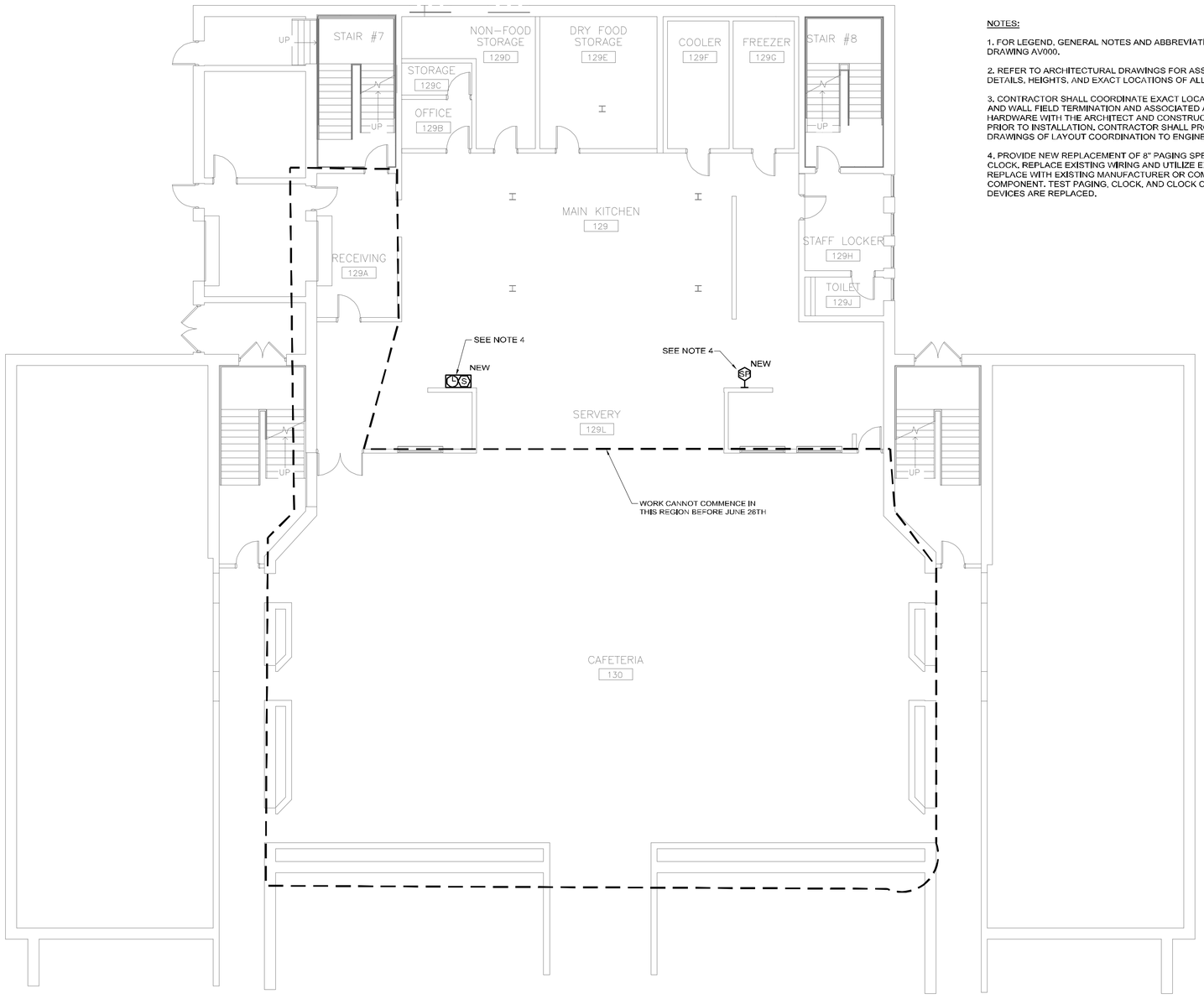
SHEET NUMBER:

AVD203

SHEET 58 **OF** 61

REVIEWED BY: CIVIL ____ ARCH ____ STRU ____ PLUM ____ FIRE ____ MECH ____ ELEC ____

C:\2013\13031331 • Somerville High School Auditorium\1300 Drawings\Audio Visual\Plot Sheets\20130091 AVD203 AUDIO VISUAL AUDITORIUM BALCONY DEMO FLOOR PLAN.dwg [Tblock] March 03, 2014 • Kirsten Ohanesian



NOTES:

1. FOR LEGEND, GENERAL NOTES AND ABBREVIATIONS REFER TO DRAWING AV000.

2. REFER TO ARCHITECTURAL DRAWINGS FOR ASSOCIATED MOUNTING DETAILS, HEIGHTS, AND EXACT LOCATIONS OF ALL DEVICES.

3. CONTRACTOR SHALL COORDINATE EXACT LOCATIONS OF ALL RACK AND WALL FIELD TERMINATION AND ASSOCIATED AUDIOVISUAL HARDWARE WITH THE ARCHITECT AND CONSTRUCTION MANAGER PRIOR TO INSTALLATION. CONTRACTOR SHALL PROVIDE DIMENSIONED DRAWINGS OF LAYOUT COORDINATION TO ENGINEER FOR RECORD.

4. PROVIDE NEW REPLACEMENT OF 8" PAGING SPEAKER AND 12" CLOCK. REPLACE EXISTING WIRING AND UTILIZE EXISTING BACKBOXES. REPLACE WITH EXISTING MANUFACTURER OR COMPATIBLE COMPONENT. TEST PAGING, CLOCK, AND CLOCK CONNECTIONS ONCE DEVICES ARE REPLACED.

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

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Number	Description	Date

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81 Highland Avenue,
Somerville, MA 02143

AUDIO VISUAL CAFETERIA/ KITCHEN FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: JD
DRAWN BY: JD
CHECKED BY: BP
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

AV201

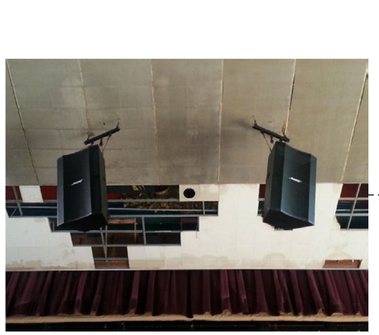
SHEET 59 **OF** 61

G:\2013\13031 • Somerville High School Auditorium\1300 Drawings\Audio Visual\Plot Sheets\20130301 AV201 AUDIO VISUAL CAFETERIA+KITCHEN FLOOR PLAN.dwg [Work] March 03, 2014 • 4:21 pm drhanek

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

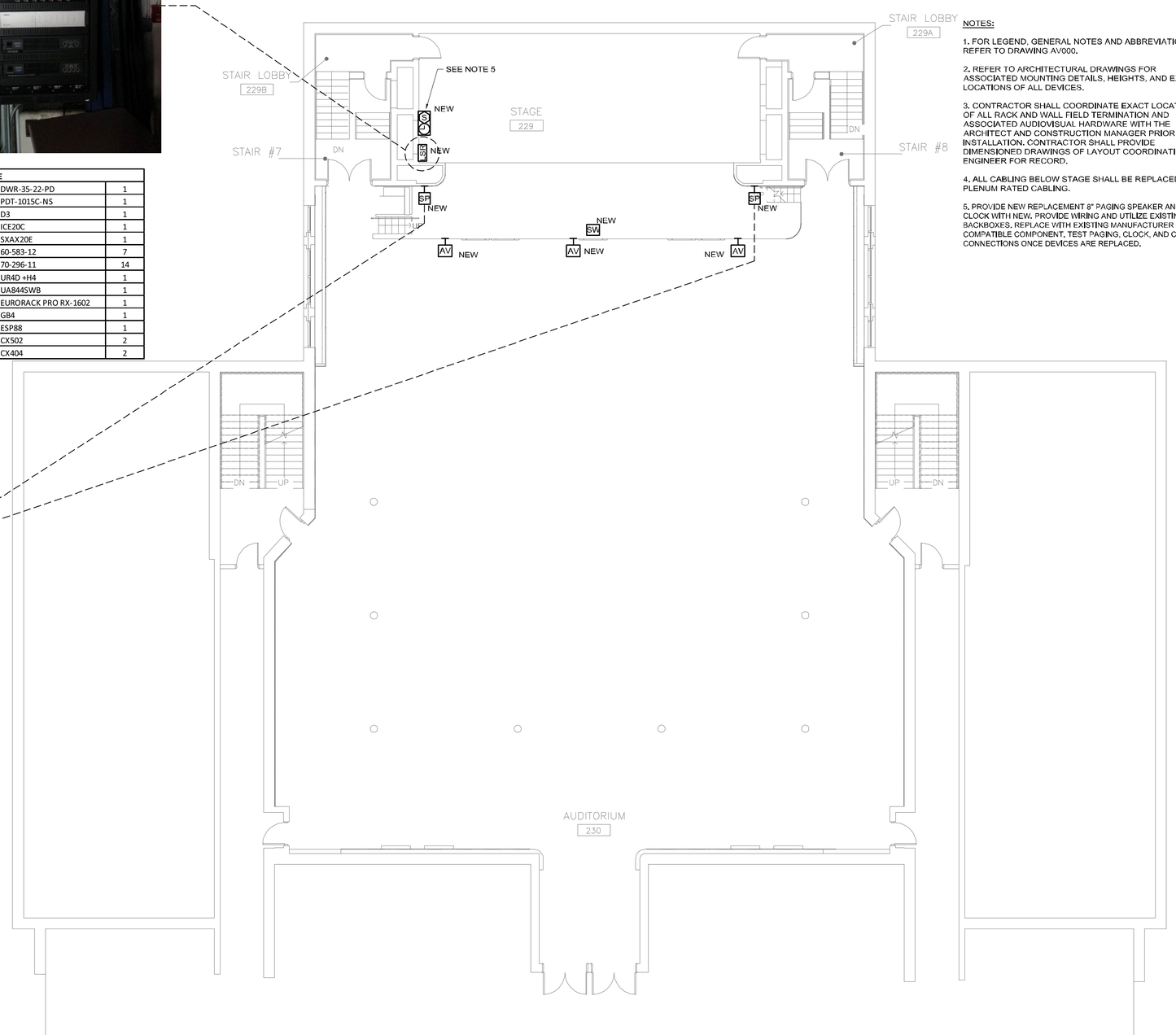


NEW AUDIO VISUAL EQUIPMENT SCHEDULE			
LOCAL SOUND RACK	MIDDLE ATLANTIC	DWR-35-22-PD	1
POWER STRIP	MIDDLE ATLANTIC	PDT-1015C-NS	1
RACK DRAWER, 3 RU	MIDDLE ATLANTIC	D3	1
UPS	SURGEX	ICE20C	1
POWER SUPPLY	SURGEX	SXAX20E	1
MOUNTING FRAME, MAAP-TYPE,2-GANG, BLACK	EXTRON	60-583-12	7
MICROPHONE MODULE, XLR, FEMALE, BLACK	EXTRON	70-296-11	14
WIRELESS MIC RECEIVER	SHURE	UR4D +H4	1
WIRELESS MIC ANTENNA EXPANDER	SHURE	UA844SWB	1
MICROPHONE MIXER	BEHRINGER	EURORACK PRO RX-1602	1
AUDIO MIXING CONSOLE	SOUNDCRAFT	GB4	1
BOSE PROCESSOR	BOSE	ESP88	1
AMPLIFIER	QSC	CX502	2
AMPLIFIER	QSC	CX404	2



(TYPICAL)

NEW AUDIO VISUAL EQUIPMENT SCHEDULE			
TWO WAY FULL RANGE LOUDSPEAKER	BOSE	LT 9702 WR	2
SUBWOOFER	EAW SB180zP	0008955	1



NOTES:

1. FOR LEGEND, GENERAL NOTES AND ABBREVIATIONS REFER TO DRAWING AV000.

2. REFER TO ARCHITECTURAL DRAWINGS FOR ASSOCIATED MOUNTING DETAILS, HEIGHTS, AND EXACT LOCATIONS OF ALL DEVICES.

3. CONTRACTOR SHALL COORDINATE EXACT LOCATIONS OF ALL RACK AND WALL FIELD TERMINATION AND ASSOCIATED AUDIOVISUAL HARDWARE WITH THE ARCHITECT AND CONSTRUCTION MANAGER PRIOR TO INSTALLATION. CONTRACTOR SHALL PROVIDE DIMENSIONED DRAWINGS OF LAYOUT COORDINATION TO ENGINEER FOR RECORD.

4. ALL CABLING BELOW STAGE SHALL BE REPLACED WITH PLENUM RATED CABLING.

5. PROVIDE NEW REPLACEMENT 8" PAGING SPEAKER AND 12" CLOCK WITH NEW. PROVIDE WIRING AND UTILIZE EXISTING BACKBOXES. REPLACE WITH EXISTING MANUFACTURER OR COMPATIBLE COMPONENT. TEST PAGING, CLOCK, AND CLOCK CONNECTIONS ONCE DEVICES ARE REPLACED.

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REVISIONS		
Number	Description	Date

ISSUED FOR BID

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

AUDIO VISUAL AUDITORIUM FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: JD
DRAWN BY: JD
CHECKED BY: BP
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

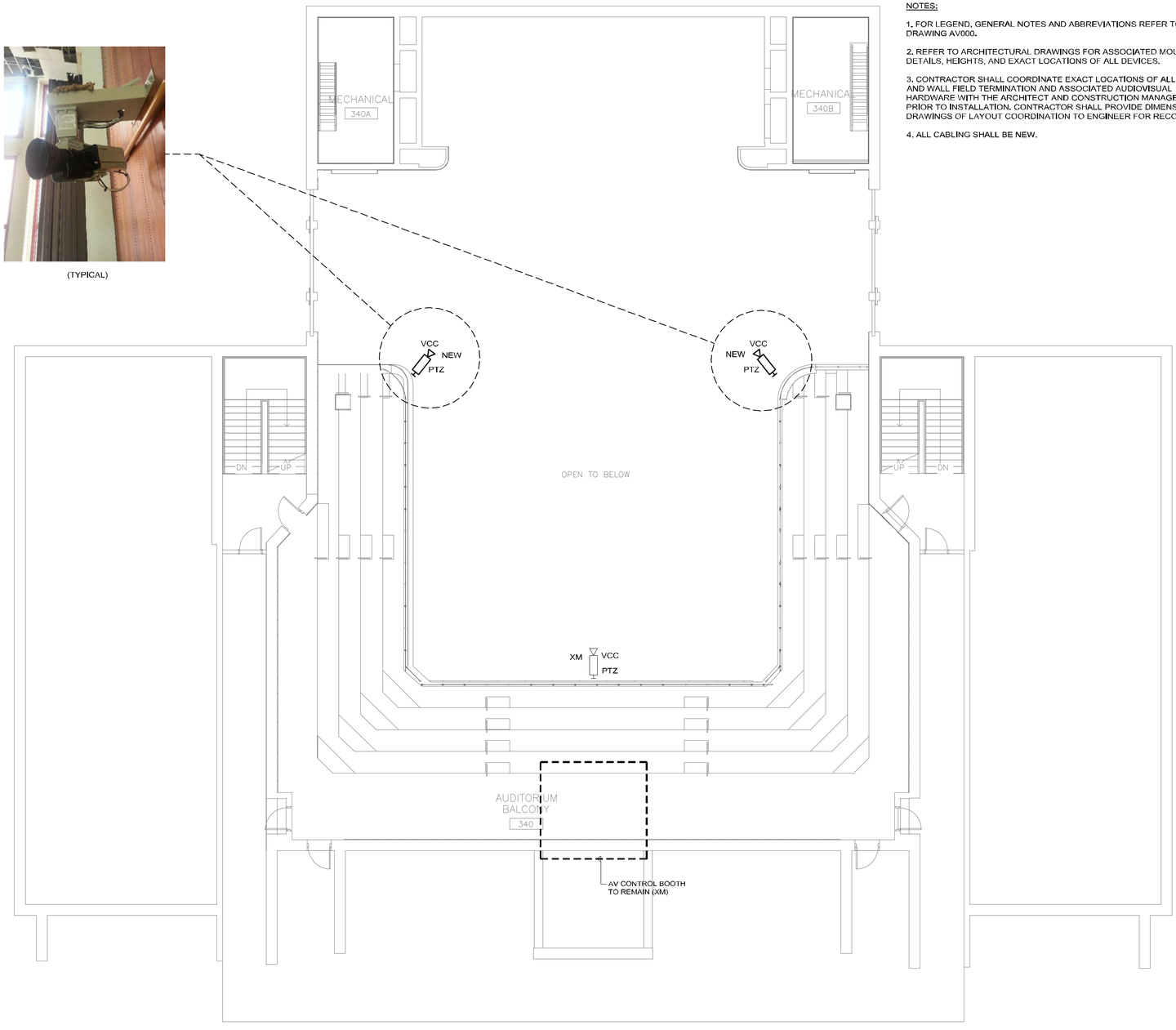
AV202

SHEET 60 OF 61

G:\2013\13001301 - Somerville High School Auditorium\1300 Drawings\Audio Visual\Plot Sheets\13001301 AV202 AUDIO VISUAL AUDITORIUM FLOOR PLAN.dwg (Vonn) March 03, 2014 - 4:29pm dfavreau

AUDIO VISUAL EQUIPMENT SCHEDULE			
VIDEO CAMERA WITH ITEGRATED PTZ FUNCTION	PANASONIC	AW-H120W	2
CAMERA WALL MOUNT BRACKET	VADDIO	535-2000-223	2

(TYPICAL)



NOTES:

1. FOR LEGEND, GENERAL NOTES AND ABBREVIATIONS REFER TO DRAWING AV000.

2. REFER TO ARCHITECTURAL DRAWINGS FOR ASSOCIATED MOUNTING DETAILS, HEIGHTS, AND EXACT LOCATIONS OF ALL DEVICES.

3. CONTRACTOR SHALL COORDINATE EXACT LOCATIONS OF ALL RACK AND WALL FIELD TERMINATION AND ASSOCIATED AUDIOVISUAL HARDWARE WITH THE ARCHITECT AND CONSTRUCTION MANAGER PRIOR TO INSTALLATION. CONTRACTOR SHALL PROVIDE DIMENSIONED DRAWINGS OF LAYOUT COORDINATION TO ENGINEER FOR RECORD.

4. ALL CABLING SHALL BE NEW.

REVIEWED BY: CIVIL: ARCH: STRU: PLUM: FIRE: MECH: ELEC:

CDR MAGUIRE
Architects / Engineers / Planners
211 Congress Street, 11th Floor
Boston, Massachusetts 02110
TEL. (617) 778-1440
www.cdrmaguire.com

RDK ENGINEERS
Andover, MA • Boston, MA • Amherst, MA
Durham, NC • Charlotte, NC
RDK Engineers
200 Brickstone Square
Andover, MA 01810-1488
P 978-296-6200
F 978-296-6201
W www.rdkengineers.com

REVISIONS		
Number	Description	Date

ISSUED FOR BID

Somerville Public Schools
Education · Inspiration · Excellence

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

81 Highland Avenue, Somerville, MA 02143

AUDIO VISUAL AUDITORIUM BALCONY FLOOR PLAN

PROJECT NUMBER 19431.01
DESIGNED BY: JD
DRAWN BY: JD
CHECKED BY: BP
DATE: March 03, 2014
SCALE: 1/8" = 1 '- 0"

SHEET NUMBER:

AV203

SHEET 61 **OF** 61

G:\2013\13031 • Somerville High School Auditorium\1300 Drawings\Audio Visual\Plot Sheets\13031 AV203 AUDIO VISUAL AUDITORIUM BALCONY FLOOR PLAN.dwg [Print] March 03, 2014 • ezXpon dfranzek

INVITATION FOR BIDS

(IFB # 14-71)

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

Filed Sub Bids Due and Opened	**11:00 a.m.**	**March 19, 2014**
General Contractor Bids Due and Opened	**11:00 a.m.**	**March 27, 2014**

CITY OF SOMERVILLE, MASSACHUSETTS
Joseph A. Curtatone, Mayor

Purchasing Department
Angela M. Allen, Purchasing Director

Skip Bandini
Capital Projects & Planning
City of Somerville
1 Franey Road
Somerville, MA 02145
P: 617-625-6600
F: 617-625-0999

TABLE OF CONTENTS
Invitation for Bid Documents

PART 1: BID INVITATION

Section 1:
000200 Invitation to Bid

Section 2:
002000 Instructions to Bidders

Section 3: Bid Submission Documents:
003000 Form for General Bid
003200 Somerville Living Wage Form
003250 Responsible Employer Ordinance
003300 Acknowledgement of Notice to Bidders
003400 Certificate of Non-Collusion & Tax Compliance Statement
003500 Certificate of Signature Authority
003600 Signature Form
003700 Reference Form
003800 Bid Bond

Section 4: Other Bid Documents
004100 Division of Labor and Industries Prevailing Wage Rates
004200 Division of Labor and Industries Statement of Compliance
004300 General Term and Conditions

PART 2: SAMPLE CONSTRUCTION CONTRACT

a. Sample Contract
- Appendix A – Scope of Work (including Technical Specifications)*
- Appendix B – Contractor's Bid Price; Form for General Bid , Bid Form for Alternates (From Bid Book)
- Appendix C – General Terms and Conditions*
- Appendix D – Insurance Requirements
- Appendix E – Wage Rates and Living Wage (From Bid Book)
- Appendix F – Certificate of Good Standing (for corporations)
- Appendix G – Procurement documentation (Advertisements and Notice to Bidders)
- Appendix H – Statement of Management
- Appendix I – Performance Bond and Payment Bond, if contract over $2000

*Appendix to be included in contract by reference

PART 3: TECHNICAL SPECIFICATIONS

DIVISION SECTION TITLE

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

000000 TITLE
000001 FRONT END
008600 LIST OF DRAWINGS

DIVISION 01 – GENERAL REQUIREMENTS

011000 SUMMARY OF WORK
012000 PROJECT MEETINGS
012500 PRODUCT SUBSTITUTIONS
012600 CONTRACT MODIFICATION PROCEDURES
013100 PROJECT MANAGEMENT AND COORDINATION
013200 CONSTRUCTION PROGRESS DOCUMENTATION
013300 SUBMITTAL PROCEDURES
SUBSTITUTION REQUEST FORM
014000 QUALITY REQUIREMENTS
014200 REFERENCES
015000 TEMPORARY FACILITIES
015001 AIR QUALITY REQUIREMENTS
015002 RODENT CONTROL
016000 PRODUCT REQUIREMENTS
017300 EXECUTION
017329 CUTTING AND PATCHING
017419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
017700 CLOSEOUT PROCEDURES
017823 OPERATION AND MAINTENANCE DATA
017839 PROJECT RECORD DOCUMENTS
017900 DEMONSTRATION AND TRAINING
018130 FIRE SUPPRESSION SYSTEMS COMMISSIONING

DIVISION 02 – EXISTING CONDITIONS

024119 SELECTIVE DEMOLITION
024120 REMEDIATION

DIVISION 04 – MASONRY

042000 UNIT MASONRY

DIVISION 05 – METALS (FSB REQUIRED)

*050001 MISCELLANEOUS AND ORNAMENTAL IRON (FSB REQUIRED)
*055000 METAL FABRICATIONS (PART OF FSB SECTION 050001)
*055213 PIPE AND TUBE RAILINGS (PART OF FSB SECTION 050001)
057313 GLAZED DECORATIVE METAL RAILINGS

DIVISION 06 - WOOD, PLASTICS AND COMPOSITES

061053 MISCELLANEOUS ROUGH CARPENTRY
061600 SHEATHING
064600 WOOD TRIM

DIVISION 07 - THERMAL AND MOISTURE PROTECTION (FSB REQUIRED)

*070001 WATERPROOFING, DAMPPROOFING AND CAULKING (FSB REQUIRED)
072100 THERMAL INSULATION
*078413 PENETRATION FIRESTOPPING (FSB REQUIRED) (PART OF FSB SECTION 070001)
*079200 JOINT SEALANTS (FSB REQUIRED) (PART OF FSB SECTION 070001)

DIVISION 08 – OPENINGS

089119 FIXED LOUVERS

DIVISION 09 – FINISHES (FSB REQUIRED)

*090003 ACOUSTICAL TILE (FSB REQUIRED)
*090007 PAINTING (FSB REQUIRED)
092116 GYPSUM BOARD ASSEMBLIES
*095113 ACOUSTICAL PANEL CEILINGS (PART OF FSB SECTION 090003)
096400 WOOD FLOORING
096500 RESILIENT FLOORING
096813 TILE CARPETING
*099100 PAINTING (PART OF FSB SECTION 090007)

DIVISION 10 – SPECIALTIES

104400 FIRE PROTECTION SPECIALTIES
105200 AUTOMATIC FIRE CURTAINS

DIVISION 11 – EQUIPMENT

116143 STAGE CURTAINS

DIVISION 14 - CONVEYING EQUIPMENT (FSB REQUIRED)

*140001 ELEVATORS (FSB REQUIRED)
*144200 WHEELCHAIR LIFTS (PART OF FSB SECTION 140001)

DIVISION 23 - HVAC (FSB REQUIRED)

230000 HEATING, VENTILATION AND AIR CONDITIONING

DIVISION 26 - ELECTRICAL (FSB REQUIRED)

260000 ELECTRICAL
265561 THEATRICAL LIGHTING AND CONTROL SYSTEM

DIVISION 27 – AUDIO VISUAL

274000 AUDIO VISUAL

PART 4: CONSTRUCTION DOCUMENT DRAWING LIST

Drawing Number	Drawing Title
-	Cover Sheet

GENERAL

COVERSHEET

ARCHITECTURAL DEMOLITION

AD101 CAFETERIA/ KITCHEN DEMO FLOOR PLAN
AD102 AUDITORIUM DEMO FLOOR PLAN
AD103 AUDITORIUM BALCONY DEMO FLOOR PLAN
AD104 CAFETERIA/ KITCHEN DEMO RCP
AD105 AUDITORIUM DEMO RCP
AD106 INTERIOR DEMO ELEVATIONS
AD107 PHOTO REFERENCES FOR DEMO
AD108 PHOTO REFERENCES FOR DEMO

ARCHITECTURAL

A001 SYMBOLS AND ABBREVIATIONS
A010 CODE DATA SHEET
A101 CAFETERIA/ KITCHEN FLOOR PLAN
A102 AUDITORIUM FLOOR PLAN
A103 AUDITORIUM BALCONY FLOOR PLAN

A121 CAFETERIA/ KITCHEN RCP
A122 AUDITORIUM RCP
A123 AUDITORIUM BALCONY RCP
A401 STAIR AND RAILING DETAILS
A511 INTERIOR DETAILS
A512 STRUCTURAL DETAILS
A602 FINISH SCHEDULE AND OPENINGS
A630 CAFETERIA/ KITCHEN FLOOR FINISH PLAN
A631 AUDITORIUM FLOOR FINISH PLAN
A632 AUDITORIUM BALCONY FLOOR FINISH PLAN
A701 INTERIOR ELEVATIONS

MECHANICAL DEMO

HD201 HVAC CAFETERIA/ KITCHEN DEMO FLOOR PLAN
HD202 HVAC AUDITORIUM DEMO FLOOR PLAN
HD203 HVAC AUDTIORIUM BALCONY DEMO FLOOR PLAN
HD204 HVAC ROOF DEMO FLOOR PLAN

MECHANICAL

H000 HVAC LEGEND, NOTES AND ABBREVIATIONS
H201 HVAC CAFETERIA/ KITCHEN FLOOR PLAN
H202 HVAC AUDITORIUM FLOOR PLAN
H203 HVAC AUDITORIUM BALCONY FLOOR PLAN
H204 HVAC ROOF PLAN
H500 HVAC CONTROLS SEQUENCES
H501 HVAC CONTROLS SEQUENCES
H700 HVAC DETAILS
H701 HVAC DETAILS
H702 HVAC DETAILS
H800 HVAC SCHEDULES

ELECTRICAL DEMO

ED201 FIRE ALARM CAFETERIA/ KITCHEN FLOOR PLAN
ED202 FIRE ALARM AUDITORIUM FLOOR PLAN
ED203 FIRE ALARM AUDITORIUM BALCONY FLOOR PLAN

ELECTRICAL

E000 ELECTRICAL LEGEND, NOTES AND ABBREVIATIONS
E100 ELECTRICAL KITCHEN AND AUDITORIUM ROUTING PLANS

E201 ELECTRICAL LIGHTING CAFETERIA/ KITCHEN FLOOR PLAN
E202 ELECTRICAL LIGHTING AUDITORIUM FLOOR PLAN
E203 ELECTRICAL LIGHTING AUDITORIUM BALCONY FLOOR PLAN
E301 ELECTRICAL POWER CAFETERIA/ KITCHEN FLOOR PLAN
E302 ELECTRICAL POWER AUDITORIUM FLOOR PLAN
E303 ELECTRICAL POWER AUDITORIUM BALCONY FLOOR PLAN
E401 ELECTRICAL FIRE ALARM CAFETERIA/ KITCHEN FLOOR PLAN
E402 ELECTRICAL FIRE ALARM AUDITORIUM FLOOR PLAN
E403 ELECTRICAL FIRE ALARM AUDITORIUM BALCONY FLOOR PLAN
E500 ELECTRICAL SCHEDULES AND DETAILS

AUDIO VISUAL DEMO

AVD201 AUDIO VISUAL CAFETERIA/KITCHEN DEMO FLOOR PLAN
AVD202 AUDIO VISUAL AUDITORIUM DEMO FLOOR PLAN
AVD203 AUDIO VISUAL AUDITORIUM BALCONY DEMO FLOOR PLAN

AUDIO VISUAL

AV000 AUDIO VISUAL LEGEND, NOTES AND ABBREVIATIONS
AV201 AUDIO VISUAL CAFETERIA/ KITCHEN FLOOR PLAN
AV202 AUDIO VISUAL AUDITORIUM FLOOR PLAN
AV203 AUDIO VISUAL AUDITORIUM BALCONY FLOOR PLAN

NOTE: Bidders shall check the attached documents with the above list to verify all parts are included before submitting a bid.

PART 1 SECTION 00020:

CITY OF SOMERVILLE MASSACHUSETTS
INVITATION TO BID
REPAIRS TO SOMERVILLE HIGH SCHOOL
AUDITORIUM, KITCHEN AND CAFETERIA
Bid No. IFB #14-71

Enclosed you will find an invitation to bid for: **Repairs to Somerville High School Auditorium, Kitchen and Cafeteria, 81 Highland Avenue, Somerville, MA 02143.**

Plans and specifications will be available online from the City's Purchasing Department web page: http://www.somervillema.gov/departments/finance/purchasing/bids and via email by request to amallen@somervillema.gov . Bid documents may be printed upon request upon deposit of $ 100.00 for each set in the form of a check made payable to the City of Somerville. **The deposit will be refundable, upon return of the plans and specifications in good condition.** Any person requesting additional sets will be required to pay an additional fee, for each additional set, in the amount of $ 100.00 per set. Bidders must allow up to three business days from time of request before printed documents will be available.

A Pre-Bid Conference and site visit, will be held on Tuesday, March 11, 2014 at 10:00 AM, Somerville High School, 81 Highland Avenue Somerville, MA 02143. Participants shall convene at the main entrance at this address, located on the concourse.

File Sub-bids, no file sub-bids are required on this project.

Sealed general bids will be received at the Purchasing Department, 1st Floor, City Hall, 93 Highland Avenue, Somerville, MA 02143 until, **no later than 11:00AM, on March 19, 2014 for Filed Sub-Bids and March 27, 2014 for General Contractor Bids** at which time all general bids will be publicly opened and read aloud.

Please mark the outside of all sealed bid envelopes (for filed sub-bids and general bids) with the following: **"IFB #14-71." Filed sub-bidders shall also indicate on the envelope which trade(s) are included in the enclosed bid(s).**

BIDS SUBMITTED MUST BE AN ORIGINAL.

The completion of the forms provided and listed in Part 1, Section 3 is necessary for consideration of a potential contract award. When submitting bid documents, please refer to Part I, Section 3 where the Bidder's Checklist appears and retain the order of documents as originally provided.

All general bids and filed sub-bids shall be accompanied by a bid deposit in the form of a certified, cashier's or treasurer's check issued by a responsible bank or trust company made payable to the City of Somerville, or a bid bond, in an amount not less than five percent (5%) of the value of the bid. The City of Somerville's Responsible Employer Ordinance, and the Massachusetts Prevailing Wage Rates apply to this procurement.

CITY HALL HOURS: WE ARE OPEN MONDAY THROUGH WEDNESDAY, 8:30AM THROUGH 4:30PM, UNTIL 7:30 P.M. ON THURSDAYS, AND CLOSE ON FRIDAYS AT 12:30 P.M.

PART 1, SECTION 2:

INSTRUCTIONS TO BIDDERS

(Chapter 149M – Construction- Competitive Sealed Bids)

1. **NAME OF PROJECT**

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

2. **AWARDING AUTHORITY**

The City of Somerville (City), acting by and through the Purchasing Department, invites sealed bids for repairs to Somerville High School auditorium and parts of the kitchen at the Somerville High School in accordance with the Contract Documents.

Contact:

Angela M. Allen
Director of Purchasing

City of Somerville
93 Highland Avenue
Somerville, MA 02143
Phone (617) 625-6600 x3400

Skip Bandini,
Director, Capital Projects & Planning

City of Somerville
One Franey Road
Somerville, MA 02145
Phone (617) 625-6600 x5123

3. ARCHITECT:

CDR Maguire, Inc.
211 Congress Street, 11th Floor
Boston, MA 02110

Contact: Fabrizio Caruso, Project Manager
Phone: (617) 778 - 1464
Fax: (617) 348 - 2413

4. **LOCATION OF PROJECT**

The location of the Somerville High School is at 81 Highland Avenue, Somerville, MA.

5. BRIEF DESCRIPTION OF WORK MORE PARTICULARLY DESCRIBED IN THE PLANS AND SPECIFICATIONS INCLUDED AS PART OF THIS BID PACKAGE.

The City seeks demolition, remediation, and construction services for the Repairs to Somerville High School Auditorium, Kitchen and Cafeteria. The project is located at 81 Highland Street, Somerville, MA 02143. The project area is approximately 17,966 SF.

ESTIMATED CONSTRUCTION COST OF THE PROJECT

The estimated cost for the project is $2,400,000

6. PROJECT SCHEDULE:

Construction Start:	April 3, 2014
Date of Substantial Completion:	August 15, 2014
Date of Final Completion: 100% completion of all work.	August 29, 2014

Bidders are instructed to note the firmness of the dates of Final Completion. For the purpose of meeting these deadlines, the City may be prepared to authorize extended work hours beyond those prescribed by City ordinance, to include work on Sundays with the prior permission of the City.

Contractor submission of all paperwork required for the Construction Contract, including but not limited to insurance certificates, performance and payment bonds, a certificate of good standing from the Secretary of State, and four complete originals of the contract with ink-signed signature pages shall be submitted to the Purchasing Director no later than 5 working days from award of the contract.

The successful bidder shall be required to submit a preliminary construction schedule within 10 days of the established date of award of the Contract and a more detailed Gantt-type construction schedule within 15 days of the established award of the contract, which shows the dates of substantial and final completion.

7. GOVERNING LAW

Massachusetts General Laws, c. 149M.

8. SALES TAX EXEMPTION

Materials, equipment, and supplies for this project are exempt from sales tax in accordance with M.G.L. Chapter 64H, Section 6 (d). The city will furnish the successful bidder with its sales tax exemption number.

9. PERMIT FEES

Contractor is responsible for all permits. Fees for City of Somerville permits are waived.

10. MINIMUM BID CRITERIA

- All bidders must have been conducting business, in this specified field, for a minimum of five (5) years.
- All bidders must have successfully constructed a minimum of three projects similar in magnitude within the last six (6) years.
- All bidders must be DCAMM certified for general construction.

11. PRE-BID CONFERENCE QUESTIONS AND INFORMATION

A Pre-Bid Conference and site visit, will be held on Tuesday, March 11 at 10:00 a.m., Somerville High School, 81 Highland Avenue, Somerville MA 02143.

All questions regarding the project and this Invitation to Bid should be in writing, submitted to Angela M. Allen, Purchasing Director, Purchasing Department, Somerville City Hall, First Floor, 93 Highland Avenue, Somerville, Massachusetts, 02143. Questions may be submitted either by mail, or email to amallen@somervillema.gov.

Questions must be submitted in writing **by 12:00 p.m., Wednesday, March 12, 2014,** and they will be answered in writing to all holders of the bid proposals. Bidders must submit e-mail address (preferred) or a fax number with their inquiries. If any bidders contact any other person or department outside of Purchasing with inquiries, they may be disqualified from the bidding process.

Key Dates

Pre-bid Conference	10:00 a.m.	March 11, 2014
Deadline for Questions	12:00 p.m.	March 12, 2014
Filed Sub Bids Due and Opened	11:00 a.m.	March 19, 2014
General Contractor Bids Due and Opened	11:00 a.m.	March 27, 2014
Anticipated Contract Award		April 1, 2014
Anticipated Notice to Proceed		April 1, 2014
Commencement of Work		April 3, 2014
Project Completion		August 15, 2014

12. BID SUBMISSION TIME AND PLACE OF BID OPENING

Sealed bids (clearly identified as a bid and endorsed with the name and address of the bidder) must be received **no later than 11:00 a.m.** by the Purchasing Department, first floor, City Hall, 93 Highland Avenue, Somerville, MA, 02143, **on March 19, 2014 for Filed Sub-Bids and March 27, 2014 for General Contractor Bids**, at which time they will be publicly opened and read aloud. In the event City Hall is closed, the deadline shall be 11:00 a.m. on the next day City Hall is open for business.

ADDITIONAL REQUIREMENTS: PLEASE READ CAREFULLY, FAILURE TO MEET THESE REQUIREMENTS COULD RESULT IN REJECTION OF A BID.

13. BID SUBMISSION REQUIREMENTS

Bid Signature

A bid must be signed as follows: 1) if the bidder is an individual, by her/him personally; 2) if the bidder is a partnership, by the name of the partnership, followed by the signature of each general partner; and 3) if the bidder is a corporation or limited liability company (LLC), by the authorized officer, whose signature must be a person named on the Corporate Secretary's

Certificate of Authority or Certificate of Authority for an LLC (see required forms in this bid package).

Changes and Addenda

If any changes are made to this IFB, an addendum will be issued. Addenda will be posted on the city's purchasing web-page (http://www.somervillema.gov/departments/finance/purchasing/bids) e-mailed to all bidders on record as having picked up the IFB. No changes may be made to the bid documents, except as authorized in an addendum from the Purchasing Department.

Modification or Withdrawal of Bids, Mistakes, and Minor Informalities

A bidder may correct, modify, or withdraw a bid by written notice received by the City of Somerville prior to the time and date set for the bid opening. Bid modifications must be submitted in a sealed envelope clearly labeled "Modification No.__" to the address listed in part one of this section. Each modification must be numbered in sequence, and must reference the original IFB.

After the bid opening, a bidder may not change any provision of the bid in a manner prejudicial to the interests of the City or fair competition. Minor informalities will be waived or the bidder will be allowed to correct them. If a mistake and the intended correct bid are clearly evident on the face of the bid document, the mistake will be corrected to reflect the intended correct bid, and the bidder will be notified in writing; the bidder may not withdraw the bid. A bidder may withdraw a bid if a mistake is clearly evident on the face of the bid document, but the intended correct bid is not similarly evident.

Right to Cancel/Reject Bids

The City of Somerville may cancel this IFB, or reject in whole or in part any and all bids, if the City determines that cancellation or rejection serves the best interests of the City.

Bid Prices to Remain Firm

All bid prices submitted in response to this IFB must remain firm for 60 days following the bid opening.

Unbalanced Bids

The City reserves the right to reject unbalanced, front loaded, and conditional bids.

Documents to be Submitted as part of Bid:

The following documents must be submitted with the complete signed bid package:

Bid Submission Documents (Section 003000)

Form for General Bid (Section 003050)

Living Wage Form (Section 003200)

Responsible Employer Ordinance (Section 003250)

Acknowledgement of Notice to Bidders (Section 003300)

Quality Requirements Form (Section 003350)

Certificate of Non-Collusion and Tax Compliance (Section 003400)

Certificate of Signature Authority (Section 003500)

Signature Form (Section 003600)

Reference Form (Section 003700)

Schedule of Values. Bidders do not need to include a Schedule of Values with their bid package. The successful bidder will be required to submit a refined and detailed schedule of values for review and approval by the design professional prior to signing the construction contract.

5% Statutory Bid Guaranty. All bids shall be accompanied by a bid bond or bank certified check or bank treasurer's check in the amount of 5% of the bid price, which shall become the property of the City of Somerville if the bid is accepted and the bidder neglects or refuses to comply with the terms of the bid.

For successful bidder: Certificate of Good Standing: If the bidder is a corporation, a Certificate of Good Standing should accompany the signed contract. Certificate available online at:http://corp.sec.state.ma.us/corp/Certificates/Certificate_Request.asp
or call Tel: (617) 727-9640 for more information.

QUALITY REQUIREMENTS

Please respond to the following questions. A negative response to any of the first four questions will automatically disqualify the Bidder. A negative response to the final question about SOMWBA will not disqualify the Bidder.

	Yes	No
Has the contractor been established in this specified field for at least 5 years?		
Has the contractor successfully completed a minimum of three (3) similar projects within the past six (6) years?		
Can the contractor certify that all employees to be provided have successfully completed at least 10 hours of OSHA		

approved training in Construction Safety and Health?		
Is the General Contractor DCAMM Certified?		
Optional: Vendor: Are you a State Office for Minority and Women Owned Business Assistance (SOMWBA) certified minority- or woman- owned business?		

14. APPLICABLE WAGE RATES:

The contractor shall pay State prevailing wage rates. The applicable wage rates are attached as part of this bid package and will be included as Appendix J in the contract. A signed Compliance Form must be included with the bid package, Form included.

15. SAMPLE CONSTRUCTION CONTRACT

The successful bidder shall execute with the City of Somerville a Contract ("Contract") in substantially the same form as the sample contract included in this bid package. In addition to the items submitted with the bid, the contract includes certain other documents which may be executed by the Bidder selected as contractor and which are included as Appendices to the Sample Construction Contract (see Part 2) include:

Certificate of Authority (for corporations and LLC's if the contract is signed by other than the President, there must be a current Certificate of Vote signed by the corporate clerk or secretary stating who is authorized to sign contracts on the Corporations or LLC's behalf)

Appendix D: Insurance Certificates– evidencing minimum coverage as follows:
General Liability - $1,000,000 per occurrence, $2,000,000 aggregate
Automobile Liability: $500,000 per occurrence, $1,000,000 aggregate
Workman's Compensation: statutory coverage

Appendix F: Certificate of Good Standing: Certificate available online at
http://corp.sec.state.ma.us/corp/Certificates/Certificate_Request.asp
or call Tel: (617) 727-9640 for more information.

Appendix H: Statement of Management (for contracts over $100,000.00)

Appendix I: Performance and Payment Bonds for 100% of the contract sum

All paperwork required for the contract shall be completed and delivered to the Purchasing Department no later than five (5) working days after the Award of the Contract.

ITEMS OF SPECIAL CONSIDERATION

The Contractor's attention is specifically drawn to the following items of special consideration relative to this project, most of which are also addressed in the Technical Specifications.

a. The Contractor must provide police details at the Contractor's expense.

b. The Contractor must obtain all permits as necessary.

19. RESERVATION OF RIGHTS

The City reserves the right to extend the deadline for submission of bids, to request supplemental information, to waive minor informalities, and reserves the right to reject any and all bids, if in its sole judgment, the best interests of the City of Somerville would be served by doing so.

20. RULE FOR AWARD

A contract will be awarded to the lowest responsible and eligible bidder. All required bid documents must be provided to be deemed responsive and eligible.

PART 1 SECTION 3

Somerville High School
Repairs to Somerville High School Auditorium, Kitchen and Cafeteria
(IFB # 14-71)

BID SUBMISSION DOCUMENTS

BIDDERS NAME: _____

This Bid Submission includes the following:

____ Form for General Bid

____ Unit Price Proposal Form

____ Quality Requirements

____ Somerville Living Wage Form

____ Responsible Employer Ordinance Form

____ Acknowledgement of Notice to Bidders

____ Certificate of Non-Collusion and Tax Compliance

_____Certificate of Signature Authority

_____Signature Form

_____Reference Form

_____5% Statutory Bid Bond or Guaranty

_____Prevailing Wage Compliance Form

_____DCAMM Certificate of Eligibility and Update Statement

**Part 1 Section 003050: FORM FOR GENERAL BID
FOR CONSTRUCTION CONTRACT**

To the Awarding Authority:

A. The undersigned proposes to furnish all labor and materials required for:

Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

in accordance with the accompanying plans and specifications prepared by

CDR Maguire Inc.
211 Congress Street, 11th Floor
Boston, MA 02110

Contact: Fabrizio Caruso, Project Manager
Phone: (617) 778 - 1440
Fax: (617) 348 - 2143

specified below, subject to additions and deductions according to the terms of the specifications.

B. This bid includes addenda #1_____, #2 _____, #3 _____, #4 _____.

C. The proposed contract price is:

$_____.
(total bid in figures)

_____DOLLARS
(total bid in words)

D. While the proposed contract price does not include the items listed on the attached "Bid Form for Alternates," the bidder understands that the project construction cost estimate provided by the city is inclusive of all the work described in this form.

E. The Undersigned Bidder agrees that, if it is selected as general contractor, it will within five working days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the Awarding Authority, execute a contract in accordance with the terms of this bid, including furnishing a 100% performance bond and a 100% labor and materials or payment bond, each of a surety company qualified to

do business under the laws of the Commonwealth of Massachusetts and satisfactory to the Awarding Authority and each in the sum of the contract price, the premiums for which are to be paid by the general contractor and are included in the contract price; and, in addition, furnishing a certificate of good standing and insurance certificates as required by the bid documents.

F. The Undersigned Bidder hereby certifies that it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Project and that it will comply fully with all laws and regulations applicable to this Award, including applicable provisions of MGL Chapter c. 149M.

G. The Undersigned Bidder further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

H. The Undersigned Bidder certifies under the penalties of perjury that:

(1) Pursuant to M.G.L. c. 62C, §49A, to the best of the signatories knowledge and belief, that the Undersigned Bidder is in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support, as well as paid all contributions and payments in lieu of contributions pursuant to MGL 151A, §19A(b), and

(2) the Federal Employer Identification Number (EIN) of the Bidder is # _____, and that it is in compliance with all federal, state, and local laws regarding taxation.

I. The Undersigned Bidder certifies under penalties of perjury that the Bidder is not presently debarred from doing federal or state public construction work, that the Bidder has not had its low bid rejected by any municipality in the previous two years, except

_____

in which case the reasons for rejection were as follows:

_____

J. The Undersigned Bidder has submitted the information on the Reference Form:

- (00370-1), requesting three references for similar projects completed during the previous six (6) years. The Undersigned Bidder understands that the contractor and subcontractors will be required to pay prevailing wages to laborers and mechanics, and that if the Undersigned's bid is significantly below the average bid, the Awarding Authority may require the Bidder to substantiate that the bid is based on payment of wages at prevailing rates.

M. The Undersigned Bidder certifies that it can achieve Final Completion by: March 14, 2014

Executed this _____ day of _____ 20 .

On behalf of :

_____
(Undersigned Bidder Business Name)

_____

_____
(Business Address) and (Telephone)

By:

_____
(Name and Address of Person Signing Bid)

_____
(Title of Person Signing bid)

SOMERVILLE LIVING WAGE ORDINANCE CERTIFICATION FORM

CITY OF SOMERVILLE CODE OF ORDINANCES SECTION 2-397 et seq[1].

Instructions: This form shall be included in all Invitations for Bids and Requests for Proposals which involve the furnishing of labor, time or effort (with no end product other than reports) by vendors contracting or subcontracting with the City of Somerville, where the contract price meets or exceeds the following dollar threshold: $10,000. If the undersigned is selected, this form will be attached to the contract or subcontract and the certifications made herein shall be incorporated as part of such contract or subcontract. **Complete this form and sign and date where indicated below on page 2.**

Purpose: The purpose of this form is to ensure that such vendors pay a "Living Wage" (defined below) to all covered employees (i.e., all employees except individuals in a city, state or federally funded youth program). In the case of bids, the City will award the contract to the lowest responsive and responsible bidder paying a Living Wage. In the case of RFP's, the City will select the most advantageous proposal from a responsive and responsible offeror paying a Living Wage. In neither case, however, shall the City be under any obligation to select a bid or proposal that exceeds the funds available for the contract.

Definition of "Living Wage": For this contract or subcontract, as of **7/1/2013** "Living Wage" shall be deemed to be an hourly wage of no less than **$11.89** per hour. From time to time, the Living Wage may be upwardly adjusted and amendments, if any, to the contract or subcontract may require the payment of a higher hourly rate if a higher rate is then in effect.

CERTIFICATIONS

1. The undersigned shall pay no less than the Living Wage to all covered employees who directly expend their time on the contract or subcontract with the City of Somerville.

2. The undersigned shall post a notice, (copy enclosed), to be furnished by the contracting City Department, informing covered employees of the protections and obligations provided for in the Somerville Living Wage Ordinance, and that for assistance and information, including copies of the Ordinance, employees should contact the contracting City Department. Such notice shall be posted in each location where services are performed by covered employees, in a conspicuous place where notices to employees are customarily posted.

3. The undersigned shall maintain payrolls for all covered employees and basic records relating hereto and shall preserve them for a period of three years. The records shall contain the name and address of each employee, the number of hours worked, the gross wages, a copy of the social

[1]Copies of the Ordinance are available upon request to the Purchasing Department.

security returns, and evidence of payment thereof and such other data as may be required by the contracting City Department from time to time.

4. The undersigned shall submit payroll records to the City upon request and, if the City receives information of possible noncompliance with the provisions the Somerville Living Wage Ordinance, the undersigned shall permit City representatives to observe work being performed at the work site, to interview employees, and to examine the books and records relating to the payrolls being investigated to determine payment of wages.

5. The undersigned shall not fund wage increases required by the Somerville Living Wage Ordinance by reducing the health insurance benefits of any of its employees.

6. The undersigned agrees that the penalties and relief set forth in the Somerville Living Wage Ordinance shall be in addition to the rights and remedies set forth in the contract and/or subcontract.

CERTIFIED BY:

Signature: _____
(Duly Authorized Representative of Vendor)

Title: _____

Name of Vendor:_____

Date: _____

INSTRUCTIONS: PLEASE POST

NOTICE TO ALL EMPLOYEES REGARDING PAYMENT OF LIVING WAGE

Under the Somerville, Massachusetts' Living Wage Ordinance (Ordinance No. 1999-1), any person or entity who has entered into a contract with the City of Somerville is required to pay its employees who are involved in providing services to the City of Somerville no less than a "Living Wage".

The Living Wage as of **7/1/2013** is **$11.89** per hour. The only employees who are not covered by the Living Wage Ordinance are individuals in a Youth Program. "Youth Program" as defined in the Ordinance, "means any city, state or federally funded program which employs youth, as defined by city, state or federal guidelines, during the summer, or as part of a school to work program, or in any other related seasonal or part-time program."

For assistance and information regarding the protections and obligations provided for in the Living Wage Ordinance and/or a copy of the Living Wage Ordinance, all employees should contact the City of Somerville's Purchasing Department directly

CITY OF SOMERVILLE
ORDINANCE NO. 2008-08
IN THE BOARD OF ALDERMEN: June 12, 2008

Be it ordained by the Board of Aldermen, in session assembled, that the Code of Ordinances of the City of Somerville, is hereby amended by adding a new Section 2-355 as follows:

Sec. 2-355. Responsible Employer Ordinance.

(a) The Board of Aldermen hereby finds and determines that the failure of certain construction firms awarded contracts funded by the City to include and enforce provisions requiring compliance with state laws governing the payment of prevailing wages, the provision of workers compensation coverage, and the proper classification of individuals as employees and not as independent contractors, as well as provisions concerning health insurance coverage and state-certified apprenticeship programs, is injurious to the life, health and happiness of individuals employed by such firms and is deleterious to the quality of life in the City where most of such individuals reside.

(b) Every contract awarded by the City under G. L. c. 149, § 44A (2) where the amount of the contract is more than one-hundred thousand dollars, and any subcontract awarded in connection with any such general contract where the amount of such subcontract is more than twenty-five thousand dollars, shall be deemed to incorporate by reference the provisions of sub-parts (1) through (5) of this subsection together with the provisions of subsections (c), (d) and (e) of this section.

1. The bidder and all subcontractors under the bidder shall comply with the requirements of G. L. c. 149 concerning the payment of prevailing wage rates to their employees;
2. The bidder and all subcontractors under the bidder must maintain and participate in a bona fide apprentice training program as defined by G. L. c. 23, §§ 11H & 11I for each apprenticeable trade or occupation represented in its workforce that is approved by the division of apprentice training of the department of labor and workforce development of the Commonwealth and must abide by the apprentice to journeymen ratio for each trade prescribed therein in the performance of the contract;
3. The bidder and all subcontractors under the bidder must offer, at its expense, hospitalization and medical benefits for all individuals employed on the project or coverage which is comparable to the hospitalization and medical benefits provided by the health and welfare plans in the applicable craft recognized by G. L. c. 149, § 26, in establishing minimum wage rates. All such plans shall meet or exceed state requirements for such plans.
4. The bidder and all subcontractors under the bidder must maintain appropriate industrial accident insurance coverage in accordance with G. L. c. 152 for all individuals employed on the project;
5. The bidder and all subcontractors under the bidder must properly classify individuals employed on the project as employees rather than independent contractors and comply with all laws concerning workers' compensation insurance coverage, unemployment taxes, social security taxes and income taxes as respects all such employees.

(c) All bidders and all subcontractors under such bidders who are awarded, or otherwise obtain, contracts from the city on projects governed by G. L. c. 149, § 44A (2), shall comply with the obligations described in sub-parts (1) through (5) of subsection (b) of this section for the entire duration of their work on the project, and an officer of each such bidder or subcontractor under the bidder shall certify under oath and in writing on a weekly basis that they are in compliance with these obligations.

(d) Any bidder or subcontractor under the bidder who fails to comply with any of the obligations described in sub-parts (1) through (5) of subsection (b) of this section for any period of time, or fails to comply with the weekly certification obligations described in subsection (c) of this subsection shall be subject to any or all of the following sanctions:

1. temporary suspension of work on the project until compliance is obtained; or,
2. withholding by the City of payment due under the contract until compliance is obtained; or,
3. permanent removal from any further work on the project; or,
4. recovery by the city from the general contractor of 1/10 of 1% of the general contract or $ 1,000.00, whichever sum is greater, in the nature of liquidated damages assessed for each week that the general contractor is in non-compliance or, if a subcontractor is in non-compliance, the recovery by the city from the general contractor as a back charge against the subcontractor of 1/10 of 1% of the subcontract price, or $ 400.00, whichever sum is greater, in the nature of liquidated damages assessed for each week that the subcontractor is in non-compliance.

(e) In addition to these sanctions a general bidder or contractor shall be equally liable for any violation of the obligations described in sub-parts (l) through (5) of subsection (b) of this section committed by any of its subcontractors or sub bidders, excepting only those violations which arise from work performed by subcontractors with subcontracts governed by G. L. c. 149, § 44F. Any contractor or subcontractor who has been determined to have violated any of the provisions of subsections (b) or (c) of this section shall be barred from performing any work on any future contracts awarded by the City for six months for the first violation, three years for the second violation, and permanently for a third violation.

(f) The provisions of this section shall not apply to construction projects for which the low general bid was less than one-hundred thousand dollars, or to work performed pursuant to subcontracts governed by G. L. 149, § 44F where the bid for such subcontract was less than twenty-five thousand dollars.

Receipt Acknowledged _____ *day of* _____, *20*___.

_____
Name of Vendor

By: _____
Name

Its: _____
Title

_____
Signature

CITY OF SOMERVILLE
Responsible Employer Ordinance

WEEKLY COMPLIANCE FORM

In accordance with the Code of Ordinances of the City of Somerville, Section 2-355, all general contractors and all subcontractors under such general contractors who are awarded, or otherwise obtain, contracts from the city on projects governed by G. L. c. 149, § 44A (2), shall comply with the obligations described in sub-parts (1) through (5) of subsection (b) of this section for the entire duration of their work on the project, and an officer of each such general contractor or subcontractor under the general contractor where the amount of such subcontract is more than $25,000.00, shall certify under oath and in writing on a weekly basis that they are in compliance with these obligations.

NOTICE TO BIDDERS
IFB #14-71

All bids must be in accordance with terms and conditions set forth herein as stated.

SECTION A. **Sealed general bids** will be received at the office of the Purchasing Director, Somerville High School, 81 Highland Avenue, Somerville, MA. 02143 **no later than 11:00AM, on March 19, 2014 for Filed Sub-Bids and March 27, 2014 for General Contractor Bids,** at which time and place they will be publicly opened and read.

A Pre-Bid Conference and site visit, will be held on March 11, 2014 at 10:00 a.m., Somerville High School, 81 Highland Avenue, Somerville, MA 02143.

SECTION B. Forms of price bid, specifications and terms of contract can be obtained at the Purchasing Department office on or after **March 5, 2014.**

SECTION C. Bid envelopes shall be clearly marked as follows: **"IFB #14-71, Bid for Repairs to Somerville High School Auditorium, Kitchen and Cafeteria."**

SECTION D. If **awarded** vendor is a Corporation, vendor must comply with request for "Certificate of Good Standing". See attached instructions.

SECTION E. **INSURANCE: Awarded Vendor** must comply with insurance requirements as stated in the bid package.

SECTION F. Living Wage - see Somerville Living Wage Form (00320)
Prevailing Wage Rates
Responsible Employer Ordinance

SECTION G. The requirements in Section **E or F** will be waived if the words "Non-Applicable" **(N/A)** are inserted in the space designated.

SECTION H. The copy of the bid deposited with the City will be accompanied by a bid guarantee in the amount of 5% of the proposed bid amount. The estimated contract amount is $150,000.00. A Bid bond, Certified Check, Treasurer's Check, or Cashier's Check made payable to the City must be submitted with each bid. Said bid guarantee will become the property of the City of Somerville if the proposal is accepted and the bidder either neglects or refuses to comply with the terms of the proposal. Bid guarantee will be returned within 30 days to all unsuccessful bidders.

SECTION I. A Performance Bond and a Labor and Materials Bond in the amount of 100% of the total contract price will be required by the City.

SECTION J. The Purchasing Director reserves the right to accept or reject any or all bids, to waive any minor informalities, if in her sole judgment, the best interest of the City of Somerville would be served by so doing.

SECTION K. The City reserves the right to cancel a contract, if awarded bidder does not respond to all necessary documents and required signature forms within ten (10) working days of receipt of contract.

SECTION L. The Vendor must certify that all employees to be provided have successfully completed at least ten (10) hours of OSHA approved training in Construction Safety and Health.

Signature:_____

Company:_____

By: _____ Title:_____

Date:_____ Tel. No: _____Fax:_____

Applicable to Corporations:

I hereby attest that the signatory to this bid has the authority to sign and submit bids for the Corporation.

ATTEST: _____
Secretary

Non-Collusion Form and Tax Compliance Certification

Instructions: Complete each part of this two-part form and sign and date where indicated below.

A. NON-COLLUSION FORM

I, the undersigned, hereby certify under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person.

As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

Signature: _____
(**Individual Submitted Bid or Proposal)**
Duly Authorized

Name of Business or Entity:_____

Date: _____

B. TAX COMPLIANCE CERTIFICATION

Pursuant to M.G.L. c. 62C, §49A, I certify under the penalties of perjury that, to the best of my knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support, as well as paid all contributions and payments in lieu of contributions pursuant to MGL 151A, §19A(b).

Signature: _____
(Duly Authorized Representative of Vendor)

Name of Business or Entity:_____

Social Security Number or Federal Tax ID#:_____

Date: _____

Certificate of Authority
(Corporations Only)

Instructions: Complete this form and sign and date where indicated below.

1. I hereby certify that I, the undersigned, am the duly elected Clerk/Secretary of

_____.
(Insert Full Name of Corporation)

2. I hereby certify that the following individual _____
(Insert the Name of Officer who Signed the Contract and Bonds)

is the duly elected_____ of said Corporation.
(Insert the Title of the Officer in Line 2)

3. I hereby certify that on _____
(Insert Date: Must be *on or before* Date Officer Signed Contract/Bonds)

at a duly authorized meeting of the Board of Directors of said corporation, at which a quorum was present, it was voted that

_____ _____
(Insert Name of Officer from Line 2) (Insert Title of Officer from Line 2)

of this corporation be and hereby is authorized to make, enter into, execute, and deliver contracts and bonds in the name and on behalf of said corporation, and affix its Corporate Seal thereto, and such execution of any contract of obligation in this corporation's name and on its behalf, with or without the Corporate Seal, shall be valid and binding upon this corporation; and that the above vote has not been amended or rescinded and remains in full force and effect as of the date set forth below.

4. **ATTEST**:
Signature: _____ ***AFFIX CORPORATE SEAL HERE***
(**Clerk or Secretary)**
Printed Name: _____

Printed Title:_____

Date: _____
(Date Must Be *on or after* Date Officer Signed Contract/Bonds)

Certificate of Authority
(Limited Liability Companies Only)

Instructions: Complete this form and sign and date where indicated below.

1. I, the undersigned, being a member or manager of

_____,
(Complete Name of Limited Liability Company)

a limited liability company (LLC) hereby certify as to the contents of this form for the purpose of contracting with the City of Somerville.

2. The LLC is organized under the laws of the state of: _____.

3. The LLC is managed by **(check one)** a Manager or by its Members.

4. I hereby certify that each of the following individual(s) is:
   - a member/manager of the LLC;
   - duly authorized to execute and deliver this contract, agreement, and/or other legally binding documents relating to any contract and/or agreement on behalf of the LLC;
   - duly authorized to do and perform all acts and things necessary or appropriate to carry out the terms of this contract or agreement on behalf of the LLC; and
   - that no resolution, vote, or other document or action is necessary to establish such authority.

Name	Title

5. **Signature**:_____

   Printed Name: _____

   Printed Title:_____

   Date: _____

CITY OF SOMERVILLE

SIGNATURE FORM

NAME OF COMPANY: _____

ADDRESS: _____

TELEPHONE #:_____ FAX #: _____

DATE: _____ EMAIL: _____

SIGNATURE OF AUTHORIZED CONTRACTING OFFICIAL:

_____

TITLE: _____

RESIDENCE: _____

IF COMPANY IS A PARTNERSHIP:

FULL NAME AND RESIDENCE OF EACH PARTNER:

_____

_____

IF COMPANY IS A CORPORATION:

THE CORPORATE NAME IS: _____

THE CORPORATION IS ORGANIZED UNDER THE LAWS OF: _____

THE PRESIDENT IS: _____

THE TREASURER IS: _____

THE CLERK/SECRETARY OR ASSISTANT CLERK/SECRETARY WHO WILL EXECUTE THE CONTRACT AND SIGN THE CERTIFICATE OF AUTHORITY IS:

_____

NAME OF CORPORATION THAT WILL APPEAR ON A POTENTIAL CONTRACTUAL AGREEMENT IF DIFFERENT FROM ABOVE:_____.

NAME AND TITLE OF PERSON WHO WILL BE THE PRINCIPAL SIGNATORY ON THE CONTRACT IF OTHER THAN THE PRESIDENT:

NAME:_____TITLE: _____

REFERENCE FORM

Bidder:_____

IFB Title: **Repairs to Somerville High School Auditorium, Kitchen and Cafeteria.**
Bidder must provide references from three municipalities for similar projects completed during the previous six (6) years.

Reference:_____ Contact:_____

Address:_____ Phone:_____

_____ Fax:_____

Description and date(s) of supplies or services provided:_____

_____

_____

Reference:_____ Contact:_____

Address:_____ Phone:_____

_____ Fax:_____

Description and date(s) of supplies or services provided:_____

_____

_____

Reference:_____ Contact:_____

Address:_____ Phone:_____

_____ Fax:_____

Description and date(s) of supplies or services provided:_____

_____

BID BOND OR GUARANTY

BIDDER TO INSERT HERE

Section 4: Other Bid Documents

Division of Labor and Industries Wage Rates

DEVAL L. PATRICK
Governor

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

RACHEL KAPRIELIAN
Secretary

HEATHER E. ROWE
Director

Awarding Authority: City of Somerville

Contract Number:

City/Town: SOMERVILLE

Description of Work: Building repairs to storm damaged auditorium, kitchen and caferia.

Job Location: 81 Highland Avenue, Somerville, MA

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- Awarding authorities must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. Once a contractor has been selected by the awarding authority, the wage schedule shall be made a part of the contract for that project. The wage schedule must be posted in a conspicuous place at the work site during the life of the project in accordance with M.G.L. c. 149, § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project regardless of whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Training (DAT). Apprentices must keep his/her apprentice identification card on his/her person during all work hours on the project. If an apprentice rate is listed on the prevailing wage schedule for the trade in which an apprentice is registered with the DAT, the apprentice may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **If an apprentice rate is not listed on the prevailing wage schedule for the trade in which an apprentice is registered with the DAT, the apprentice must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports directly to the awarding authority and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$32.05	$9.41	$8.80	$0.00	$50.26
	06/01/2014	$32.40	$9.41	$8.80	$0.00	$50.61
	08/01/2014	$32.40	$9.91	$8.80	$0.00	$51.11
	12/01/2014	$32.40	$9.91	$9.33	$0.00	$51.64
	06/01/2015	$32.75	$9.91	$9.33	$0.00	$51.99
	08/01/2015	$32.75	$10.41	$9.33	$0.00	$52.49
	12/01/2015	$32.75	$10.41	$10.08	$0.00	$53.24
	06/01/2016	$33.25	$10.41	$10.08	$0.00	$53.74
	08/01/2016	$33.25	$10.91	$10.08	$0.00	$54.24
	12/01/2016	$33.25	$10.91	$10.89	$0.00	$55.05
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$32.12	$9.41	$8.80	$0.00	$50.33
	06/01/2014	$32.47	$9.41	$8.80	$0.00	$50.68
	08/01/2014	$32.47	$9.91	$8.80	$0.00	$51.18
	12/01/2014	$32.47	$9.91	$9.33	$0.00	$51.71
	06/01/2015	$32.82	$9.91	$9.33	$0.00	$52.06
	08/01/2015	$32.82	$10.41	$9.33	$0.00	$52.56
	12/01/2015	$32.82	$10.41	$10.08	$0.00	$53.31
	06/01/2016	$33.32	$10.41	$10.08	$0.00	$53.81
	08/01/2016	$33.32	$10.91	$10.08	$0.00	$54.31
	12/01/2016	$33.32	$10.91	$10.89	$0.00	$55.12
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$32.24	$9.41	$8.80	$0.00	$50.45
	06/01/2014	$32.59	$9.41	$8.80	$0.00	$50.80
	08/01/2014	$32.59	$9.91	$8.80	$0.00	$51.30
	12/01/2014	$32.59	$9.91	$9.33	$0.00	$51.83
	06/01/2015	$32.94	$9.91	$9.33	$0.00	$52.18
	08/01/2015	$32.94	$10.41	$9.33	$0.00	$52.68
	12/01/2015	$32.94	$10.41	$10.08	$0.00	$53.43
	06/01/2016	$33.44	$10.41	$10.08	$0.00	$53.93
	08/01/2016	$33.44	$10.91	$10.08	$0.00	$54.43
	12/01/2016	$33.44	$10.91	$10.89	$0.00	$55.24
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$84.21	$9.80	$18.17	$0.00	$112.18
	08/01/2014	$87.36	$9.80	$18.17	$0.00	$115.33
	08/01/2015	$90.51	$9.80	$18.17	$0.00	$118.48
AIR TRACK OPERATOR *LABORERS - ZONE 1*	12/01/2013	$34.10	$7.30	$12.70	$0.00	$54.10
	06/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	12/01/2014	$35.60	$7.30	$12.70	$0.00	$55.60
	06/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	12/01/2015	$37.10	$7.30	$12.70	$0.00	$57.10
	06/01/2016	$37.85	$7.30	$12.70	$0.00	$57.85
	12/01/2016	$38.85	$7.30	$12.70	$0.00	$58.85

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	12/01/2013	$30.68	$10.40	$5.95	$0.00	$47.03
	06/01/2014	$31.58	$10.40	$5.95	$0.00	$47.93
	12/01/2014	$32.48	$10.40	$5.95	$0.00	$48.83
	06/01/2015	$33.43	$10.40	$5.95	$0.00	$49.78
	12/01/2015	$34.38	$10.40	$5.95	$0.00	$50.73
ASPHALT RAKER *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 1*	12/01/2013	$34.10	$7.30	$12.70	$0.00	$54.10
	06/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	12/01/2014	$35.60	$7.30	$12.70	$0.00	$55.60
	06/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	12/01/2015	$37.10	$7.30	$12.70	$0.00	$57.10
	06/01/2016	$37.85	$7.30	$12.70	$0.00	$57.85
	12/01/2016	$38.85	$7.30	$12.70	$0.00	$58.85
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2010	$37.70	$6.97	$11.18	$0.00	$55.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2010

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$24.51	$6.97	$11.18	$0.00	$42.66
2	65	$24.51	$6.97	$11.18	$0.00	$42.66
3	70	$26.39	$6.97	$11.18	$0.00	$44.54
4	75	$28.28	$6.97	$11.18	$0.00	$46.43
5	80	$30.16	$6.97	$11.18	$0.00	$48.31
6	85	$32.05	$6.97	$11.18	$0.00	$50.20
7	90	$33.93	$6.97	$11.18	$0.00	$52.08
8	95	$35.82	$6.97	$11.18	$0.00	$53.97

Notes:

Apprentice to Journeyworker Ratio:1:5

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (BOSTON)*	02/01/2014	$48.06	$10.18	$18.15	$0.00	$76.39
	08/01/2014	$48.96	$10.18	$18.22	$0.00	$77.36
	02/01/2015	$49.52	$10.18	$18.22	$0.00	$77.92
	08/01/2015	$50.42	$10.18	$18.29	$0.00	$78.89
	02/01/2016	$50.99	$10.18	$18.29	$0.00	$79.46
	08/01/2016	$51.89	$10.18	$18.37	$0.00	$80.44
	02/01/2017	$52.46	$10.18	$18.37	$0.00	$81.01

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Boston*

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.03	$10.18	$18.15	$0.00	$52.36
2	60	$28.84	$10.18	$18.15	$0.00	$57.17
3	70	$33.64	$10.18	$18.15	$0.00	$61.97
4	80	$38.45	$10.18	$18.15	$0.00	$66.78
5	90	$43.25	$10.18	$18.15	$0.00	$71.58

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.48	$10.18	$18.22	$0.00	$52.88
2	60	$29.38	$10.18	$18.22	$0.00	$57.78
3	70	$34.27	$10.18	$18.22	$0.00	$62.67
4	80	$39.17	$10.18	$18.22	$0.00	$67.57
5	90	$44.06	$10.18	$18.22	$0.00	$72.46

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2013	$34.45	$7.30	$12.90	$0.00	$54.65
	06/01/2014	$35.20	$7.30	$12.90	$0.00	$55.40
	12/01/2014	$35.95	$7.30	$12.90	$0.00	$56.15
	06/01/2015	$36.70	$7.30	$12.90	$0.00	$56.90
	12/01/2015	$37.45	$7.30	$12.90	$0.00	$57.65
	06/01/2016	$38.20	$7.30	$12.90	$0.00	$58.40
	12/01/2016	$39.20	$7.30	$12.90	$0.00	$59.40
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2013	$33.30	$7.30	$12.90	$0.00	$53.50
	06/01/2014	$34.05	$7.30	$12.90	$0.00	$54.25
	12/01/2014	$34.80	$7.30	$12.90	$0.00	$55.00
	06/01/2015	$35.55	$7.30	$12.90	$0.00	$55.75
	12/01/2015	$36.30	$7.30	$12.90	$0.00	$56.50
	06/01/2016	$37.05	$7.30	$12.90	$0.00	$57.25
	12/01/2016	$38.05	$7.30	$12.90	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2013	$33.30	$7.30	$12.90	$0.00	$53.50
	06/01/2014	$34.05	$7.30	$12.90	$0.00	$54.25
	12/01/2014	$34.80	$7.30	$12.90	$0.00	$55.00
	06/01/2015	$35.55	$7.30	$12.90	$0.00	$55.75
	12/01/2015	$36.30	$7.30	$12.90	$0.00	$56.50
	06/01/2016	$37.05	$7.30	$12.90	$0.00	$57.25
	12/01/2016	$38.05	$7.30	$12.90	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 1 (Metro Boston)*	09/01/2013	$40.35	$9.80	$15.61	$0.00	$65.76
	03/01/2014	$41.18	$9.80	$15.61	$0.00	$66.59
	09/01/2014	$42.20	$9.80	$15.61	$0.00	$67.61
	03/01/2015	$43.22	$9.80	$15.61	$0.00	$68.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER - Zone 1 Metro Boston*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.18	$9.80	$1.57	$0.00	$31.55
2	60	$24.21	$9.80	$1.57	$0.00	$35.58
3	70	$28.25	$9.80	$10.90	$0.00	$48.95
4	75	$30.26	$9.80	$10.90	$0.00	$50.96
5	80	$32.28	$9.80	$12.47	$0.00	$54.55
6	80	$32.28	$9.80	$12.47	$0.00	$54.55
7	90	$36.32	$9.80	$14.04	$0.00	$60.16
8	90	$36.32	$9.80	$14.04	$0.00	$60.16

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.59	$9.80	$1.57	$0.00	$31.96
2	60	$24.71	$9.80	$1.57	$0.00	$36.08
3	70	$28.83	$9.80	$10.90	$0.00	$49.53
4	75	$30.89	$9.80	$10.90	$0.00	$51.59
5	80	$32.94	$9.80	$12.47	$0.00	$55.21
6	80	$32.94	$9.80	$12.47	$0.00	$55.21
7	90	$37.06	$9.80	$14.04	$0.00	$60.90
8	90	$37.06	$9.80	$14.04	$0.00	$60.90

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (BOSTON)*	01/01/2014	$43.60	$10.90	$18.71	$1.30	$74.51
	07/01/2014	$43.77	$10.90	$18.71	$1.30	$74.68
	01/01/2015	$44.69	$10.90	$18.71	$1.30	$75.60
	07/01/2015	$45.29	$10.90	$18.71	$1.30	$76.20
	01/01/2016	$46.21	$10.90	$18.71	$1.30	$77.12

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CEMENT MASONRY/PLASTERING - Eastern Mass (Boston)*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.80	$10.90	$12.21	$1.30	$46.21
2	60	$26.16	$10.90	$13.71	$1.30	$52.07
3	65	$28.34	$10.90	$14.71	$1.30	$55.25
4	70	$30.52	$10.90	$15.71	$1.30	$58.43
5	75	$32.70	$10.90	$16.71	$1.30	$61.61
6	80	$34.88	$10.90	$17.71	$1.30	$64.79
7	90	$39.24	$10.90	$18.71	$1.30	$70.15

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.89	$10.90	$12.21	$1.30	$46.30
2	60	$26.26	$10.90	$13.71	$1.30	$52.17
3	65	$28.45	$10.90	$14.71	$1.30	$55.36
4	70	$30.64	$10.90	$15.71	$1.30	$58.55
5	75	$32.83	$10.90	$16.71	$1.30	$61.74
6	80	$35.02	$10.90	$17.71	$1.30	$64.93
7	90	$39.39	$10.90	$18.71	$1.30	$70.30

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$41.49	$10.00	$14.18	$0.00	$65.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$28.11	$10.00	$14.18	$0.00	$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 1*	01/01/2014	$45.91	$7.85	$16.10	$0.00	$69.86
	07/01/2014	$46.76	$7.85	$16.10	$0.00	$70.71
	01/01/2015	$47.66	$7.85	$16.10	$0.00	$71.61
	07/01/2015	$48.56	$7.85	$16.10	$0.00	$72.51
	01/01/2016	$49.51	$7.85	$16.10	$0.00	$73.46
	07/01/2016	$50.46	$7.85	$16.10	$0.00	$74.41
	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.96	$7.85	$0.00	$0.00	$30.81
2	55	$25.25	$7.85	$3.66	$0.00	$36.76
3	60	$27.55	$7.85	$3.99	$0.00	$39.39
4	65	$29.84	$7.85	$4.32	$0.00	$42.01
5	70	$32.14	$7.85	$14.11	$0.00	$54.10
6	75	$34.43	$7.85	$14.44	$0.00	$56.72
7	80	$36.73	$7.85	$14.77	$0.00	$59.35
8	90	$41.32	$7.85	$15.44	$0.00	$64.61

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.38	$7.85	$0.00	$0.00	$31.23
2	55	$25.72	$7.85	$3.66	$0.00	$37.23
3	60	$28.06	$7.85	$3.99	$0.00	$39.90
4	65	$30.39	$7.85	$4.32	$0.00	$42.56
5	70	$32.73	$7.85	$14.11	$0.00	$54.69
6	75	$35.07	$7.85	$14.44	$0.00	$57.36
7	80	$37.41	$7.85	$14.77	$0.00	$60.03
8	90	$42.08	$7.85	$15.44	$0.00	$65.37

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 1*	12/01/2013	$33.50	$7.30	$12.70	$0.00	$53.50
	06/01/2014	$34.25	$7.30	$12.70	$0.00	$54.25
	12/01/2014	$35.00	$7.30	$12.70	$0.00	$55.00
	06/01/2015	$35.75	$7.30	$12.70	$0.00	$55.75
	12/01/2015	$36.50	$7.30	$12.70	$0.00	$56.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 1*	12/01/2013	$34.50	$7.30	$12.70	$0.00	$54.50
	06/01/2014	$35.25	$7.30	$12.70	$0.00	$55.25
	12/01/2014	$36.00	$7.30	$12.70	$0.00	$56.00
	06/01/2015	$36.75	$7.30	$12.70	$0.00	$56.75
	12/01/2015	$37.50	$7.30	$12.70	$0.00	$57.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 1*	12/01/2013	$34.25	$7.30	$12.70	$0.00	$54.25
	06/01/2014	$35.00	$7.30	$12.70	$0.00	$55.00
	12/01/2014	$35.75	$7.30	$12.70	$0.00	$55.75
	06/01/2015	$36.50	$7.30	$12.70	$0.00	$56.50
	12/01/2015	$37.25	$7.30	$12.70	$0.00	$57.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 1*	12/01/2013	$34.50	$7.30	$12.70	$0.00	$54.50
	06/01/2014	$35.25	$7.30	$12.70	$0.00	$55.25
	12/01/2014	$36.00	$7.30	$12.70	$0.00	$56.00
	06/01/2015	$36.75	$7.30	$12.70	$0.00	$56.75
	12/01/2015	$37.50	$7.30	$12.70	$0.00	$57.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 1*	12/01/2013	$34.25	$7.30	$12.70	$0.00	$54.25
	06/01/2014	$35.00	$7.30	$12.70	$0.00	$55.00
	12/01/2014	$35.75	$7.30	$12.70	$0.00	$55.75
	06/01/2015	$36.50	$7.30	$12.70	$0.00	$56.50
	12/01/2015	$37.25	$7.30	$12.70	$0.00	$57.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 1*	12/01/2013	$33.50	$7.30	$12.70	$0.00	$53.50
	06/01/2014	$34.25	$7.30	$12.70	$0.00	$54.25
	12/01/2014	$35.00	$7.30	$12.70	$0.00	$55.00
	06/01/2015	$35.75	$7.30	$12.70	$0.00	$55.75
	12/01/2015	$36.50	$7.30	$12.70	$0.00	$56.50
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$56.14	$9.80	$18.17	$0.00	$84.11
	08/01/2014	$58.24	$9.80	$18.17	$0.00	$86.21
	08/01/2015	$60.34	$9.80	$18.17	$0.00	$88.31
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$40.10	$9.80	$18.17	$0.00	$68.07
	08/01/2014	$41.60	$9.80	$18.17	$0.00	$69.57
	08/01/2015	$43.10	$9.80	$18.17	$0.00	$71.07
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$60.15	$9.80	$18.17	$0.00	$88.12
	08/01/2014	$62.40	$9.80	$18.17	$0.00	$90.37
	08/01/2015	$64.65	$9.80	$18.17	$0.00	$92.62
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$84.21	$9.80	$18.17	$0.00	$112.18
	08/01/2014	$87.36	$9.80	$18.17	$0.00	$115.33
	08/01/2015	$90.51	$9.80	$18.17	$0.00	$118.48
DRAWBRIDGE OPERATOR (Construction) *ELECTRICIANS LOCAL 103*	09/01/2013	$43.96	$13.00	$14.42	$0.00	$71.38
	03/01/2014	$44.45	$13.00	$14.68	$0.00	$72.13
	09/01/2014	$45.12	$13.00	$14.70	$0.00	$72.82
	03/01/2015	$45.84	$13.00	$14.72	$0.00	$73.56
	09/01/2015	$46.80	$13.00	$14.75	$0.00	$74.55
	03/01/2016	$47.75	$13.00	$14.78	$0.00	$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN *ELECTRICIANS LOCAL 103*	09/01/2013	$43.96	$13.00	$14.42	$0.00	$71.38
	03/01/2014	$44.45	$13.00	$14.68	$0.00	$72.13
	09/01/2014	$45.12	$13.00	$14.70	$0.00	$72.82
	03/01/2015	$45.84	$13.00	$14.72	$0.00	$73.56
	09/01/2015	$46.80	$13.00	$14.75	$0.00	$74.55
	03/01/2016	$47.75	$13.00	$14.78	$0.00	$75.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.58	$13.00	$0.53	$0.00	$31.11
2	40	$17.58	$13.00	$0.53	$0.00	$31.11
3	45	$19.78	$13.00	$10.78	$0.00	$43.56
4	45	$19.78	$13.00	$10.78	$0.00	$43.56
5	50	$21.98	$13.00	$11.11	$0.00	$46.09
6	55	$24.18	$13.00	$11.45	$0.00	$48.63
7	60	$26.38	$13.00	$11.77	$0.00	$51.15
8	65	$28.57	$13.00	$12.11	$0.00	$53.68
9	70	$30.77	$13.00	$12.43	$0.00	$56.20
10	75	$32.97	$13.00	$12.77	$0.00	$58.74

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.78	$13.00	$0.53	$0.00	$31.31
2	40	$17.78	$13.00	$0.53	$0.00	$31.31
3	45	$20.00	$13.00	$11.04	$0.00	$44.04
4	45	$20.00	$13.00	$11.04	$0.00	$44.04
5	50	$22.23	$13.00	$11.37	$0.00	$46.60
6	55	$24.45	$13.00	$11.70	$0.00	$49.15
7	60	$26.67	$13.00	$12.03	$0.00	$51.70
8	65	$28.89	$13.00	$12.37	$0.00	$54.26
9	70	$31.12	$13.00	$12.69	$0.00	$56.81
10	75	$33.34	$13.00	$13.03	$0.00	$59.37

Notes: :
App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2012	$52.45	$8.78	$6.96	$0.00	$68.19

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.23	$8.78	$0.00	$0.00	$35.01
2	55	$28.85	$8.78	$6.96	$0.00	$44.59
3	65	$34.09	$8.78	$6.96	$0.00	$49.83
4	70	$36.72	$8.78	$6.96	$0.00	$52.46
5	80	$41.96	$8.78	$6.96	$0.00	$57.70

Notes:
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2012	$38.59	$8.78	$6.96	$0.00	$54.33
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2013	$38.73	$10.00	$13.55	$0.00	$62.28
	05/01/2014	$39.50	$10.00	$13.55	$0.00	$63.05
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2013	$40.15	$10.00	$13.55	$0.00	$63.70
	05/01/2014	$40.92	$10.00	$13.55	$0.00	$64.47
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2013	$21.10	$10.00	$13.55	$0.00	$44.65
	05/01/2014	$21.55	$10.00	$13.55	$0.00	$45.10
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 103*	09/01/2013	$43.96	$13.00	$14.42	$0.00	$71.38
	03/01/2014	$44.45	$13.00	$14.68	$0.00	$72.13
	09/01/2014	$45.12	$13.00	$14.70	$0.00	$72.82
	03/01/2015	$45.84	$13.00	$14.72	$0.00	$73.56
	09/01/2015	$46.80	$13.00	$14.75	$0.00	$74.55
	03/01/2016	$47.75	$13.00	$14.78	$0.00	$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING*ELECTRICIANS LOCAL 103*	09/01/2013	$32.97	$13.00	$12.77	$0.00	$58.74
	03/01/2014	$33.44	$13.00	$13.03	$0.00	$59.47
	09/01/2014	$33.84	$13.00	$13.05	$0.00	$59.89
	03/01/2015	$34.38	$13.00	$13.06	$0.00	$60.44
	09/01/2015	$35.10	$13.00	$13.08	$0.00	$61.18
	03/01/2016	$35.81	$13.00	$13.10	$0.00	$61.91

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$33.76	$10.00	$14.18	$0.00	$57.94
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER *LABORERS - ZONE 1*	12/01/2013	$20.50	$7.30	$12.70	$0.00	$40.50
	06/01/2014	$20.50	$7.30	$12.70	$0.00	$40.50
	12/01/2014	$20.50	$7.30	$12.70	$0.00	$40.50
	06/01/2015	$20.50	$7.30	$12.70	$0.00	$40.50
	12/01/2015	$20.50	$7.30	$12.70	$0.00	$40.50
	06/01/2016	$20.50	$7.30	$12.70	$0.00	$40.50
	12/01/2016	$20.50	$7.30	$12.70	$0.00	$40.50
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	09/01/2013	$38.61	$9.80	$16.71	$0.00	$65.12
	03/01/2014	$38.61	$9.80	$16.71	$0.00	$65.12

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.31	$9.80	$1.79	$0.00	$30.90
2	55	$21.24	$9.80	$1.79	$0.00	$32.83
3	60	$23.17	$9.80	$11.34	$0.00	$44.31
4	65	$25.10	$9.80	$11.34	$0.00	$46.24
5	70	$27.03	$9.80	$13.13	$0.00	$49.96
6	75	$28.96	$9.80	$13.13	$0.00	$51.89
7	80	$30.89	$9.80	$14.92	$0.00	$55.61
8	85	$32.82	$9.80	$14.92	$0.00	$57.54

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.31	$9.80	$1.79	$0.00	$30.90
2	55	$21.24	$9.80	$1.79	$0.00	$32.83
3	60	$23.17	$9.80	$11.34	$0.00	$44.31
4	65	$25.10	$9.80	$11.34	$0.00	$46.24
5	70	$27.03	$9.80	$13.13	$0.00	$49.96
6	75	$28.96	$9.80	$13.13	$0.00	$51.89
7	80	$30.89	$9.80	$14.92	$0.00	$55.61
8	85	$32.82	$9.80	$14.92	$0.00	$57.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$28.11	$10.00	$14.18	$0.00	$52.29

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 1)*	01/01/2014	$41.20	$7.85	$16.10	$0.00	$65.15
	07/01/2014	$42.05	$7.85	$16.10	$0.00	$66.00
	01/01/2015	$42.95	$7.85	$16.10	$0.00	$66.90
	07/01/2015	$43.85	$7.85	$16.10	$0.00	$67.80
	01/01/2016	$44.80	$7.85	$16.10	$0.00	$68.75
	07/01/2016	$45.75	$7.85	$16.10	$0.00	$69.70
	01/01/2017	$46.70	$7.85	$16.10	$0.00	$70.65

Apprentice - *GLAZIER - Local 35 Zone 1*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.60	$7.85	$0.00	$0.00	$28.45
2	55	$22.66	$7.85	$3.66	$0.00	$34.17
3	60	$24.72	$7.85	$3.99	$0.00	$36.56
4	65	$26.78	$7.85	$4.32	$0.00	$38.95
5	70	$28.84	$7.85	$14.11	$0.00	$50.80
6	75	$30.90	$7.85	$14.44	$0.00	$53.19
7	80	$32.96	$7.85	$14.77	$0.00	$55.58
8	90	$37.08	$7.85	$15.44	$0.00	$60.37

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.03	$7.85	$0.00	$0.00	$28.88
2	55	$23.13	$7.85	$3.66	$0.00	$34.64
3	60	$25.23	$7.85	$3.99	$0.00	$37.07
4	65	$27.33	$7.85	$4.32	$0.00	$39.50
5	70	$29.44	$7.85	$14.11	$0.00	$51.40
6	75	$31.54	$7.85	$14.44	$0.00	$53.83
7	80	$33.64	$7.85	$14.77	$0.00	$56.26
8	90	$37.85	$7.85	$15.44	$0.00	$61.14

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 12/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.27	$10.00	$0.00	$0.00	$32.27
2	60	$24.29	$10.00	$14.18	$0.00	$48.47
3	65	$26.32	$10.00	$14.18	$0.00	$50.50
4	70	$28.34	$10.00	$14.18	$0.00	$52.52
5	75	$30.37	$10.00	$14.18	$0.00	$54.55
6	80	$32.39	$10.00	$14.18	$0.00	$56.57
7	85	$34.42	$10.00	$14.18	$0.00	$58.60
8	90	$36.44	$10.00	$14.18	$0.00	$60.62

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2014	$42.76	$9.82	$19.74	$2.17	$74.49
	08/01/2014	$43.61	$9.82	$19.74	$2.17	$75.34
	02/01/2015	$44.51	$9.82	$19.74	$2.17	$76.24
	08/01/2015	$45.51	$9.82	$19.74	$2.17	$77.24
	02/01/2016	$46.51	$9.82	$19.74	$2.17	$78.24
	08/01/2016	$47.66	$9.82	$19.74	$2.17	$79.39
	02/01/2017	$48.76	$9.82	$19.74	$2.17	$80.49
	08/01/2017	$49.86	$9.82	$19.74	$2.17	$81.59
	02/01/2018	$51.01	$9.82	$19.74	$2.17	$82.74
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	09/01/2013	$43.96	$13.00	$14.42	$0.00	$71.38
	03/01/2014	$44.45	$13.00	$14.68	$0.00	$72.13
	09/01/2014	$45.12	$13.00	$14.70	$0.00	$72.82
	03/01/2015	$45.84	$13.00	$14.72	$0.00	$73.56
	09/01/2015	$46.80	$13.00	$14.75	$0.00	$74.55
	03/01/2016	$47.75	$13.00	$14.78	$0.00	$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2014	$42.76	$9.82	$19.74	$2.17	$74.49
	08/01/2014	$43.61	$9.82	$19.74	$2.17	$75.34
	02/01/2015	$44.51	$9.82	$19.74	$2.17	$76.24
	08/01/2015	$45.51	$9.82	$19.74	$2.17	$77.24
	02/01/2016	$46.51	$9.82	$19.74	$2.17	$78.24
	08/01/2016	$47.66	$9.82	$19.74	$2.17	$79.39
	02/01/2017	$48.76	$9.82	$19.74	$2.17	$80.49
	08/01/2017	$49.86	$9.82	$19.74	$2.17	$81.59
	02/01/2018	$51.01	$9.82	$19.74	$2.17	$82.74
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 1*	12/01/2013	$34.10	$7.30	$12.70	$0.00	$54.10
	06/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	12/01/2014	$35.60	$7.30	$12.70	$0.00	$55.60
	06/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	12/01/2015	$37.10	$7.30	$12.70	$0.00	$57.10
	06/01/2016	$37.85	$7.30	$12.70	$0.00	$57.85
	12/01/2016	$38.85	$7.30	$12.70	$0.00	$58.85
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2013	$42.11	$10.95	$12.10	$0.00	$65.16
	09/01/2014	$44.11	$10.95	$12.10	$0.00	$67.16

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.06	$10.95	$9.00	$0.00	$41.01
2	60	$25.27	$10.95	$9.62	$0.00	$45.84
3	70	$29.48	$10.95	$10.24	$0.00	$50.67
4	80	$33.69	$10.95	$10.86	$0.00	$55.50

Effective Date - 09/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.06	$10.95	$9.00	$0.00	$42.01
2	60	$26.47	$10.95	$9.62	$0.00	$47.04
3	70	$30.88	$10.95	$10.24	$0.00	$52.07
4	80	$35.29	$10.95	$10.86	$0.00	$57.10

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (BOSTON AREA)*	09/16/2013	$40.85	$7.70	$18.60	$0.00	$67.15

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *IRONWORKER - Local 7 Boston*

Effective Date - 09/16/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$24.51	$7.70	$18.60	$0.00	$50.81
2	70	$28.60	$7.70	$18.60	$0.00	$54.90
3	75	$30.64	$7.70	$18.60	$0.00	$56.94
4	80	$32.68	$7.70	$18.60	$0.00	$58.98
5	85	$34.72	$7.70	$18.60	$0.00	$61.02
6	90	$36.77	$7.70	$18.60	$0.00	$63.07

Notes:

** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 1*

Effective Date - 12/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.01	$7.30	$12.70	$0.00	$40.01
2	70	$23.35	$7.30	$12.70	$0.00	$43.35
3	80	$26.68	$7.30	$12.70	$0.00	$46.68
4	90	$30.02	$7.30	$12.70	$0.00	$50.02

Effective Date - 06/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.46	$7.30	$12.70	$0.00	$40.46
2	70	$23.87	$7.30	$12.70	$0.00	$43.87
3	80	$27.28	$7.30	$12.70	$0.00	$47.28
4	90	$30.69	$7.30	$12.70	$0.00	$50.69

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 1*	12/01/2013	$33.50	$7.30	$12.70	$0.00	$53.50
	06/01/2014	$34.25	$7.30	$12.70	$0.00	$54.25
	12/01/2014	$35.00	$7.30	$12.70	$0.00	$55.00
	06/01/2015	$35.75	$7.30	$12.70	$0.00	$55.75
	12/01/2015	$36.50	$7.30	$12.70	$0.00	$56.50
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MASON TENDER *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
This classification applies to the wholesale removal of standing trees including all associated trimming of branches and limbs, and applies to the removal of branches at locations not on or around utility lines. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2014	$36.66	$10.18	$16.83	$0.00	$63.67
	08/01/2014	$37.37	$10.18	$16.90	$0.00	$64.45
	02/01/2015	$37.82	$10.18	$16.90	$0.00	$64.90
	08/01/2015	$38.53	$10.18	$16.97	$0.00	$65.68
	02/01/2016	$38.98	$10.18	$16.97	$0.00	$66.13
	08/01/2016	$39.68	$10.18	$17.05	$0.00	$66.91
	02/01/2017	$40.14	$10.18	$17.05	$0.00	$67.37

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.33	$10.18	$16.83	$0.00	$45.34
2	60	$22.00	$10.18	$16.83	$0.00	$49.01
3	70	$25.66	$10.18	$16.83	$0.00	$52.67
4	80	$29.33	$10.18	$16.83	$0.00	$56.34
5	90	$32.99	$10.18	$16.83	$0.00	$60.00

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.69	$10.18	$16.90	$0.00	$45.77
2	60	$22.42	$10.18	$16.90	$0.00	$49.50
3	70	$26.16	$10.18	$16.90	$0.00	$53.24
4	80	$29.90	$10.18	$16.90	$0.00	$56.98
5	90	$33.63	$10.18	$16.90	$0.00	$60.71

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2014	$48.10	$10.18	$18.15	$0.00	$76.43
	08/01/2014	$49.00	$10.18	$18.22	$0.00	$77.40
	02/01/2015	$49.56	$10.18	$18.22	$0.00	$77.96
	08/01/2015	$50.46	$10.18	$18.29	$0.00	$78.93
	02/01/2016	$51.03	$10.18	$18.29	$0.00	$79.50
	08/01/2016	$51.93	$10.18	$18.37	$0.00	$80.48
	02/01/2017	$52.50	$10.18	$18.37	$0.00	$81.05

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.05	$10.18	$18.15	$0.00	$52.38
2	60	$28.86	$10.18	$18.15	$0.00	$57.19
3	70	$33.67	$10.18	$18.15	$0.00	$62.00
4	80	$38.48	$10.18	$18.15	$0.00	$66.81
5	90	$43.29	$10.18	$18.15	$0.00	$71.62

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.50	$10.18	$18.22	$0.00	$52.90
2	60	$29.40	$10.18	$18.22	$0.00	$57.80
3	70	$34.30	$10.18	$18.22	$0.00	$62.70
4	80	$39.20	$10.18	$18.22	$0.00	$67.60
5	90	$44.10	$10.18	$18.22	$0.00	$72.50

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
MILLWRIGHT (Zone 1) *MILLWRIGHTS LOCAL 1121 - Zone 1*	10/01/2013	$35.20	$9.80	$16.01	$0.00	$61.01
	04/01/2014	$35.98	$9.80	$16.01	$0.00	$61.79
	10/01/2014	$36.93	$9.80	$16.01	$0.00	$62.74
	04/01/2015	$37.89	$9.80	$16.01	$0.00	$63.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 1*

Effective Date - 10/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$19.36	$9.80	$4.40	$0.00	$33.56
2	65	$22.88	$9.80	$13.21	$0.00	$45.89
3	75	$26.40	$9.80	$14.01	$0.00	$50.21
4	85	$29.92	$9.80	$14.81	$0.00	$54.53

Effective Date - 04/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$19.79	$9.80	$4.40	$0.00	$33.99
2	65	$23.39	$9.80	$13.21	$0.00	$46.40
3	75	$26.99	$9.80	$14.01	$0.00	$50.80
4	85	$30.58	$9.80	$14.81	$0.00	$55.19

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$20.96	$10.00	$14.18	$0.00	$45.14
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$24.43	$10.00	$14.18	$0.00	$48.61
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 1*	01/01/2014	$45.91	$7.85	$16.10	$0.00	$69.86
	07/01/2014	$46.76	$7.85	$16.10	$0.00	$70.71
	01/01/2015	$47.66	$7.85	$16.10	$0.00	$71.61
	07/01/2015	$48.56	$7.85	$16.10	$0.00	$72.51
	01/01/2016	$49.51	$7.85	$16.10	$0.00	$73.46
	07/01/2016	$50.46	$7.85	$16.10	$0.00	$74.41
	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.96	$7.85	$0.00	$0.00	$30.81
2	55	$25.25	$7.85	$3.66	$0.00	$36.76
3	60	$27.55	$7.85	$3.99	$0.00	$39.39
4	65	$29.84	$7.85	$4.32	$0.00	$42.01
5	70	$32.14	$7.85	$14.11	$0.00	$54.10
6	75	$34.43	$7.85	$14.44	$0.00	$56.72
7	80	$36.73	$7.85	$14.77	$0.00	$59.35
8	90	$41.32	$7.85	$15.44	$0.00	$64.61

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.38	$7.85	$0.00	$0.00	$31.23
2	55	$25.72	$7.85	$3.66	$0.00	$37.23
3	60	$28.06	$7.85	$3.99	$0.00	$39.90
4	65	$30.39	$7.85	$4.32	$0.00	$42.56
5	70	$32.73	$7.85	$14.11	$0.00	$54.69
6	75	$35.07	$7.85	$14.44	$0.00	$57.36
7	80	$37.41	$7.85	$14.77	$0.00	$60.03
8	90	$42.08	$7.85	$15.44	$0.00	$65.37

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2014	$42.60	$7.85	$16.10	$0.00	$66.55
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 1*	07/01/2014	$43.45	$7.85	$16.10	$0.00	$67.40
	01/01/2015	$44.35	$7.85	$16.10	$0.00	$68.30
	07/01/2015	$45.25	$7.85	$16.10	$0.00	$69.20
	01/01/2016	$46.20	$7.85	$16.10	$0.00	$70.15
	07/01/2016	$47.15	$7.85	$16.10	$0.00	$71.10
	01/01/2017	$48.10	$7.85	$16.10	$0.00	$72.05

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - Spray/Sandblast - New*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.30	$7.85	$0.00	$0.00	$29.15
2	55	$23.43	$7.85	$3.66	$0.00	$34.94
3	60	$25.56	$7.85	$3.99	$0.00	$37.40
4	65	$27.69	$7.85	$4.32	$0.00	$39.86
5	70	$29.82	$7.85	$14.11	$0.00	$51.78
6	75	$31.95	$7.85	$14.44	$0.00	$54.24
7	80	$34.08	$7.85	$14.77	$0.00	$56.70
8	90	$38.34	$7.85	$15.44	$0.00	$61.63

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.73	$7.85	$0.00	$0.00	$29.58
2	55	$23.90	$7.85	$3.66	$0.00	$35.41
3	60	$26.07	$7.85	$3.99	$0.00	$37.91
4	65	$28.24	$7.85	$4.32	$0.00	$40.41
5	70	$30.42	$7.85	$14.11	$0.00	$52.38
6	75	$32.59	$7.85	$14.44	$0.00	$54.88
7	80	$34.76	$7.85	$14.77	$0.00	$57.38
8	90	$39.11	$7.85	$15.44	$0.00	$62.40

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 1*	01/01/2014	$40.66	$7.85	$16.10	$0.00	$64.61
	07/01/2014	$41.51	$7.85	$16.10	$0.00	$65.46
	01/01/2015	$42.41	$7.85	$16.10	$0.00	$66.36
	07/01/2015	$43.31	$7.85	$16.10	$0.00	$67.26
	01/01/2016	$44.26	$7.85	$16.10	$0.00	$68.21
	07/01/2016	$45.21	$7.85	$16.10	$0.00	$69.16
	01/01/2017	$46.16	$7.85	$16.10	$0.00	$70.11

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.33	$7.85	$0.00	$0.00	$28.18
2	55	$22.36	$7.85	$3.66	$0.00	$33.87
3	60	$24.40	$7.85	$3.99	$0.00	$36.24
4	65	$26.43	$7.85	$4.32	$0.00	$38.60
5	70	$28.46	$7.85	$14.11	$0.00	$50.42
6	75	$30.50	$7.85	$14.44	$0.00	$52.79
7	80	$32.53	$7.85	$14.77	$0.00	$55.15
8	90	$36.59	$7.85	$15.44	$0.00	$59.88

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.76	$7.85	$0.00	$0.00	$28.61
2	55	$22.83	$7.85	$3.66	$0.00	$34.34
3	60	$24.91	$7.85	$3.99	$0.00	$36.75
4	65	$26.98	$7.85	$4.32	$0.00	$39.15
5	70	$29.06	$7.85	$14.11	$0.00	$51.02
6	75	$31.13	$7.85	$14.44	$0.00	$53.42
7	80	$33.21	$7.85	$14.77	$0.00	$55.83
8	90	$37.36	$7.85	$15.44	$0.00	$60.65

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 1*	01/01/2014	$41.20	$7.85	$16.10	$0.00	$65.15
	07/01/2014	$42.05	$7.85	$16.10	$0.00	$66.00
	01/01/2015	$42.95	$7.85	$16.10	$0.00	$66.90
	07/01/2015	$43.85	$7.85	$16.10	$0.00	$67.80
	01/01/2016	$44.80	$7.85	$16.10	$0.00	$68.75
	07/01/2016	$45.75	$7.85	$16.10	$0.00	$69.70
	01/01/2017	$46.70	$7.85	$16.10	$0.00	$70.65

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 1 - BRUSH NEW*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.60	$7.85	$0.00	$0.00	$28.45
2	55	$22.66	$7.85	$3.66	$0.00	$34.17
3	60	$24.72	$7.85	$3.99	$0.00	$36.56
4	65	$26.78	$7.85	$4.32	$0.00	$38.95
5	70	$28.84	$7.85	$14.11	$0.00	$50.80
6	75	$30.90	$7.85	$14.44	$0.00	$53.19
7	80	$32.96	$7.85	$14.77	$0.00	$55.58
8	90	$37.08	$7.85	$15.44	$0.00	$60.37

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.03	$7.85	$0.00	$0.00	$28.88
2	55	$23.13	$7.85	$3.66	$0.00	$34.64
3	60	$25.23	$7.85	$3.99	$0.00	$37.07
4	65	$27.33	$7.85	$4.32	$0.00	$39.50
5	70	$29.44	$7.85	$14.11	$0.00	$51.40
6	75	$31.54	$7.85	$14.44	$0.00	$53.83
7	80	$33.64	$7.85	$14.77	$0.00	$56.26
8	90	$37.85	$7.85	$15.44	$0.00	$61.14

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 1*	01/01/2014	$39.26	$7.85	$16.10	$0.00	$63.21
	07/01/2014	$40.11	$7.85	$16.10	$0.00	$64.06
	01/01/2015	$41.01	$7.85	$16.10	$0.00	$64.96
	07/01/2015	$41.91	$7.85	$16.10	$0.00	$65.86
	01/01/2016	$42.86	$7.85	$16.10	$0.00	$66.81
	07/01/2016	$43.81	$7.85	$16.10	$0.00	$67.76
	01/01/2017	$44.76	$7.85	$16.10	$0.00	$68.71

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - BRUSH REPAINT*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.63	$7.85	$0.00	$0.00	$27.48
2	55	$21.59	$7.85	$3.66	$0.00	$33.10
3	60	$23.56	$7.85	$3.99	$0.00	$35.40
4	65	$25.52	$7.85	$4.32	$0.00	$37.69
5	70	$27.48	$7.85	$14.11	$0.00	$49.44
6	75	$29.45	$7.85	$14.44	$0.00	$51.74
7	80	$31.41	$7.85	$14.77	$0.00	$54.03
8	90	$35.33	$7.85	$15.44	$0.00	$58.62

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.06	$7.85	$0.00	$0.00	$27.91
2	55	$22.06	$7.85	$3.66	$0.00	$33.57
3	60	$24.07	$7.85	$3.99	$0.00	$35.91
4	65	$26.07	$7.85	$4.32	$0.00	$38.24
5	70	$28.08	$7.85	$14.11	$0.00	$50.04
6	75	$30.08	$7.85	$14.44	$0.00	$52.37
7	80	$32.09	$7.85	$14.77	$0.00	$54.71
8	90	$36.10	$7.85	$15.44	$0.00	$59.39

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$31.88	$9.41	$8.80	$0.00	$50.09
	06/01/2014	$32.23	$9.41	$8.80	$0.00	$50.44
	08/01/2014	$32.23	$9.91	$8.80	$0.00	$50.94
	12/01/2014	$32.23	$9.91	$9.33	$0.00	$51.47
	06/01/2015	$32.58	$9.91	$9.33	$0.00	$51.82
	08/01/2015	$32.58	$10.41	$9.33	$0.00	$52.32
	12/01/2015	$32.58	$10.41	$10.08	$0.00	$53.07
	06/01/2016	$33.08	$10.41	$10.08	$0.00	$53.57
	08/01/2016	$33.08	$10.91	$10.08	$0.00	$54.07
	12/01/2016	$33.08	$10.91	$10.89	$0.00	$54.88
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$40.10	$9.80	$18.17	$0.00	$68.07
	08/01/2014	$41.60	$9.80	$18.17	$0.00	$69.57
	08/01/2015	$43.10	$9.80	$18.17	$0.00	$71.07
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$40.10	$9.80	$18.17	$0.00	$68.07
	08/01/2014	$41.60	$9.80	$18.17	$0.00	$69.57
	08/01/2015	$43.10	$9.80	$18.17	$0.00	$71.07

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.05	$9.80	$18.17	$0.00	$48.02
2	60	$24.06	$9.80	$18.17	$0.00	$52.03
3	70	$28.07	$9.80	$18.17	$0.00	$56.04
4	75	$30.08	$9.80	$18.17	$0.00	$58.05
5	80	$32.08	$9.80	$18.17	$0.00	$60.05
6	80	$32.08	$9.80	$18.17	$0.00	$60.05
7	90	$36.09	$9.80	$18.17	$0.00	$64.06
8	90	$36.09	$9.80	$18.17	$0.00	$64.06

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.80	$9.80	$18.17	$0.00	$48.77
2	60	$24.96	$9.80	$18.17	$0.00	$52.93
3	70	$29.12	$9.80	$18.17	$0.00	$57.09
4	75	$31.20	$9.80	$18.17	$0.00	$59.17
5	80	$33.28	$9.80	$18.17	$0.00	$61.25
6	80	$33.28	$9.80	$18.17	$0.00	$61.25
7	90	$37.44	$9.80	$18.17	$0.00	$65.41
8	90	$37.44	$9.80	$18.17	$0.00	$65.41

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48

Apprentice - *PIPEFITTER - Local 537*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.74	$8.75	$6.50	$0.00	$34.99
2	45	$22.20	$8.75	$14.39	$0.00	$45.34
3	60	$29.60	$8.75	$14.39	$0.00	$52.74
4	70	$34.54	$8.75	$14.39	$0.00	$57.68
5	80	$39.47	$8.75	$14.39	$0.00	$62.61

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
PLUMBERS & GASFITTERS *PLUMBERS & GASFITTERS LOCAL 12*	09/01/2013	$49.06	$9.82	$14.04	$0.00	$72.92
	03/01/2014	$50.06	$9.82	$14.04	$0.00	$73.92
	09/01/2014	$51.06	$9.82	$14.04	$0.00	$74.92
	03/01/2015	$52.06	$9.82	$14.04	$0.00	$75.92
	09/01/2015	$53.06	$9.82	$14.04	$0.00	$76.92
	03/01/2016	$54.21	$9.82	$14.04	$0.00	$78.07
	09/01/2016	$55.26	$9.82	$14.04	$0.00	$79.12
	03/01/2017	$56.26	$9.82	$14.04	$0.00	$80.12

Apprentice - *PLUMBER/GASFITTER - Local 12*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.17	$9.82	$5.26	$0.00	$32.25
2	40	$19.62	$9.82	$5.92	$0.00	$35.36
3	55	$26.98	$9.82	$7.95	$0.00	$44.75
4	65	$31.89	$9.82	$9.30	$0.00	$51.01
5	75	$36.80	$9.82	$10.65	$0.00	$57.27

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.52	$9.82	$5.26	$0.00	$32.60
2	40	$20.02	$9.82	$5.92	$0.00	$35.76
3	55	$27.53	$9.82	$7.95	$0.00	$45.30
4	65	$32.54	$9.82	$9.30	$0.00	$51.66
5	75	$37.55	$9.82	$10.65	$0.00	$58.02

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic$54.16 Step5 with lic$60.40

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER *LABORERS - ZONE 1*	12/01/2013	$34.35	$7.30	$12.70	$0.00	$54.35
	06/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	12/01/2014	$35.85	$7.30	$12.70	$0.00	$55.85
	06/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	12/01/2015	$37.35	$7.30	$12.70	$0.00	$57.35
	06/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
	12/01/2016	$39.10	$7.30	$12.70	$0.00	$59.10
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$28.11	$10.00	$14.18	$0.00	$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS LOCAL 25a*	05/01/2011	$29.99	$7.75	$5.91	$0.00	$43.65
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RESIDENTIAL WOOD FRAME (All Other Work) *CARPENTERS -ZONE 1 (Residential Wood)*	04/01/2011	$37.25	$8.67	$15.51	$0.00	$61.43
RESIDENTIAL WOOD FRAME CARPENTER ** ** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement.*CARPENTERS -ZONE 1 (Residential Wood)*	05/01/2011	$27.49	$6.34	$6.23	$0.00	$40.06
As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER rate.						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER (Residential Wood Frame) - Zone 1*

Effective Date - 05/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$16.49	$6.34	$0.00	$0.00	$22.83
2	60	$16.49	$6.34	$6.23	$0.00	$29.06
3	65	$17.87	$6.34	$6.23	$0.00	$30.44
4	70	$19.24	$6.34	$6.23	$0.00	$31.81
5	75	$20.62	$6.34	$6.23	$0.00	$33.19
6	80	$21.99	$6.34	$6.23	$0.00	$34.56
7	85	$23.37	$6.34	$6.23	$0.00	$35.94
8	90	$24.74	$6.34	$6.23	$0.00	$37.31

Notes:

Apprentice to Journeyworker Ratio:1:5

RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	02/01/2014	$39.21	$10.50	$10.70	$0.00	$60.41
	08/01/2014	$40.11	$10.50	$10.70	$0.00	$61.31
	02/01/2015	$41.01	$10.50	$10.70	$0.00	$62.21
	08/01/2015	$41.91	$10.50	$10.70	$0.00	$63.11
	02/01/2016	$42.81	$10.50	$10.70	$0.00	$64.01

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 33*

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.61	$10.50	$3.38	$0.00	$33.49
2	60	$23.53	$10.50	$10.70	$0.00	$44.73
3	65	$25.49	$10.50	$10.70	$0.00	$46.69
4	75	$29.41	$10.50	$10.70	$0.00	$50.61
5	85	$33.33	$10.50	$10.70	$0.00	$54.53

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.06	$10.50	$3.38	$0.00	$33.94
2	60	$24.07	$10.50	$10.70	$0.00	$45.27
3	65	$26.07	$10.50	$10.70	$0.00	$47.27
4	75	$30.08	$10.50	$10.70	$0.00	$51.28
5	85	$34.09	$10.50	$10.70	$0.00	$55.29

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	02/01/2014	$39.46	$10.50	$10.70	$0.00	$60.66
	08/01/2014	$40.36	$10.50	$10.70	$0.00	$61.56
	02/01/2015	$41.26	$10.50	$10.70	$0.00	$62.46
	08/01/2015	$42.16	$10.50	$10.70	$0.00	$63.36
	02/01/2016	$43.06	$10.50	$10.70	$0.00	$64.26
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2014	$42.76	$9.82	$19.74	$2.17	$74.49
	08/01/2014	$43.61	$9.82	$19.74	$2.17	$75.34
	02/01/2015	$44.51	$9.82	$19.74	$2.17	$76.24
	08/01/2015	$45.51	$9.82	$19.74	$2.17	$77.24
	02/01/2016	$46.51	$9.82	$19.74	$2.17	$78.24
	08/01/2016	$47.66	$9.82	$19.74	$2.17	$79.39
	02/01/2017	$48.76	$9.82	$19.74	$2.17	$80.49
	08/01/2017	$49.86	$9.82	$19.74	$2.17	$81.59
	02/01/2018	$51.01	$9.82	$19.74	$2.17	$82.74

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.10	$9.82	$4.28	$0.00	$31.20
2	40	$17.10	$9.82	$4.28	$0.00	$31.20
3	45	$19.24	$9.82	$8.70	$1.13	$38.89
4	45	$19.24	$9.82	$8.70	$1.13	$38.89
5	50	$21.38	$9.82	$9.49	$1.22	$41.91
6	50	$21.38	$9.82	$9.74	$1.23	$42.17
7	60	$25.66	$9.82	$11.05	$1.40	$47.93
8	65	$27.79	$9.82	$11.84	$1.48	$50.93
9	75	$32.07	$9.82	$13.41	$1.66	$56.96
10	85	$36.35	$9.82	$14.48	$1.82	$62.47

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.44	$9.82	$4.28	$0.00	$31.54
2	40	$17.44	$9.82	$4.28	$0.00	$31.54
3	45	$19.62	$9.82	$8.70	$1.13	$39.27
4	45	$19.62	$9.82	$8.70	$1.13	$39.27
5	50	$21.81	$9.82	$9.49	$1.22	$42.34
6	50	$21.81	$9.82	$9.74	$1.23	$42.60
7	60	$26.17	$9.82	$11.05	$1.40	$48.44
8	65	$28.35	$9.82	$11.84	$1.48	$51.49
9	75	$32.71	$9.82	$13.41	$1.66	$57.60
10	85	$37.07	$9.82	$14.48	$1.82	$63.19

Notes:
Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SIGN ERECTOR *PAINTERS LOCAL 35 - ZONE 1*	06/01/2013	$25.81	$7.07	$7.05	$0.00	$39.93

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SIGN ERECTOR - Local 35 Zone 1*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$12.91	$7.07	$0.00	$0.00	$19.98
2	55	$14.20	$7.07	$2.45	$0.00	$23.72
3	60	$15.49	$7.07	$2.45	$0.00	$25.01
4	65	$16.78	$7.07	$2.45	$0.00	$26.30
5	70	$18.07	$7.07	$7.05	$0.00	$32.19
6	75	$19.36	$7.07	$7.05	$0.00	$33.48
7	80	$20.65	$7.07	$7.05	$0.00	$34.77
8	85	$21.94	$7.07	$7.05	$0.00	$36.06
9	90	$23.23	$7.07	$7.05	$0.00	$37.35

Notes:

Steps are 4 mos.

Apprentice to Journeyworker Ratio:1:1

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$32.34	$9.41	$8.80	$0.00	$50.55
	06/01/2014	$32.69	$9.41	$8.80	$0.00	$50.90
	08/01/2014	$32.69	$9.91	$8.80	$0.00	$51.40
	12/01/2014	$32.69	$9.91	$9.33	$0.00	$51.93
	06/01/2015	$33.04	$9.91	$9.33	$0.00	$52.28
	08/01/2015	$33.04	$10.41	$9.33	$0.00	$52.78
	12/01/2015	$33.04	$10.41	$10.08	$0.00	$53.53
	06/01/2016	$33.54	$10.41	$10.08	$0.00	$54.03
	08/01/2016	$33.54	$10.91	$10.08	$0.00	$54.53
	12/01/2016	$33.54	$10.91	$10.89	$0.00	$55.34
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$32.63	$9.41	$8.80	$0.00	$50.84
	06/01/2014	$32.98	$9.41	$8.80	$0.00	$51.19
	08/01/2014	$32.98	$9.91	$8.80	$0.00	$51.69
	12/01/2014	$32.98	$9.91	$9.33	$0.00	$52.22
	06/01/2015	$33.33	$9.91	$9.33	$0.00	$52.57
	08/01/2015	$33.33	$10.41	$9.33	$0.00	$53.07
	12/01/2015	$33.33	$10.41	$10.08	$0.00	$53.82
	06/01/2016	$33.83	$10.41	$10.08	$0.00	$54.32
	08/01/2016	$33.83	$10.91	$10.08	$0.00	$54.82
	12/01/2016	$33.83	$10.91	$10.89	$0.00	$55.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1*	01/01/2014	$53.33	$8.42	$12.85	$0.00	$74.60
	03/01/2014	$54.58	$8.42	$12.85	$0.00	$75.85
	10/01/2014	$55.73	$8.42	$12.85	$0.00	$77.00
	01/01/2015	$55.73	$8.42	$13.00	$0.00	$77.15
	03/01/2015	$56.73	$8.42	$13.00	$0.00	$78.15
	10/01/2015	$57.88	$8.42	$13.00	$0.00	$79.30
	01/01/2016	$57.88	$8.67	$13.15	$0.00	$79.70
	03/01/2016	$58.88	$8.67	$13.15	$0.00	$80.70
	10/01/2016	$60.03	$8.67	$13.15	$0.00	$81.85
	03/01/2017	$61.03	$8.67	$13.15	$0.00	$82.85

Apprentice - *SPRINKLER FITTER - Local 550 (Section A) Zone 1*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$18.67	$8.42	$8.25	$0.00	$35.34
2	40	$21.33	$8.42	$8.25	$0.00	$38.00
3	45	$24.00	$8.42	$8.25	$0.00	$40.67
4	50	$26.67	$8.42	$8.25	$0.00	$43.34
5	55	$29.33	$8.42	$8.25	$0.00	$46.00
6	60	$32.00	$8.42	$8.25	$0.00	$48.67
7	65	$34.66	$8.42	$8.25	$0.00	$51.33
8	70	$37.33	$8.42	$8.25	$0.00	$54.00
9	75	$40.00	$8.42	$8.25	$0.00	$56.67
10	80	$42.66	$8.42	$8.25	$0.00	$59.33

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$19.10	$8.42	$8.25	$0.00	$35.77
2	40	$21.83	$8.42	$8.25	$0.00	$38.50
3	45	$24.56	$8.42	$8.25	$0.00	$41.23
4	50	$27.29	$8.42	$8.25	$0.00	$43.96
5	55	$30.02	$8.42	$8.25	$0.00	$46.69
6	60	$32.75	$8.42	$8.25	$0.00	$49.42
7	65	$35.48	$8.42	$8.25	$0.00	$52.15
8	70	$38.21	$8.42	$8.25	$0.00	$54.88
9	75	$40.94	$8.42	$8.25	$0.00	$57.61
10	80	$43.66	$8.42	$8.25	$0.00	$60.33

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 103*	09/01/2013	$32.97	$13.00	$12.77	$0.00	$58.74
	03/01/2014	$33.44	$13.00	$13.03	$0.00	$59.47
	09/01/2014	$33.84	$13.00	$13.05	$0.00	$59.89
	03/01/2015	$34.38	$13.00	$13.06	$0.00	$60.44
	09/01/2015	$35.10	$13.00	$13.08	$0.00	$61.18
	03/01/2016	$35.81	$13.00	$13.10	$0.00	$61.91

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$13.19	$13.00	$0.40	$0.00	$26.59
2	40	$13.19	$13.00	$0.40	$0.00	$26.59
3	45	$14.84	$13.00	$10.04	$0.00	$37.88
4	45	$14.84	$13.00	$10.04	$0.00	$37.88
5	50	$16.49	$13.00	$10.29	$0.00	$39.78
6	55	$18.13	$13.00	$10.53	$0.00	$41.66
7	60	$19.78	$13.00	$10.78	$0.00	$43.56
8	65	$21.43	$13.00	$11.03	$0.00	$45.46
9	70	$23.08	$13.00	$11.28	$0.00	$47.36
10	75	$24.73	$13.00	$11.53	$0.00	$49.26

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$13.38	$13.00	$0.40	$0.00	$26.78
2	40	$13.38	$13.00	$0.40	$0.00	$26.78
3	45	$15.05	$13.00	$10.29	$0.00	$38.34
4	45	$15.05	$13.00	$10.29	$0.00	$38.34
5	50	$16.72	$13.00	$10.54	$0.00	$40.26
6	55	$18.39	$13.00	$10.79	$0.00	$42.18
7	60	$20.06	$13.00	$11.04	$0.00	$44.10
8	65	$21.74	$13.00	$11.29	$0.00	$46.03
9	70	$23.41	$13.00	$11.54	$0.00	$47.95
10	75	$25.08	$13.00	$11.79	$0.00	$49.87

Notes:

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TERRAZZO FINISHERS	02/01/2014	$47.00	$10.18	$18.15	$0.00	$75.33
BRICKLAYERS LOCAL 3 - MARBLE & TILE	08/01/2014	$47.90	$10.18	$18.22	$0.00	$76.30
	02/01/2015	$48.46	$10.18	$18.22	$0.00	$76.86
	08/01/2015	$49.36	$10.18	$18.29	$0.00	$77.83
	02/01/2016	$49.93	$10.18	$18.29	$0.00	$78.40
	08/01/2016	$50.83	$10.18	$18.37	$0.00	$79.38
	02/01/2017	$51.40	$10.18	$18.37	$0.00	$79.95

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.50	$10.18	$18.15	$0.00	$51.83
2	60	$28.20	$10.18	$18.15	$0.00	$56.53
3	70	$32.90	$10.18	$18.15	$0.00	$61.23
4	80	$37.60	$10.18	$18.15	$0.00	$65.93
5	90	$42.30	$10.18	$18.15	$0.00	$70.63

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.95	$10.18	$18.22	$0.00	$52.35
2	60	$28.74	$10.18	$18.22	$0.00	$57.14
3	70	$33.53	$10.18	$18.22	$0.00	$61.93
4	80	$38.32	$10.18	$18.22	$0.00	$66.72
5	90	$43.11	$10.18	$18.22	$0.00	$71.51

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER	12/01/2013	$34.70	$7.30	$12.90	$0.00	$54.90
LABORERS - FOUNDATION AND MARINE	06/01/2014	$35.45	$7.30	$12.90	$0.00	$55.65
	12/01/2014	$36.20	$7.30	$12.90	$0.00	$56.40
	06/01/2015	$36.95	$7.30	$12.90	$0.00	$57.15
	12/01/2015	$37.70	$7.30	$12.90	$0.00	$57.90
	06/01/2016	$38.45	$7.30	$12.90	$0.00	$58.65
	12/01/2016	$39.45	$7.30	$12.90	$0.00	$59.65

For apprentice rates see "Apprentice- LABORER"

TEST BORING DRILLER HELPER	12/01/2013	$33.42	$7.30	$12.90	$0.00	$53.62
LABORERS - FOUNDATION AND MARINE	06/01/2014	$34.17	$7.30	$12.90	$0.00	$54.37
	12/01/2014	$34.92	$7.30	$12.90	$0.00	$55.12
	06/01/2015	$35.67	$7.30	$12.90	$0.00	$55.87
	12/01/2015	$36.42	$7.30	$12.90	$0.00	$56.62
	06/01/2016	$37.17	$7.30	$12.90	$0.00	$57.37
	12/01/2016	$38.17	$7.30	$12.90	$0.00	$58.37

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2013	$33.30	$7.30	$12.90	$0.00	$53.50
	06/01/2014	$34.05	$7.30	$12.90	$0.00	$54.25
	12/01/2014	$34.80	$7.30	$12.90	$0.00	$55.00
	06/01/2015	$35.55	$7.30	$12.90	$0.00	$55.75
	12/01/2015	$36.30	$7.30	$12.90	$0.00	$56.50
	06/01/2016	$37.05	$7.30	$12.90	$0.00	$57.25
	12/01/2016	$38.05	$7.30	$12.90	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$32.92	$9.41	$8.80	$0.00	$51.13
	06/01/2014	$33.27	$9.41	$8.80	$0.00	$51.48
	08/01/2014	$33.27	$9.91	$8.80	$0.00	$51.98
	12/01/2014	$33.27	$9.91	$9.33	$0.00	$52.51
	06/01/2015	$33.62	$9.91	$9.33	$0.00	$52.86
	08/01/2015	$33.62	$10.41	$9.33	$0.00	$53.36
	12/01/2015	$33.62	$10.41	$10.08	$0.00	$54.11
	06/01/2016	$34.12	$10.41	$10.08	$0.00	$54.61
	08/01/2016	$34.12	$10.91	$10.08	$0.00	$55.11
	12/01/2016	$34.12	$10.91	$10.89	$0.00	$55.92
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	12/01/2013	$45.58	$7.30	$13.30	$0.00	$66.18
	06/01/2014	$46.33	$7.30	$13.30	$0.00	$66.93
	12/01/2014	$47.08	$7.30	$13.30	$0.00	$67.68
	06/01/2015	$47.83	$7.30	$13.30	$0.00	$68.43
	12/01/2015	$48.58	$7.30	$13.30	$0.00	$69.18
	06/01/2016	$49.33	$7.30	$13.30	$0.00	$69.93
	12/01/2016	$50.33	$7.30	$13.30	$0.00	$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2013	$47.58	$7.30	$13.30	$0.00	$68.18
	06/01/2014	$48.33	$7.30	$13.30	$0.00	$68.93
	12/01/2014	$49.08	$7.30	$13.30	$0.00	$69.68
	06/01/2015	$49.83	$7.30	$13.30	$0.00	$70.43
	12/01/2015	$50.58	$7.30	$13.30	$0.00	$71.18
	06/01/2016	$51.33	$7.30	$13.30	$0.00	$71.93
	12/01/2016	$52.33	$7.30	$13.30	$0.00	$72.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2013	$37.65	$7.30	$13.30	$0.00	$58.25
	06/01/2014	$38.40	$7.30	$13.30	$0.00	$59.00
	12/01/2014	$39.15	$7.30	$13.30	$0.00	$59.75
	06/01/2015	$39.90	$7.30	$13.30	$0.00	$60.50
	12/01/2015	$40.65	$7.30	$13.30	$0.00	$61.25
	06/01/2016	$41.40	$7.30	$13.30	$0.00	$62.00
	12/01/2016	$42.40	$7.30	$13.30	$0.00	$63.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2013	$39.65	$7.30	$13.30	$0.00	$60.25
	06/01/2014	$40.40	$7.30	$13.30	$0.00	$61.00
	12/01/2014	$41.15	$7.30	$13.30	$0.00	$61.75
	06/01/2015	$41.90	$7.30	$13.30	$0.00	$62.50
	12/01/2015	$42.65	$7.30	$13.30	$0.00	$63.25
	06/01/2016	$43.40	$7.30	$13.30	$0.00	$64.00
	12/01/2016	$44.40	$7.30	$13.30	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$32.34	$9.41	$8.80	$0.00	$50.55
	06/01/2014	$32.69	$9.41	$8.80	$0.00	$50.90
	08/01/2014	$32.69	$9.91	$8.80	$0.00	$51.40
	12/01/2014	$32.69	$9.91	$9.33	$0.00	$51.93
	06/01/2015	$33.04	$9.91	$9.33	$0.00	$52.28
	08/01/2015	$33.04	$10.41	$9.33	$0.00	$52.78
	12/01/2015	$33.04	$10.41	$10.08	$0.00	$53.53
	06/01/2016	$33.54	$10.41	$10.08	$0.00	$54.03
	08/01/2016	$33.54	$10.91	$10.08	$0.00	$54.53
	12/01/2016	$33.54	$10.91	$10.89	$0.00	$55.34
WAGON DRILL OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12*	09/01/2013	$49.06	$9.82	$14.04	$0.00	$72.92
	03/01/2014	$50.06	$9.82	$14.04	$0.00	$73.92
	09/01/2014	$51.06	$9.82	$14.04	$0.00	$74.92
	03/01/2015	$52.06	$9.82	$14.04	$0.00	$75.92
	09/01/2015	$53.06	$9.82	$14.04	$0.00	$76.92
	03/01/2016	$54.21	$9.82	$14.04	$0.00	$78.07
	09/01/2016	$55.26	$9.82	$14.04	$0.00	$79.12
	03/01/2017	$56.26	$9.82	$14.04	$0.00	$80.12
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$25.66	$8.70	$4.48	$0.00	$38.84
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$36.55	$8.70	$6.58	$0.00	$51.83
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$29.94	$8.70	$6.05	$0.00	$44.69
For apprentice rates see "Apprentice- LINEMAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$23.52	$8.70	$5.24	$0.00	$37.46
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$36.35	$8.70	$9.43	$0.00	$54.48
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$32.08	$8.70	$6.59	$0.00	$47.37
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$23.52	$8.70	$3.72	$0.00	$35.94
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$19.25	$8.70	$2.85	$0.00	$30.80
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$42.77	$8.70	$11.78	$0.00	$63.25

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.66	$8.70	$4.24	$0.00	$38.60
2	65	$27.80	$8.70	$4.71	$0.00	$41.21
3	70	$29.94	$8.70	$5.43	$0.00	$44.07
4	75	$32.08	$8.70	$6.16	$0.00	$46.94
5	80	$34.22	$8.70	$6.88	$0.00	$49.80
6	85	$36.35	$8.70	$7.62	$0.00	$52.67
7	90	$38.49	$8.70	$8.83	$0.00	$56.02

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$26.33	$4.18	$2.79	$0.00	$33.30
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$24.78	$4.18	$2.74	$0.00	$31.70
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$24.78	$4.18	$2.74	$0.00	$31.70
TREE TRIMMER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* This classification applies only to the trimming of branches on and around utility lines.	01/29/2012	$17.18	$3.37	$0.00	$0.00	$20.55
TREE TRIMMER GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* This classification applies only to the trimming of branches on and around utility lines.	01/29/2012	$15.15	$3.37	$0.00	$0.00	$18.52

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours) unless otherwise specified.

* Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof.
** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

APPENDIX F

CERTIFICATE OF GOOD STANDING (FOR CORPORATIONS)

INSERT DOCUMENT FROM BID MANUAL HERE

Certificate of Good Standing: If the bidder is a corporation, a Certificate of Good Standing shall be provided with executed contracts. Certificate of Good Standing available online at: http://corp.sec.state.ma.us/corp/Certificates/Certificate_Request.asp or call Tel: (617) 727-9640 for more information.

APPENDIX G

PROCUREMENT DOCUMENTATION

ADVERTISEMENTS, NOTICE TO BIDDERS, ETC.

APPENDIX H

STATEMENT OF MANAGEMENT FOR CONTRACTS OVER $100,000

STATEMENT OF MANAGEMENT

In accordance with M.G.L. Chapter 30, Section 39R, the undersigned successful bidder states that its system of internal accounting controls and that of its subsidiaries reasonably assure (1) that transactions are executed in accordance with management's general and specific authorization; (2) that transactions are recorded as necessary to permit preparation of financial statements in conformity with generally accepted accounting principles, and to maintain accountability for assets; (3) that access to assets is permitted only in accordance with management's general or specific authorization, and (4) that the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Executed this _____day of _____

On behalf of _____
(Successful bidder name)

_____
(Address and telephone of successful bidder)

_____
(Name and title of person signing statement)

By:_____
(Signature)

CERTIFIED PUBLIC ACCOUNTANT STATEMENT

In accordance with M.G.L. 30, Section 39R I, _____ a certified public accountant, state that I have examined the above Statement of Management on internal accounting controls, and that in my opinion (1) the representations of management are consistent with the result of management's evaluation of the system of internal accounting controls; and (2) that such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the above referenced successful bidder's financial statements.

_____

(Signature)

_____

(Business name, address and telephone number)

APPENDIX I

PERFORMANCE BOND AND PAYMENT BOND

FOR CONTRACTS OVER $2000

PERFORMANCE BOND

We, the undersigned,

_____,
(Name of Contractor)

_____,
(Address of Contractor)

_____, hereinafter called Principal, and
(Corporation, Partnership, or Individual)

_____,
(Name of Surety)

_____, (Address of Surety)

hereinafter called Surety, are held and firmly bound unto CITY OF SOMERVILLE, 93 Highland Avenue, Somerville, MA 02143, hereinafter called Owner, in the penal sum of Dollars

($_____) in lawful money of the United States, for the payment of which sum well and truly to be made. We hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

The condition of this obligation is such that the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20____, a copy of which is attached hereto and made a part hereof, for the project known as Repairs to Somerville High School Auditorium, Kitchen and Cafeteria and the Principal and Surety bind themselves to the Owner for the performance of the contract.

Now, therefore, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the

original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety and during the guaranty period set forth in the contract, and if it shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by a reason of failure to do so, and shall reimburse and repay the Owner all outlay and expenses which the Owner may incur in making good any default, then this obligation shall be void; otherwise, this bond shall remain in full force and effect; provided, further, that the said Surety for value received hereby agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder of the specifications accompanying the same shall in any wise affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications. Provided, further, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed on this _____day of , 20____.

CONTRACTOR AS PRINCIPAL	SURETY
_____	_____
(Signature)	(Signature)
Name and Title:	Name and Title:
SEAL	SEAL

Payment Bond

We, the undersigned,

_____,
(Name of Contractor)

_____,
(Address of Contractor)

_____, hereinafter called Principal, and
(Corporation, Partnership, or Individual)

_____,
(Name of Surety)

_____, (Address of Surety)

hereinafter called Surety, are held and firmly bound unto CITY OF SOMERVILLE, 93 Highland Avenue, Somerville, MA 02143, hereinafter called Owner, in the penal sum of Dollars

($_____) in lawful money of the United States, for the payment of which sum well and truly to be made. We hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

The condition of this obligation is such that the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20___, a copy of which is attached hereto and made a part hereof, for the project known as Repairs to Somerville High School Auditorium, Kitchen and Cafeteria.

Now, therefore, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or

modification thereof, including all amounts due for materials used in connection with the work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise this bond is remain in full force and effect. Provided, further, that the said Surety for value received hereby agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder of the Specifications accompanying the same shall in any wise affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

Provided, further, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed on this _____day of , 20____.

CONTRACTOR AS PRINCIPAL	SURETY
----------	----------
(Signature)	(Signature)
Name and Title:	Name and Title:
SEAL	SEAL

PART III TECHNICAL SPECIFICATIONS – DIVISIONS 1 AND 2

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.23	$8.78	$0.00	$0.00	$35.01
2	55	$28.85	$8.78	$6.96	$0.00	$44.59
3	65	$34.09	$8.78	$6.96	$0.00	$49.83
4	70	$36.72	$8.78	$6.96	$0.00	$52.46
5	80	$41.96	$8.78	$6.96	$0.00	$57.70

Notes:
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2012	$38.59	$8.78	$6.96	$0.00	$54.33
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2013	$38.73	$10.00	$13.55	$0.00	$62.28
	05/01/2014	$39.50	$10.00	$13.55	$0.00	$63.05
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2013	$40.15	$10.00	$13.55	$0.00	$63.70
	05/01/2014	$40.92	$10.00	$13.55	$0.00	$64.47
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2013	$21.10	$10.00	$13.55	$0.00	$44.65
	05/01/2014	$21.55	$10.00	$13.55	$0.00	$45.10
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 103*	09/01/2013	$43.96	$13.00	$14.42	$0.00	$71.38
	03/01/2014	$44.45	$13.00	$14.68	$0.00	$72.13
	09/01/2014	$45.12	$13.00	$14.70	$0.00	$72.82
	03/01/2015	$45.84	$13.00	$14.72	$0.00	$73.56
	09/01/2015	$46.80	$13.00	$14.75	$0.00	$74.55
	03/01/2016	$47.75	$13.00	$14.78	$0.00	$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING*ELECTRICIANS LOCAL 103*	09/01/2013	$32.97	$13.00	$12.77	$0.00	$58.74
	03/01/2014	$33.44	$13.00	$13.03	$0.00	$59.47
	09/01/2014	$33.84	$13.00	$13.05	$0.00	$59.89
	03/01/2015	$34.38	$13.00	$13.06	$0.00	$60.44
	09/01/2015	$35.10	$13.00	$13.08	$0.00	$61.18
	03/01/2016	$35.81	$13.00	$13.10	$0.00	$61.91

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$33.76	$10.00	$14.18	$0.00	$57.94
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER *LABORERS - ZONE 1*	12/01/2013	$20.50	$7.30	$12.70	$0.00	$40.50
	06/01/2014	$20.50	$7.30	$12.70	$0.00	$40.50
	12/01/2014	$20.50	$7.30	$12.70	$0.00	$40.50
	06/01/2015	$20.50	$7.30	$12.70	$0.00	$40.50
	12/01/2015	$20.50	$7.30	$12.70	$0.00	$40.50
	06/01/2016	$20.50	$7.30	$12.70	$0.00	$40.50
	12/01/2016	$20.50	$7.30	$12.70	$0.00	$40.50
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	09/01/2013	$38.61	$9.80	$16.71	$0.00	$65.12
	03/01/2014	$38.61	$9.80	$16.71	$0.00	$65.12

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.31	$9.80	$1.79	$0.00	$30.90
2	55	$21.24	$9.80	$1.79	$0.00	$32.83
3	60	$23.17	$9.80	$11.34	$0.00	$44.31
4	65	$25.10	$9.80	$11.34	$0.00	$46.24
5	70	$27.03	$9.80	$13.13	$0.00	$49.96
6	75	$28.96	$9.80	$13.13	$0.00	$51.89
7	80	$30.89	$9.80	$14.92	$0.00	$55.61
8	85	$32.82	$9.80	$14.92	$0.00	$57.54

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.31	$9.80	$1.79	$0.00	$30.90
2	55	$21.24	$9.80	$1.79	$0.00	$32.83
3	60	$23.17	$9.80	$11.34	$0.00	$44.31
4	65	$25.10	$9.80	$11.34	$0.00	$46.24
5	70	$27.03	$9.80	$13.13	$0.00	$49.96
6	75	$28.96	$9.80	$13.13	$0.00	$51.89
7	80	$30.89	$9.80	$14.92	$0.00	$55.61
8	85	$32.82	$9.80	$14.92	$0.00	$57.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$28.11	$10.00	$14.18	$0.00	$52.29

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 1)*	01/01/2014	$41.20	$7.85	$16.10	$0.00	$65.15
	07/01/2014	$42.05	$7.85	$16.10	$0.00	$66.00
	01/01/2015	$42.95	$7.85	$16.10	$0.00	$66.90
	07/01/2015	$43.85	$7.85	$16.10	$0.00	$67.80
	01/01/2016	$44.80	$7.85	$16.10	$0.00	$68.75
	07/01/2016	$45.75	$7.85	$16.10	$0.00	$69.70
	01/01/2017	$46.70	$7.85	$16.10	$0.00	$70.65

Apprentice - *GLAZIER - Local 35 Zone 1*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.60	$7.85	$0.00	$0.00	$28.45
2	55	$22.66	$7.85	$3.66	$0.00	$34.17
3	60	$24.72	$7.85	$3.99	$0.00	$36.56
4	65	$26.78	$7.85	$4.32	$0.00	$38.95
5	70	$28.84	$7.85	$14.11	$0.00	$50.80
6	75	$30.90	$7.85	$14.44	$0.00	$53.19
7	80	$32.96	$7.85	$14.77	$0.00	$55.58
8	90	$37.08	$7.85	$15.44	$0.00	$60.37

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.03	$7.85	$0.00	$0.00	$28.88
2	55	$23.13	$7.85	$3.66	$0.00	$34.64
3	60	$25.23	$7.85	$3.99	$0.00	$37.07
4	65	$27.33	$7.85	$4.32	$0.00	$39.50
5	70	$29.44	$7.85	$14.11	$0.00	$51.40
6	75	$31.54	$7.85	$14.44	$0.00	$53.83
7	80	$33.64	$7.85	$14.77	$0.00	$56.26
8	90	$37.85	$7.85	$15.44	$0.00	$61.14

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 12/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.27	$10.00	$0.00	$0.00	$32.27
2	60	$24.29	$10.00	$14.18	$0.00	$48.47
3	65	$26.32	$10.00	$14.18	$0.00	$50.50
4	70	$28.34	$10.00	$14.18	$0.00	$52.52
5	75	$30.37	$10.00	$14.18	$0.00	$54.55
6	80	$32.39	$10.00	$14.18	$0.00	$56.57
7	85	$34.42	$10.00	$14.18	$0.00	$58.60
8	90	$36.44	$10.00	$14.18	$0.00	$60.62

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2014	$42.76	$9.82	$19.74	$2.17	$74.49
	08/01/2014	$43.61	$9.82	$19.74	$2.17	$75.34
	02/01/2015	$44.51	$9.82	$19.74	$2.17	$76.24
	08/01/2015	$45.51	$9.82	$19.74	$2.17	$77.24
	02/01/2016	$46.51	$9.82	$19.74	$2.17	$78.24
	08/01/2016	$47.66	$9.82	$19.74	$2.17	$79.39
	02/01/2017	$48.76	$9.82	$19.74	$2.17	$80.49
	08/01/2017	$49.86	$9.82	$19.74	$2.17	$81.59
	02/01/2018	$51.01	$9.82	$19.74	$2.17	$82.74
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	09/01/2013	$43.96	$13.00	$14.42	$0.00	$71.38
	03/01/2014	$44.45	$13.00	$14.68	$0.00	$72.13
	09/01/2014	$45.12	$13.00	$14.70	$0.00	$72.82
	03/01/2015	$45.84	$13.00	$14.72	$0.00	$73.56
	09/01/2015	$46.80	$13.00	$14.75	$0.00	$74.55
	03/01/2016	$47.75	$13.00	$14.78	$0.00	$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2014	$42.76	$9.82	$19.74	$2.17	$74.49
	08/01/2014	$43.61	$9.82	$19.74	$2.17	$75.34
	02/01/2015	$44.51	$9.82	$19.74	$2.17	$76.24
	08/01/2015	$45.51	$9.82	$19.74	$2.17	$77.24
	02/01/2016	$46.51	$9.82	$19.74	$2.17	$78.24
	08/01/2016	$47.66	$9.82	$19.74	$2.17	$79.39
	02/01/2017	$48.76	$9.82	$19.74	$2.17	$80.49
	08/01/2017	$49.86	$9.82	$19.74	$2.17	$81.59
	02/01/2018	$51.01	$9.82	$19.74	$2.17	$82.74
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 1*	12/01/2013	$34.10	$7.30	$12.70	$0.00	$54.10
	06/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	12/01/2014	$35.60	$7.30	$12.70	$0.00	$55.60
	06/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	12/01/2015	$37.10	$7.30	$12.70	$0.00	$57.10
	06/01/2016	$37.85	$7.30	$12.70	$0.00	$57.85
	12/01/2016	$38.85	$7.30	$12.70	$0.00	$58.85
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2013	$42.11	$10.95	$12.10	$0.00	$65.16
	09/01/2014	$44.11	$10.95	$12.10	$0.00	$67.16

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.06	$10.95	$9.00	$0.00	$41.01
2	60	$25.27	$10.95	$9.62	$0.00	$45.84
3	70	$29.48	$10.95	$10.24	$0.00	$50.67
4	80	$33.69	$10.95	$10.86	$0.00	$55.50

Effective Date - 09/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.06	$10.95	$9.00	$0.00	$42.01
2	60	$26.47	$10.95	$9.62	$0.00	$47.04
3	70	$30.88	$10.95	$10.24	$0.00	$52.07
4	80	$35.29	$10.95	$10.86	$0.00	$57.10

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (BOSTON AREA)*	09/16/2013	$40.85	$7.70	$18.60	$0.00	$67.15

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *IRONWORKER - Local 7 Boston*

Effective Date - 09/16/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$24.51	$7.70	$18.60	$0.00	$50.81
2	70	$28.60	$7.70	$18.60	$0.00	$54.90
3	75	$30.64	$7.70	$18.60	$0.00	$56.94
4	80	$32.68	$7.70	$18.60	$0.00	$58.98
5	85	$34.72	$7.70	$18.60	$0.00	$61.02
6	90	$36.77	$7.70	$18.60	$0.00	$63.07

Notes:

** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 1*

Effective Date - 12/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.01	$7.30	$12.70	$0.00	$40.01
2	70	$23.35	$7.30	$12.70	$0.00	$43.35
3	80	$26.68	$7.30	$12.70	$0.00	$46.68
4	90	$30.02	$7.30	$12.70	$0.00	$50.02

Effective Date - 06/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.46	$7.30	$12.70	$0.00	$40.46
2	70	$23.87	$7.30	$12.70	$0.00	$43.87
3	80	$27.28	$7.30	$12.70	$0.00	$47.28
4	90	$30.69	$7.30	$12.70	$0.00	$50.69

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 1*	12/01/2013	$33.50	$7.30	$12.70	$0.00	$53.50
	06/01/2014	$34.25	$7.30	$12.70	$0.00	$54.25
	12/01/2014	$35.00	$7.30	$12.70	$0.00	$55.00
	06/01/2015	$35.75	$7.30	$12.70	$0.00	$55.75
	12/01/2015	$36.50	$7.30	$12.70	$0.00	$56.50
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MASON TENDER *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
This classification applies to the wholesale removal of standing trees including all associated trimming of branches and limbs, and applies to the removal of branches at locations not on or around utility lines. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2014	$36.66	$10.18	$16.83	$0.00	$63.67
	08/01/2014	$37.37	$10.18	$16.90	$0.00	$64.45
	02/01/2015	$37.82	$10.18	$16.90	$0.00	$64.90
	08/01/2015	$38.53	$10.18	$16.97	$0.00	$65.68
	02/01/2016	$38.98	$10.18	$16.97	$0.00	$66.13
	08/01/2016	$39.68	$10.18	$17.05	$0.00	$66.91
	02/01/2017	$40.14	$10.18	$17.05	$0.00	$67.37

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.33	$10.18	$16.83	$0.00	$45.34
2	60	$22.00	$10.18	$16.83	$0.00	$49.01
3	70	$25.66	$10.18	$16.83	$0.00	$52.67
4	80	$29.33	$10.18	$16.83	$0.00	$56.34
5	90	$32.99	$10.18	$16.83	$0.00	$60.00

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.69	$10.18	$16.90	$0.00	$45.77
2	60	$22.42	$10.18	$16.90	$0.00	$49.50
3	70	$26.16	$10.18	$16.90	$0.00	$53.24
4	80	$29.90	$10.18	$16.90	$0.00	$56.98
5	90	$33.63	$10.18	$16.90	$0.00	$60.71

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2014	$48.10	$10.18	$18.15	$0.00	$76.43
	08/01/2014	$49.00	$10.18	$18.22	$0.00	$77.40
	02/01/2015	$49.56	$10.18	$18.22	$0.00	$77.96
	08/01/2015	$50.46	$10.18	$18.29	$0.00	$78.93
	02/01/2016	$51.03	$10.18	$18.29	$0.00	$79.50
	08/01/2016	$51.93	$10.18	$18.37	$0.00	$80.48
	02/01/2017	$52.50	$10.18	$18.37	$0.00	$81.05

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.05	$10.18	$18.15	$0.00	$52.38
2	60	$28.86	$10.18	$18.15	$0.00	$57.19
3	70	$33.67	$10.18	$18.15	$0.00	$62.00
4	80	$38.48	$10.18	$18.15	$0.00	$66.81
5	90	$43.29	$10.18	$18.15	$0.00	$71.62

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.50	$10.18	$18.22	$0.00	$52.90
2	60	$29.40	$10.18	$18.22	$0.00	$57.80
3	70	$34.30	$10.18	$18.22	$0.00	$62.70
4	80	$39.20	$10.18	$18.22	$0.00	$67.60
5	90	$44.10	$10.18	$18.22	$0.00	$72.50

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
MILLWRIGHT (Zone 1) *MILLWRIGHTS LOCAL 1121 - Zone 1*	10/01/2013	$35.20	$9.80	$16.01	$0.00	$61.01
	04/01/2014	$35.98	$9.80	$16.01	$0.00	$61.79
	10/01/2014	$36.93	$9.80	$16.01	$0.00	$62.74
	04/01/2015	$37.89	$9.80	$16.01	$0.00	$63.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 1*

Effective Date - 10/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$19.36	$9.80	$4.40	$0.00	$33.56
2	65	$22.88	$9.80	$13.21	$0.00	$45.89
3	75	$26.40	$9.80	$14.01	$0.00	$50.21
4	85	$29.92	$9.80	$14.81	$0.00	$54.53

Effective Date - 04/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$19.79	$9.80	$4.40	$0.00	$33.99
2	65	$23.39	$9.80	$13.21	$0.00	$46.40
3	75	$26.99	$9.80	$14.01	$0.00	$50.80
4	85	$30.58	$9.80	$14.81	$0.00	$55.19

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$20.96	$10.00	$14.18	$0.00	$45.14
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$24.43	$10.00	$14.18	$0.00	$48.61
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 1*	01/01/2014	$45.91	$7.85	$16.10	$0.00	$69.86
	07/01/2014	$46.76	$7.85	$16.10	$0.00	$70.71
	01/01/2015	$47.66	$7.85	$16.10	$0.00	$71.61
	07/01/2015	$48.56	$7.85	$16.10	$0.00	$72.51
	01/01/2016	$49.51	$7.85	$16.10	$0.00	$73.46
	07/01/2016	$50.46	$7.85	$16.10	$0.00	$74.41
	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.96	$7.85	$0.00	$0.00	$30.81
2	55	$25.25	$7.85	$3.66	$0.00	$36.76
3	60	$27.55	$7.85	$3.99	$0.00	$39.39
4	65	$29.84	$7.85	$4.32	$0.00	$42.01
5	70	$32.14	$7.85	$14.11	$0.00	$54.10
6	75	$34.43	$7.85	$14.44	$0.00	$56.72
7	80	$36.73	$7.85	$14.77	$0.00	$59.35
8	90	$41.32	$7.85	$15.44	$0.00	$64.61

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.38	$7.85	$0.00	$0.00	$31.23
2	55	$25.72	$7.85	$3.66	$0.00	$37.23
3	60	$28.06	$7.85	$3.99	$0.00	$39.90
4	65	$30.39	$7.85	$4.32	$0.00	$42.56
5	70	$32.73	$7.85	$14.11	$0.00	$54.69
6	75	$35.07	$7.85	$14.44	$0.00	$57.36
7	80	$37.41	$7.85	$14.77	$0.00	$60.03
8	90	$42.08	$7.85	$15.44	$0.00	$65.37

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2014	$42.60	$7.85	$16.10	$0.00	$66.55
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 1*	07/01/2014	$43.45	$7.85	$16.10	$0.00	$67.40
	01/01/2015	$44.35	$7.85	$16.10	$0.00	$68.30
	07/01/2015	$45.25	$7.85	$16.10	$0.00	$69.20
	01/01/2016	$46.20	$7.85	$16.10	$0.00	$70.15
	07/01/2016	$47.15	$7.85	$16.10	$0.00	$71.10
	01/01/2017	$48.10	$7.85	$16.10	$0.00	$72.05

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - Spray/Sandblast - New*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.30	$7.85	$0.00	$0.00	$29.15
2	55	$23.43	$7.85	$3.66	$0.00	$34.94
3	60	$25.56	$7.85	$3.99	$0.00	$37.40
4	65	$27.69	$7.85	$4.32	$0.00	$39.86
5	70	$29.82	$7.85	$14.11	$0.00	$51.78
6	75	$31.95	$7.85	$14.44	$0.00	$54.24
7	80	$34.08	$7.85	$14.77	$0.00	$56.70
8	90	$38.34	$7.85	$15.44	$0.00	$61.63

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.73	$7.85	$0.00	$0.00	$29.58
2	55	$23.90	$7.85	$3.66	$0.00	$35.41
3	60	$26.07	$7.85	$3.99	$0.00	$37.91
4	65	$28.24	$7.85	$4.32	$0.00	$40.41
5	70	$30.42	$7.85	$14.11	$0.00	$52.38
6	75	$32.59	$7.85	$14.44	$0.00	$54.88
7	80	$34.76	$7.85	$14.77	$0.00	$57.38
8	90	$39.11	$7.85	$15.44	$0.00	$62.40

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 1*	01/01/2014	$40.66	$7.85	$16.10	$0.00	$64.61
	07/01/2014	$41.51	$7.85	$16.10	$0.00	$65.46
	01/01/2015	$42.41	$7.85	$16.10	$0.00	$66.36
	07/01/2015	$43.31	$7.85	$16.10	$0.00	$67.26
	01/01/2016	$44.26	$7.85	$16.10	$0.00	$68.21
	07/01/2016	$45.21	$7.85	$16.10	$0.00	$69.16
	01/01/2017	$46.16	$7.85	$16.10	$0.00	$70.11

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.33	$7.85	$0.00	$0.00	$28.18
2	55	$22.36	$7.85	$3.66	$0.00	$33.87
3	60	$24.40	$7.85	$3.99	$0.00	$36.24
4	65	$26.43	$7.85	$4.32	$0.00	$38.60
5	70	$28.46	$7.85	$14.11	$0.00	$50.42
6	75	$30.50	$7.85	$14.44	$0.00	$52.79
7	80	$32.53	$7.85	$14.77	$0.00	$55.15
8	90	$36.59	$7.85	$15.44	$0.00	$59.88

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.76	$7.85	$0.00	$0.00	$28.61
2	55	$22.83	$7.85	$3.66	$0.00	$34.34
3	60	$24.91	$7.85	$3.99	$0.00	$36.75
4	65	$26.98	$7.85	$4.32	$0.00	$39.15
5	70	$29.06	$7.85	$14.11	$0.00	$51.02
6	75	$31.13	$7.85	$14.44	$0.00	$53.42
7	80	$33.21	$7.85	$14.77	$0.00	$55.83
8	90	$37.36	$7.85	$15.44	$0.00	$60.65

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) *LABORERS - ZONE 1*	12/01/2013	$33.35	$7.30	$12.70	$0.00	$53.35
	06/01/2014	$34.10	$7.30	$12.70	$0.00	$54.10
	12/01/2014	$34.85	$7.30	$12.70	$0.00	$54.85
	06/01/2015	$35.60	$7.30	$12.70	$0.00	$55.60
	12/01/2015	$36.35	$7.30	$12.70	$0.00	$56.35
	06/01/2016	$37.10	$7.30	$12.70	$0.00	$57.10
	12/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 1*	01/01/2014	$41.20	$7.85	$16.10	$0.00	$65.15
	07/01/2014	$42.05	$7.85	$16.10	$0.00	$66.00
	01/01/2015	$42.95	$7.85	$16.10	$0.00	$66.90
	07/01/2015	$43.85	$7.85	$16.10	$0.00	$67.80
	01/01/2016	$44.80	$7.85	$16.10	$0.00	$68.75
	07/01/2016	$45.75	$7.85	$16.10	$0.00	$69.70
	01/01/2017	$46.70	$7.85	$16.10	$0.00	$70.65

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 1 - BRUSH NEW*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.60	$7.85	$0.00	$0.00	$28.45
2	55	$22.66	$7.85	$3.66	$0.00	$34.17
3	60	$24.72	$7.85	$3.99	$0.00	$36.56
4	65	$26.78	$7.85	$4.32	$0.00	$38.95
5	70	$28.84	$7.85	$14.11	$0.00	$50.80
6	75	$30.90	$7.85	$14.44	$0.00	$53.19
7	80	$32.96	$7.85	$14.77	$0.00	$55.58
8	90	$37.08	$7.85	$15.44	$0.00	$60.37

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.03	$7.85	$0.00	$0.00	$28.88
2	55	$23.13	$7.85	$3.66	$0.00	$34.64
3	60	$25.23	$7.85	$3.99	$0.00	$37.07
4	65	$27.33	$7.85	$4.32	$0.00	$39.50
5	70	$29.44	$7.85	$14.11	$0.00	$51.40
6	75	$31.54	$7.85	$14.44	$0.00	$53.83
7	80	$33.64	$7.85	$14.77	$0.00	$56.26
8	90	$37.85	$7.85	$15.44	$0.00	$61.14

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 1*	01/01/2014	$39.26	$7.85	$16.10	$0.00	$63.21
	07/01/2014	$40.11	$7.85	$16.10	$0.00	$64.06
	01/01/2015	$41.01	$7.85	$16.10	$0.00	$64.96
	07/01/2015	$41.91	$7.85	$16.10	$0.00	$65.86
	01/01/2016	$42.86	$7.85	$16.10	$0.00	$66.81
	07/01/2016	$43.81	$7.85	$16.10	$0.00	$67.76
	01/01/2017	$44.76	$7.85	$16.10	$0.00	$68.71

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - BRUSH REPAINT*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.63	$7.85	$0.00	$0.00	$27.48
2	55	$21.59	$7.85	$3.66	$0.00	$33.10
3	60	$23.56	$7.85	$3.99	$0.00	$35.40
4	65	$25.52	$7.85	$4.32	$0.00	$37.69
5	70	$27.48	$7.85	$14.11	$0.00	$49.44
6	75	$29.45	$7.85	$14.44	$0.00	$51.74
7	80	$31.41	$7.85	$14.77	$0.00	$54.03
8	90	$35.33	$7.85	$15.44	$0.00	$58.62

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.06	$7.85	$0.00	$0.00	$27.91
2	55	$22.06	$7.85	$3.66	$0.00	$33.57
3	60	$24.07	$7.85	$3.99	$0.00	$35.91
4	65	$26.07	$7.85	$4.32	$0.00	$38.24
5	70	$28.08	$7.85	$14.11	$0.00	$50.04
6	75	$30.08	$7.85	$14.44	$0.00	$52.37
7	80	$32.09	$7.85	$14.77	$0.00	$54.71
8	90	$36.10	$7.85	$15.44	$0.00	$59.39

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$31.88	$9.41	$8.80	$0.00	$50.09
	06/01/2014	$32.23	$9.41	$8.80	$0.00	$50.44
	08/01/2014	$32.23	$9.91	$8.80	$0.00	$50.94
	12/01/2014	$32.23	$9.91	$9.33	$0.00	$51.47
	06/01/2015	$32.58	$9.91	$9.33	$0.00	$51.82
	08/01/2015	$32.58	$10.41	$9.33	$0.00	$52.32
	12/01/2015	$32.58	$10.41	$10.08	$0.00	$53.07
	06/01/2016	$33.08	$10.41	$10.08	$0.00	$53.57
	08/01/2016	$33.08	$10.91	$10.08	$0.00	$54.07
	12/01/2016	$33.08	$10.91	$10.89	$0.00	$54.88
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$40.10	$9.80	$18.17	$0.00	$68.07
	08/01/2014	$41.60	$9.80	$18.17	$0.00	$69.57
	08/01/2015	$43.10	$9.80	$18.17	$0.00	$71.07
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$40.10	$9.80	$18.17	$0.00	$68.07
	08/01/2014	$41.60	$9.80	$18.17	$0.00	$69.57
	08/01/2015	$43.10	$9.80	$18.17	$0.00	$71.07

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.05	$9.80	$18.17	$0.00	$48.02
2	60	$24.06	$9.80	$18.17	$0.00	$52.03
3	70	$28.07	$9.80	$18.17	$0.00	$56.04
4	75	$30.08	$9.80	$18.17	$0.00	$58.05
5	80	$32.08	$9.80	$18.17	$0.00	$60.05
6	80	$32.08	$9.80	$18.17	$0.00	$60.05
7	90	$36.09	$9.80	$18.17	$0.00	$64.06
8	90	$36.09	$9.80	$18.17	$0.00	$64.06

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.80	$9.80	$18.17	$0.00	$48.77
2	60	$24.96	$9.80	$18.17	$0.00	$52.93
3	70	$29.12	$9.80	$18.17	$0.00	$57.09
4	75	$31.20	$9.80	$18.17	$0.00	$59.17
5	80	$33.28	$9.80	$18.17	$0.00	$61.25
6	80	$33.28	$9.80	$18.17	$0.00	$61.25
7	90	$37.44	$9.80	$18.17	$0.00	$65.41
8	90	$37.44	$9.80	$18.17	$0.00	$65.41

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48

Apprentice - *PIPEFITTER - Local 537*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.74	$8.75	$6.50	$0.00	$34.99
2	45	$22.20	$8.75	$14.39	$0.00	$45.34
3	60	$29.60	$8.75	$14.39	$0.00	$52.74
4	70	$34.54	$8.75	$14.39	$0.00	$57.68
5	80	$39.47	$8.75	$14.39	$0.00	$62.61

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
PLUMBERS & GASFITTERS *PLUMBERS & GASFITTERS LOCAL 12*	09/01/2013	$49.06	$9.82	$14.04	$0.00	$72.92
	03/01/2014	$50.06	$9.82	$14.04	$0.00	$73.92
	09/01/2014	$51.06	$9.82	$14.04	$0.00	$74.92
	03/01/2015	$52.06	$9.82	$14.04	$0.00	$75.92
	09/01/2015	$53.06	$9.82	$14.04	$0.00	$76.92
	03/01/2016	$54.21	$9.82	$14.04	$0.00	$78.07
	09/01/2016	$55.26	$9.82	$14.04	$0.00	$79.12
	03/01/2017	$56.26	$9.82	$14.04	$0.00	$80.12

Apprentice - *PLUMBER/GASFITTER - Local 12*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.17	$9.82	$5.26	$0.00	$32.25
2	40	$19.62	$9.82	$5.92	$0.00	$35.36
3	55	$26.98	$9.82	$7.95	$0.00	$44.75
4	65	$31.89	$9.82	$9.30	$0.00	$51.01
5	75	$36.80	$9.82	$10.65	$0.00	$57.27

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.52	$9.82	$5.26	$0.00	$32.60
2	40	$20.02	$9.82	$5.92	$0.00	$35.76
3	55	$27.53	$9.82	$7.95	$0.00	$45.30
4	65	$32.54	$9.82	$9.30	$0.00	$51.66
5	75	$37.55	$9.82	$10.65	$0.00	$58.02

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic$54.16 Step5 with lic$60.40

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER *LABORERS - ZONE 1*	12/01/2013	$34.35	$7.30	$12.70	$0.00	$54.35
	06/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	12/01/2014	$35.85	$7.30	$12.70	$0.00	$55.85
	06/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	12/01/2015	$37.35	$7.30	$12.70	$0.00	$57.35
	06/01/2016	$38.10	$7.30	$12.70	$0.00	$58.10
	12/01/2016	$39.10	$7.30	$12.70	$0.00	$59.10
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$28.11	$10.00	$14.18	$0.00	$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS LOCAL 25a*	05/01/2011	$29.99	$7.75	$5.91	$0.00	$43.65
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RESIDENTIAL WOOD FRAME (All Other Work) *CARPENTERS -ZONE 1 (Residential Wood)*	04/01/2011	$37.25	$8.67	$15.51	$0.00	$61.43
RESIDENTIAL WOOD FRAME CARPENTER ** ** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement.*CARPENTERS -ZONE 1 (Residential Wood)*	05/01/2011	$27.49	$6.34	$6.23	$0.00	$40.06
As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER rate.						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER (Residential Wood Frame) - Zone 1*

Effective Date - 05/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$16.49	$6.34	$0.00	$0.00	$22.83
2	60	$16.49	$6.34	$6.23	$0.00	$29.06
3	65	$17.87	$6.34	$6.23	$0.00	$30.44
4	70	$19.24	$6.34	$6.23	$0.00	$31.81
5	75	$20.62	$6.34	$6.23	$0.00	$33.19
6	80	$21.99	$6.34	$6.23	$0.00	$34.56
7	85	$23.37	$6.34	$6.23	$0.00	$35.94
8	90	$24.74	$6.34	$6.23	$0.00	$37.31

Notes:

Apprentice to Journeyworker Ratio:1:5

RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	02/01/2014	$39.21	$10.50	$10.70	$0.00	$60.41
	08/01/2014	$40.11	$10.50	$10.70	$0.00	$61.31
	02/01/2015	$41.01	$10.50	$10.70	$0.00	$62.21
	08/01/2015	$41.91	$10.50	$10.70	$0.00	$63.11
	02/01/2016	$42.81	$10.50	$10.70	$0.00	$64.01

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 33*

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.61	$10.50	$3.38	$0.00	$33.49
2	60	$23.53	$10.50	$10.70	$0.00	$44.73
3	65	$25.49	$10.50	$10.70	$0.00	$46.69
4	75	$29.41	$10.50	$10.70	$0.00	$50.61
5	85	$33.33	$10.50	$10.70	$0.00	$54.53

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.06	$10.50	$3.38	$0.00	$33.94
2	60	$24.07	$10.50	$10.70	$0.00	$45.27
3	65	$26.07	$10.50	$10.70	$0.00	$47.27
4	75	$30.08	$10.50	$10.70	$0.00	$51.28
5	85	$34.09	$10.50	$10.70	$0.00	$55.29

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	02/01/2014	$39.46	$10.50	$10.70	$0.00	$60.66
	08/01/2014	$40.36	$10.50	$10.70	$0.00	$61.56
	02/01/2015	$41.26	$10.50	$10.70	$0.00	$62.46
	08/01/2015	$42.16	$10.50	$10.70	$0.00	$63.36
	02/01/2016	$43.06	$10.50	$10.70	$0.00	$64.26
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2014	$42.76	$9.82	$19.74	$2.17	$74.49
	08/01/2014	$43.61	$9.82	$19.74	$2.17	$75.34
	02/01/2015	$44.51	$9.82	$19.74	$2.17	$76.24
	08/01/2015	$45.51	$9.82	$19.74	$2.17	$77.24
	02/01/2016	$46.51	$9.82	$19.74	$2.17	$78.24
	08/01/2016	$47.66	$9.82	$19.74	$2.17	$79.39
	02/01/2017	$48.76	$9.82	$19.74	$2.17	$80.49
	08/01/2017	$49.86	$9.82	$19.74	$2.17	$81.59
	02/01/2018	$51.01	$9.82	$19.74	$2.17	$82.74

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.10	$9.82	$4.28	$0.00	$31.20
2	40	$17.10	$9.82	$4.28	$0.00	$31.20
3	45	$19.24	$9.82	$8.70	$1.13	$38.89
4	45	$19.24	$9.82	$8.70	$1.13	$38.89
5	50	$21.38	$9.82	$9.49	$1.22	$41.91
6	50	$21.38	$9.82	$9.74	$1.23	$42.17
7	60	$25.66	$9.82	$11.05	$1.40	$47.93
8	65	$27.79	$9.82	$11.84	$1.48	$50.93
9	75	$32.07	$9.82	$13.41	$1.66	$56.96
10	85	$36.35	$9.82	$14.48	$1.82	$62.47

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.44	$9.82	$4.28	$0.00	$31.54
2	40	$17.44	$9.82	$4.28	$0.00	$31.54
3	45	$19.62	$9.82	$8.70	$1.13	$39.27
4	45	$19.62	$9.82	$8.70	$1.13	$39.27
5	50	$21.81	$9.82	$9.49	$1.22	$42.34
6	50	$21.81	$9.82	$9.74	$1.23	$42.60
7	60	$26.17	$9.82	$11.05	$1.40	$48.44
8	65	$28.35	$9.82	$11.84	$1.48	$51.49
9	75	$32.71	$9.82	$13.41	$1.66	$57.60
10	85	$37.07	$9.82	$14.48	$1.82	$63.19

Notes:
Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SIGN ERECTOR *PAINTERS LOCAL 35 - ZONE 1*	06/01/2013	$25.81	$7.07	$7.05	$0.00	$39.93

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SIGN ERECTOR - Local 35 Zone 1*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$12.91	$7.07	$0.00	$0.00	$19.98
2	55	$14.20	$7.07	$2.45	$0.00	$23.72
3	60	$15.49	$7.07	$2.45	$0.00	$25.01
4	65	$16.78	$7.07	$2.45	$0.00	$26.30
5	70	$18.07	$7.07	$7.05	$0.00	$32.19
6	75	$19.36	$7.07	$7.05	$0.00	$33.48
7	80	$20.65	$7.07	$7.05	$0.00	$34.77
8	85	$21.94	$7.07	$7.05	$0.00	$36.06
9	90	$23.23	$7.07	$7.05	$0.00	$37.35

Notes:

Steps are 4 mos.

Apprentice to Journeyworker Ratio:1:1

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$32.34	$9.41	$8.80	$0.00	$50.55
	06/01/2014	$32.69	$9.41	$8.80	$0.00	$50.90
	08/01/2014	$32.69	$9.91	$8.80	$0.00	$51.40
	12/01/2014	$32.69	$9.91	$9.33	$0.00	$51.93
	06/01/2015	$33.04	$9.91	$9.33	$0.00	$52.28
	08/01/2015	$33.04	$10.41	$9.33	$0.00	$52.78
	12/01/2015	$33.04	$10.41	$10.08	$0.00	$53.53
	06/01/2016	$33.54	$10.41	$10.08	$0.00	$54.03
	08/01/2016	$33.54	$10.91	$10.08	$0.00	$54.53
	12/01/2016	$33.54	$10.91	$10.89	$0.00	$55.34
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$32.63	$9.41	$8.80	$0.00	$50.84
	06/01/2014	$32.98	$9.41	$8.80	$0.00	$51.19
	08/01/2014	$32.98	$9.91	$8.80	$0.00	$51.69
	12/01/2014	$32.98	$9.91	$9.33	$0.00	$52.22
	06/01/2015	$33.33	$9.91	$9.33	$0.00	$52.57
	08/01/2015	$33.33	$10.41	$9.33	$0.00	$53.07
	12/01/2015	$33.33	$10.41	$10.08	$0.00	$53.82
	06/01/2016	$33.83	$10.41	$10.08	$0.00	$54.32
	08/01/2016	$33.83	$10.91	$10.08	$0.00	$54.82
	12/01/2016	$33.83	$10.91	$10.89	$0.00	$55.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1*	01/01/2014	$53.33	$8.42	$12.85	$0.00	$74.60
	03/01/2014	$54.58	$8.42	$12.85	$0.00	$75.85
	10/01/2014	$55.73	$8.42	$12.85	$0.00	$77.00
	01/01/2015	$55.73	$8.42	$13.00	$0.00	$77.15
	03/01/2015	$56.73	$8.42	$13.00	$0.00	$78.15
	10/01/2015	$57.88	$8.42	$13.00	$0.00	$79.30
	01/01/2016	$57.88	$8.67	$13.15	$0.00	$79.70
	03/01/2016	$58.88	$8.67	$13.15	$0.00	$80.70
	10/01/2016	$60.03	$8.67	$13.15	$0.00	$81.85
	03/01/2017	$61.03	$8.67	$13.15	$0.00	$82.85

Apprentice - *SPRINKLER FITTER - Local 550 (Section A) Zone 1*

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$18.67	$8.42	$8.25	$0.00	$35.34
2	40	$21.33	$8.42	$8.25	$0.00	$38.00
3	45	$24.00	$8.42	$8.25	$0.00	$40.67
4	50	$26.67	$8.42	$8.25	$0.00	$43.34
5	55	$29.33	$8.42	$8.25	$0.00	$46.00
6	60	$32.00	$8.42	$8.25	$0.00	$48.67
7	65	$34.66	$8.42	$8.25	$0.00	$51.33
8	70	$37.33	$8.42	$8.25	$0.00	$54.00
9	75	$40.00	$8.42	$8.25	$0.00	$56.67
10	80	$42.66	$8.42	$8.25	$0.00	$59.33

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$19.10	$8.42	$8.25	$0.00	$35.77
2	40	$21.83	$8.42	$8.25	$0.00	$38.50
3	45	$24.56	$8.42	$8.25	$0.00	$41.23
4	50	$27.29	$8.42	$8.25	$0.00	$43.96
5	55	$30.02	$8.42	$8.25	$0.00	$46.69
6	60	$32.75	$8.42	$8.25	$0.00	$49.42
7	65	$35.48	$8.42	$8.25	$0.00	$52.15
8	70	$38.21	$8.42	$8.25	$0.00	$54.88
9	75	$40.94	$8.42	$8.25	$0.00	$57.61
10	80	$43.66	$8.42	$8.25	$0.00	$60.33

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 103*	09/01/2013	$32.97	$13.00	$12.77	$0.00	$58.74
	03/01/2014	$33.44	$13.00	$13.03	$0.00	$59.47
	09/01/2014	$33.84	$13.00	$13.05	$0.00	$59.89
	03/01/2015	$34.38	$13.00	$13.06	$0.00	$60.44
	09/01/2015	$35.10	$13.00	$13.08	$0.00	$61.18
	03/01/2016	$35.81	$13.00	$13.10	$0.00	$61.91

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$13.19	$13.00	$0.40	$0.00	$26.59
2	40	$13.19	$13.00	$0.40	$0.00	$26.59
3	45	$14.84	$13.00	$10.04	$0.00	$37.88
4	45	$14.84	$13.00	$10.04	$0.00	$37.88
5	50	$16.49	$13.00	$10.29	$0.00	$39.78
6	55	$18.13	$13.00	$10.53	$0.00	$41.66
7	60	$19.78	$13.00	$10.78	$0.00	$43.56
8	65	$21.43	$13.00	$11.03	$0.00	$45.46
9	70	$23.08	$13.00	$11.28	$0.00	$47.36
10	75	$24.73	$13.00	$11.53	$0.00	$49.26

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$13.38	$13.00	$0.40	$0.00	$26.78
2	40	$13.38	$13.00	$0.40	$0.00	$26.78
3	45	$15.05	$13.00	$10.29	$0.00	$38.34
4	45	$15.05	$13.00	$10.29	$0.00	$38.34
5	50	$16.72	$13.00	$10.54	$0.00	$40.26
6	55	$18.39	$13.00	$10.79	$0.00	$42.18
7	60	$20.06	$13.00	$11.04	$0.00	$44.10
8	65	$21.74	$13.00	$11.29	$0.00	$46.03
9	70	$23.41	$13.00	$11.54	$0.00	$47.95
10	75	$25.08	$13.00	$11.79	$0.00	$49.87

Notes:

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TERRAZZO FINISHERS	02/01/2014	$47.00	$10.18	$18.15	$0.00	$75.33
BRICKLAYERS LOCAL 3 - MARBLE & TILE	08/01/2014	$47.90	$10.18	$18.22	$0.00	$76.30
	02/01/2015	$48.46	$10.18	$18.22	$0.00	$76.86
	08/01/2015	$49.36	$10.18	$18.29	$0.00	$77.83
	02/01/2016	$49.93	$10.18	$18.29	$0.00	$78.40
	08/01/2016	$50.83	$10.18	$18.37	$0.00	$79.38
	02/01/2017	$51.40	$10.18	$18.37	$0.00	$79.95

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.50	$10.18	$18.15	$0.00	$51.83
2	60	$28.20	$10.18	$18.15	$0.00	$56.53
3	70	$32.90	$10.18	$18.15	$0.00	$61.23
4	80	$37.60	$10.18	$18.15	$0.00	$65.93
5	90	$42.30	$10.18	$18.15	$0.00	$70.63

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.95	$10.18	$18.22	$0.00	$52.35
2	60	$28.74	$10.18	$18.22	$0.00	$57.14
3	70	$33.53	$10.18	$18.22	$0.00	$61.93
4	80	$38.32	$10.18	$18.22	$0.00	$66.72
5	90	$43.11	$10.18	$18.22	$0.00	$71.51

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER	12/01/2013	$34.70	$7.30	$12.90	$0.00	$54.90
LABORERS - FOUNDATION AND MARINE	06/01/2014	$35.45	$7.30	$12.90	$0.00	$55.65
	12/01/2014	$36.20	$7.30	$12.90	$0.00	$56.40
	06/01/2015	$36.95	$7.30	$12.90	$0.00	$57.15
	12/01/2015	$37.70	$7.30	$12.90	$0.00	$57.90
	06/01/2016	$38.45	$7.30	$12.90	$0.00	$58.65
	12/01/2016	$39.45	$7.30	$12.90	$0.00	$59.65

For apprentice rates see "Apprentice- LABORER"

TEST BORING DRILLER HELPER	12/01/2013	$33.42	$7.30	$12.90	$0.00	$53.62
LABORERS - FOUNDATION AND MARINE	06/01/2014	$34.17	$7.30	$12.90	$0.00	$54.37
	12/01/2014	$34.92	$7.30	$12.90	$0.00	$55.12
	06/01/2015	$35.67	$7.30	$12.90	$0.00	$55.87
	12/01/2015	$36.42	$7.30	$12.90	$0.00	$56.62
	06/01/2016	$37.17	$7.30	$12.90	$0.00	$57.37
	12/01/2016	$38.17	$7.30	$12.90	$0.00	$58.37

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2013	$33.30	$7.30	$12.90	$0.00	$53.50
	06/01/2014	$34.05	$7.30	$12.90	$0.00	$54.25
	12/01/2014	$34.80	$7.30	$12.90	$0.00	$55.00
	06/01/2015	$35.55	$7.30	$12.90	$0.00	$55.75
	12/01/2015	$36.30	$7.30	$12.90	$0.00	$56.50
	06/01/2016	$37.05	$7.30	$12.90	$0.00	$57.25
	12/01/2016	$38.05	$7.30	$12.90	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$32.92	$9.41	$8.80	$0.00	$51.13
	06/01/2014	$33.27	$9.41	$8.80	$0.00	$51.48
	08/01/2014	$33.27	$9.91	$8.80	$0.00	$51.98
	12/01/2014	$33.27	$9.91	$9.33	$0.00	$52.51
	06/01/2015	$33.62	$9.91	$9.33	$0.00	$52.86
	08/01/2015	$33.62	$10.41	$9.33	$0.00	$53.36
	12/01/2015	$33.62	$10.41	$10.08	$0.00	$54.11
	06/01/2016	$34.12	$10.41	$10.08	$0.00	$54.61
	08/01/2016	$34.12	$10.91	$10.08	$0.00	$55.11
	12/01/2016	$34.12	$10.91	$10.89	$0.00	$55.92
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	12/01/2013	$45.58	$7.30	$13.30	$0.00	$66.18
	06/01/2014	$46.33	$7.30	$13.30	$0.00	$66.93
	12/01/2014	$47.08	$7.30	$13.30	$0.00	$67.68
	06/01/2015	$47.83	$7.30	$13.30	$0.00	$68.43
	12/01/2015	$48.58	$7.30	$13.30	$0.00	$69.18
	06/01/2016	$49.33	$7.30	$13.30	$0.00	$69.93
	12/01/2016	$50.33	$7.30	$13.30	$0.00	$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2013	$47.58	$7.30	$13.30	$0.00	$68.18
	06/01/2014	$48.33	$7.30	$13.30	$0.00	$68.93
	12/01/2014	$49.08	$7.30	$13.30	$0.00	$69.68
	06/01/2015	$49.83	$7.30	$13.30	$0.00	$70.43
	12/01/2015	$50.58	$7.30	$13.30	$0.00	$71.18
	06/01/2016	$51.33	$7.30	$13.30	$0.00	$71.93
	12/01/2016	$52.33	$7.30	$13.30	$0.00	$72.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2013	$37.65	$7.30	$13.30	$0.00	$58.25
	06/01/2014	$38.40	$7.30	$13.30	$0.00	$59.00
	12/01/2014	$39.15	$7.30	$13.30	$0.00	$59.75
	06/01/2015	$39.90	$7.30	$13.30	$0.00	$60.50
	12/01/2015	$40.65	$7.30	$13.30	$0.00	$61.25
	06/01/2016	$41.40	$7.30	$13.30	$0.00	$62.00
	12/01/2016	$42.40	$7.30	$13.30	$0.00	$63.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2013	$39.65	$7.30	$13.30	$0.00	$60.25
	06/01/2014	$40.40	$7.30	$13.30	$0.00	$61.00
	12/01/2014	$41.15	$7.30	$13.30	$0.00	$61.75
	06/01/2015	$41.90	$7.30	$13.30	$0.00	$62.50
	12/01/2015	$42.65	$7.30	$13.30	$0.00	$63.25
	06/01/2016	$43.40	$7.30	$13.30	$0.00	$64.00
	12/01/2016	$44.40	$7.30	$13.30	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2013	$32.34	$9.41	$8.80	$0.00	$50.55
	06/01/2014	$32.69	$9.41	$8.80	$0.00	$50.90
	08/01/2014	$32.69	$9.91	$8.80	$0.00	$51.40
	12/01/2014	$32.69	$9.91	$9.33	$0.00	$51.93
	06/01/2015	$33.04	$9.91	$9.33	$0.00	$52.28
	08/01/2015	$33.04	$10.41	$9.33	$0.00	$52.78
	12/01/2015	$33.04	$10.41	$10.08	$0.00	$53.53
	06/01/2016	$33.54	$10.41	$10.08	$0.00	$54.03
	08/01/2016	$33.54	$10.91	$10.08	$0.00	$54.53
	12/01/2016	$33.54	$10.91	$10.89	$0.00	$55.34
WAGON DRILL OPERATOR *LABORERS - ZONE 1*	12/01/2013	$33.60	$7.30	$12.70	$0.00	$53.60
	06/01/2014	$34.35	$7.30	$12.70	$0.00	$54.35
	12/01/2014	$35.10	$7.30	$12.70	$0.00	$55.10
	06/01/2015	$35.85	$7.30	$12.70	$0.00	$55.85
	12/01/2015	$36.60	$7.30	$12.70	$0.00	$56.60
	06/01/2016	$37.35	$7.30	$12.70	$0.00	$57.35
	12/01/2016	$38.35	$7.30	$12.70	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12*	09/01/2013	$49.06	$9.82	$14.04	$0.00	$72.92
	03/01/2014	$50.06	$9.82	$14.04	$0.00	$73.92
	09/01/2014	$51.06	$9.82	$14.04	$0.00	$74.92
	03/01/2015	$52.06	$9.82	$14.04	$0.00	$75.92
	09/01/2015	$53.06	$9.82	$14.04	$0.00	$76.92
	03/01/2016	$54.21	$9.82	$14.04	$0.00	$78.07
	09/01/2016	$55.26	$9.82	$14.04	$0.00	$79.12
	03/01/2017	$56.26	$9.82	$14.04	$0.00	$80.12
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$25.66	$8.70	$4.48	$0.00	$38.84
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$36.55	$8.70	$6.58	$0.00	$51.83
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$29.94	$8.70	$6.05	$0.00	$44.69
For apprentice rates see "Apprentice- LINEMAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$23.52	$8.70	$5.24	$0.00	$37.46
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$36.35	$8.70	$9.43	$0.00	$54.48
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$32.08	$8.70	$6.59	$0.00	$47.37
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$23.52	$8.70	$3.72	$0.00	$35.94
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$19.25	$8.70	$2.85	$0.00	$30.80
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$42.77	$8.70	$11.78	$0.00	$63.25

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.66	$8.70	$4.24	$0.00	$38.60
2	65	$27.80	$8.70	$4.71	$0.00	$41.21
3	70	$29.94	$8.70	$5.43	$0.00	$44.07
4	75	$32.08	$8.70	$6.16	$0.00	$46.94
5	80	$34.22	$8.70	$6.88	$0.00	$49.80
6	85	$36.35	$8.70	$7.62	$0.00	$52.67
7	90	$38.49	$8.70	$8.83	$0.00	$56.02

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$26.33	$4.18	$2.79	$0.00	$33.30
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$24.78	$4.18	$2.74	$0.00	$31.70
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$24.78	$4.18	$2.74	$0.00	$31.70
TREE TRIMMER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* This classification applies only to the trimming of branches on and around utility lines.	01/29/2012	$17.18	$3.37	$0.00	$0.00	$20.55
TREE TRIMMER GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* This classification applies only to the trimming of branches on and around utility lines.	01/29/2012	$15.15	$3.37	$0.00	$0.00	$18.52

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours) unless otherwise specified.

* Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof.
** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

MASSACHUSETTS WEEKLY CERTIFIED PAYROLL REPORT FORM

Company's Name:	Address:	Phone No.:		Payroll No.:
Employer's Signature:	**Title:**	**Contract No:**	**Tax Payer ID No.**	**Work Week Ending:**
Awarding Authority's Name:	**Public Works Project Name:**	**Public Works Project Location:**		**Min. Wage Rate Sheet No.**
General / Prime Contractor's Name:	**Subcontractor's Name:**		**"Employer" Hourly Fringe Benefit Contributions**	

Employee Name & Complete Address	Employee is OSHA 10 Certified (?)	Work Classification:	Appr. Rate (%)	Hours Worked Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.	Project Hours (A) All Other Hours	Hourly Base Wage (B)	Health & Welfare Insurance (C')	ERISA Pension Plan (D)	Supp. Unemp. (E)	(B+C+D+E) Total Hourly Prev. Wage (F)	(A x F) Project Gross Wages (G) Total Gross Wages	Check No. (H)

NOTE: Pursuant to MGL Ch. 149 s.27B, every contractor and subcontractor is required to submit a "true and accurate" copy of their weekly payroll records directly to the awarding authority. Failure to comply may result in the commencement of a criminal action or the issuance of a civil citation.

Date recieved by awarding authority
/ /

Division of Labor and Industries Statement of Compliance

WEEKLY PAYROLL RECORDS REPORT
& STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided. A Payroll Form has been printed on the reverse of this page and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract.

In addition, every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority. For every week in which an apprentice is employed, a photocopy of the apprentice's identification card must be attached to the payroll report. Once collected, the awarding authority is also required to preserve those records for three years.

In addition, each such contractor, subcontractor, or public body shall furnish to the awarding authority directly, within fifteen days after completion of its portion of the work a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE

_____, 20_____

I,_____,_____
(Name of signatory party) (Title)

do hereby state:

That I pay or supervise the payment of the persons employed by

_____ on the _____
(Contractor, subcontractor or public body) (Building or project)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty nine of the General Laws.

Signature _____

Title _____

GENERAL TERMS & CONDITIONS

APPENDIX C
General Conditions

GENERAL TERMS AND CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, RECONSTRUCTION, ALTERATION, REMODELING, OR REPAIR OF ANY PUBLIC BUILDING OR PUBLIC WORK IN THE CITY OF SOMERVILLE

TABLE OF CONTENTS **Page**

Article 1 DEFINITIONS 2
Article 2 ABOUT THE CONTRACT DOCUMENTS 6
Article 3 THE CITY 10
Article 4 THE DESIGN PROFESSIONAL 12
Article 5 THE CONTRACTOR 15
Article 6 SUBCONTRACTORS 34
Article 7 PERFORMANCE AND PAYMENT BONDS 35
Article 8 INSURANCE REQUIREMENTS 36
Article 9 TESTS AND INSPECTIONS 38
Article 10 UNCOVERING AND CORRECTING WORK 39
Article 11 CHANGES IN THE WORK 40
Article 12 CHANGE IN THE CONTRACT TIME 44
Article 13 PAYMENTS 47
Article 14 SUBSTANTIAL COMPLETION 54
Article 15 GUARANTEES AND WARRANTIES 56
Article 16 CLAIMS 57
Article 17 EMERGENCIES 62
Article 18 TERMINATION OR SUSPENSION OF THE CONTRACT 62
Article 19 AMERICANS WITH DISABILITIES ACT 63
Article 20 WRITTEN NOTICE TO THE PARTIES 64
Article 21 MISCELLANEOUS PROVISIONS 64

GENERAL TERMS AND CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, RECONSTRUCTION, INSTALLATION, DEMOLITION, MAINTENANCE, OR REPAIR OF ANY PUBLIC BUILDING OR PUBLIC WORK IN THE CITY OF SOMERVILLE

ARTICLE 1: DEFINITIONS

1.1. In General.

1.1.1. Well-known meanings. When words or phrases that have a well-known technical, or construction industry, or trade meaning are used in the Contract Documents, such words or phrases shall be interpreted in accordance with that meaning, unless otherwise stated.

1.1.2. Capitalization. The words and terms defined in this Article are capitalized in these General Terms and Conditions of the Contract. Other capitalized words may refer to a specific document found in the Contract Documents.

1.1.3. Persons. Whenever the word person or persons is used, it includes, unless otherwise stated, entity or entities, respectively, including, but not limited to, corporations, partnerships, and joint venturers.

1.1.4. Singular and Plural. The following terms have the meanings indicated which are applicable to both the singular and the plural thereof.

1.2. Definitions.

1.2.1. Agreement. The Agreement is the written document between the **City** and the **Contractor** which is titled: Agreement between the City of Somerville and the Contractor, which is the executed portion of the Contract, and which forms a part of the Contract. The Agreement also includes all documents required to be attached thereto, including, but not limited to, the performance bond, the labor and materials or payment bonds, certificates of insurance, and all Modifications of the Agreement.

1.2.2. Change Order. A Change Order is a document which is signed by the **Contractor**, the **Design Professional**, and the **City;** which is directed to the **Contractor;** which authorizes the **Contractor** to make an addition to, a deletion from or a revision in the Work, or an adjustment in the Contract Sum or in the Contract Time; and which is issued on or after the date of the Agreement between the **Contractor** and the **City.**

1.2.3. City. The **City** refers to the City of Somerville, which is the owner of the Project and is the public awarding authority with whom the **Contractor** has entered into the Contract and for whom the Work is to be provided.

1.2.4. Claim. A Claim is a dispute, demand, or assertion by one of the parties arising out of or relating to the Contract for which such party is seeking relief.

1.2.5. Contract. The Contract consists of all the Contract Documents. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations**,** representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification to the Contract signed by both parties.

1.2.6. Contract Documents. The Contract Documents consist of the Agreement; the notice of award of the Contract; the Notice to Proceed; the entire Project Manual; Change Orders; Construction Change Directives; the **Contractor's** Bid and all accompanying documents; and the **Design Professional's** written interpretations and clarifications issued on or after the issuance of the Notice to Proceed. Shop Drawing submittals and reports or drawings utilized by the **Design Professional** in preparing the Contract Documents are not Contract Documents.

1.2.7. Contractor. The **Contractor** is the person who is awarded the Contract for the Project herein pursuant to M.G.L. c. 149, §44A or M.G.L. c. 39, §39M; and is identified in the Agreement as such. The term "**Contractor**" is intended to include the **Contractor** as well as its authorized representative(s).

1.2.8. Contract Sum. The Contract Sum is the total amount stated in the Agreement payable by the **City** to the **Contractor** for the completion of the Work in accordance with the Contract Documents.

1.2.9. Contract Time. Unless otherwise provided, the Contract Time is the number of days allotted in the Contract Documents or the dates stated in the Agreement, including authorized adjustments, for Substantial Completion. We usually put a contract end date that is beyond the date of substantial completion.

1.2.10. Coordination Drawings. Coordination Drawings are those drawings, which are prepared by the **Contractor** or a Subcontractor that show the exact alignment, physical locations, and configuration of the mechanical, electrical, and fire protection installations.

1.2.11. Day. The term "day" shall mean calendar day unless otherwise stated.

1.2.12. Design Professional. The **Design Professional** is the person lawfully licensed to practice architecture, engineering, or landscape architecture and has been selected by the **City** to administer the Contract. The term "**Design Professional**," while referred to in the singular, means the **Design Professional** and/or the **Design Professional's** representative. For the purposes of this project, **Design Professional** shall mean the firm of CDR Maguire Inc. Engineers and appropriate consultants.

1.2.13. Field Order. A Field Order is a written order issued by the **Design**

Professional which orders minor changes in the Work, but which does not involve a change in the Contract Sum or the Contract Time.

1.2.14. Final Completion. Final Completion is the point in time when the Design Professional finds that the Work has been fully completed in accordance with the Contract Documents. Final Completion shall be no later than thirty (30) days after Substantial Completion.

1.2.15. General Requirements. General Requirements refer to Sections of Division 1 of the Specifications.

1.2.16. Modification. A Modification is a written instrument that amends the Contract after execution of the Agreement.

1.2.17. Notice to Proceed. A Notice to Proceed is a written notice given by the **City,** or the **Design Professional**, to the **Contractor** fixing the date on which the Contract Time will begin to run and on which the **Contractor** shall start to perform its obligations under the Contract Documents.

1.2.18. Plans. The Plans are the drawings which are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location, dimensions, scope, extent, and character of the Work to be furnished and performed by the **Contractor** and which have been prepared or approved by the **Design Professional**.

1.2.19. Product Data. Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the **Contractor** to illustrate materials or equipment for some portion of the Work. Product Data are not considered part of the Contract Documents.

1.2.20. Project. The Project is the total Work to be provided under the Contract Documents and may be the whole or a part as indicated elsewhere in the Contract Documents and may include construction by the **City** or by separate contractors. The Project is the Work described in the invitation to bid (advertisement) and Specifications and illustrated by the Plans, including any Modifications.

1.2.21. Project Manual. The Project Manual is the entire set of bidding documents which includes, but is not limited to, the invitation to bid (advertisement), the instructions to bidders, all of the forms, the wage rates, all City and state requirements, the General Terms and Conditions of the Contract, any supplementary conditions thereto, the Plans, the Specifications, and all addenda.

1.2.22. Proposed Change Order. A Proposed Change Order is a Change Order that has been submitted by the **Contractor** to the **Design Professional,** is under review, and has not been approved by the **City**.

1.2.23. Samples. Samples are physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the

standards by which such portion of the Work will be judged. Samples are not considered part of the Contract Documents.

1.2.24. Shop Drawings. Shop Drawings are all drawings, diagrams, illustrations, schedules, and other information that are specifically prepared or assembled by or for the **Contractor** and submitted by the **Contractor** to illustrate some portion of the Work. Shop Drawings are not considered part of the Contract Documents.

1.2.25. Site. The Site is the location of the Project and of the Work.

1.2.26. Specifications. Specifications are those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

1.2.27. Subcontractor. A Subcontractor is a person who contracts directly with the **Contractor**, unless otherwise stated.

1.2.28. Submittals. Submittals are those Shop Drawings, Product Data, Samples, or any other required document that are provided to the Design Professional for review and approval.

1.2.29. Substantial Completion. Substantial Completion means that the Work has been completed and the Site or the facility is opened for full and intended public use, except for minor incomplete or unsatisfactory items that do not materially impair the usefulness of the Work. The **Design Professional** shall decide what constitutes "minor," "incomplete," "unsatisfactory," and "materially" and the **Design Professional's** decision shall be final.

1.2.30. Sub-subcontractor. A Sub-subcontractor is a person who has contracted directly with a Subcontractor.

1.2.31. Supplier. A Supplier is a manufacturer, fabricator, distributor, material person, or vendor having a direct contract with the Contractor or with any Subcontractor to furnish materials or equipment to be incorporated into the Work by the Contractor or any Subcontractor.

1.2.32. Work. Work refers to the services and the entire completed construction or the various separately identifiable parts thereof required by the Contract Documents, including all labor, materials, and equipment furnished, furnished and incorporated into the Project, or to be provided by the **Contractor** to fulfill the **Contractor's** obligations. The Work may constitute the whole or a part of the Project.

1.2.33. Construction Change Directive. A **Construction Change** Directive is a written directive to the **Contractor** ordering an addition to, a deletion from, or a revision to the Work issued on or after the date of the Agreement, signed by the **City**, and recommended

by the **Design Professional**.

ARTICLE 2: ABOUT THE CONTRACT DOCUMENTS

2.1. Priority/Conflict.

2.1.1. Priority Among Contract Documents. In the event of conflict among the Contract Documents, the Contract Documents shall be construed according to the following priorities:

Highest Priority:	Modifications
Second Priority:	Agreement
Third Priority:	Addenda-later date to take precedence
Fourth Priority:	Supplementary General Conditions
Fifth Priority:	General Conditions
Sixth Priority:	Plans and Specifications

2.1.1.1. If there is a conflict between the Plans and Specifications, the figured dimensions shall govern over the scaled dimensions. Detailed Plans shall govern over the general Plans. Larger scale Plans shall take precedence over smaller scale Plans. Plans shall govern over Shop Drawings. Whenever notes, specifications, dimensions, details, or schedules in the Specifications or in the Plans, or between the Specifications and the Plans, or in all other instances not specifically noted above, the **Contractor** shall provide, unless otherwise directed by a Modification of the Contract, the better quality or greater quantity of Work at no increase in the Contract Sum or in the Contract Time.

2.1.1.2. Compliance with these priority conditions shall not justify any changes in the Work or any increase in the Contract Sum or Contract Time, unless any such compliance results in Work that may not be reasonably inferred from the Contract Documents as being required to produce the intended result as determined by the **Design Professional**.

2.1.2. Review of the Contract Documents and Field Conditions and Discovery of Conflict, Error, Ambiguity, or Discrepancy. Before starting the Work, and during the progress thereof, the **Contractor** shall carefully study and compare the Contract Documents with each other and with the information furnished by the **City** pursuant to Article 3 and shall at once report to the **Design Professional** any error, inconsistency, or omission the **Contractor** may discover. Any necessary change shall be ordered as provided in Article 11, subject to the requirements of any other provisions of the Contract Documents. The **Contractor** shall not proceed with the Work affected thereby (except in an emergency) until a Modification has been issued. If the **Contractor** proceeds with the Work having discovered such errors, inconsistencies, or omissions contrary to the provisions contained herein, or if by reasonable study of the Contract Documents the **Contractor** could have discovered such, the **Contractor** shall bear all costs arising therefrom. The **Contractor** shall

be liable to the **City** for failure to report any conflict, error, ambiguity, or discrepancy of which it knew or should have known.

2.1.3. Field Measurements. The **Contractor** shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the **Contractor** with the Contract Documents before commencing activities. Errors, inconsistencies, or omissions discovered shall be reported to the **Design Professional** at once.

2.1.4. Statutory Provisions. The **City** and the **Contractor** recognize that other rights duties and obligations with respect to public construction contracts are provided for by statute, notwithstanding the fact that they may not be provided for in the Contract Documents. In case of conflict between the statutory provisions and other provisions of the Contract Documents and the provisions of any applicable statute, the statutory provisions shall govern.

2.1.5. Voided or Unlawful Provisions. In the event any provision in the Contract is voided or deemed unlawful, such provision shall be deleted without affecting the remainder of the Contract.

2.2. Execution.

2.2.1. Execution of the Agreement by the **Contractor** is a representation that the **Contractor** has visited the Site, become familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

2.3. Intent.

2.3.1. Entire Agreement. The Contract Documents comprise the entire agreement between the **City** and the **Contractor** concerning the Work**.** The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the **Contractor**. The Contract Documents are complementary; what is required by one shall be as binding as if required by all. Performance by the **Contractor** shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. All Work mentioned or indicated in the Contract Documents shall be performed by the **Contractor** as part of this Contract unless it is specifically indicated in the Contract Documents that such Work is to be done by others.

2.3.2. Statutory Provisions. Each and every provision of law, code, and regulation, required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be physically

amended to make such insertion.

2.3.3. Functionally Complete Project. It is the intent of the Contract Documents to describe a functionally complete Project. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the **Contractor**. Any Work, materials, or equipment that may be reasonably inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed by the **Contractor** whether or not specifically called for in the Contract Documents.

2.3.4. Indications or Notations. All indications or notations which apply to one of a number of similar situations, materials, or processes shall be deemed to apply to all such situations, materials, or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the Contract Documents.

2.3.5. Standards or Quality of Materials or Workmanship. Where no explicit quality or standards for materials or workmanship are established for Work, such Work is to be of good quality for the intended use and consistent with the quality of the surrounding Work and of the construction of the Project generally.

2.3.6. Manufactured Products. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.

2.3.7. Mechanical, Electrical, and Fire Protection Plans. The mechanical, electrical, and fire protection Plans are diagrammatic only and are not intended to show the alignment, physical locations, or configurations of such Work. Such Work shall be installed without additional cost to the **City** to clear all obstructions, permit proper clearances for the Work of other trades, and present an orderly appearance where exposed. Prior to beginning such Work, the **Contractor** shall prepare Coordination Drawings and demonstrate to the **Design Professional's** satisfaction that the installations will comply with the preceding sentence. The **Contractor** shall be solely liable and responsible for any costs and/or delays resulting from the **Contractor's** failure to prepare such Coordination Drawings.

2.3.8. Locations of Fixtures and Outlets. Exact locations of fixtures and outlets shall be obtained from the **Design Professional** as provided in Article 5 before the Work is roughed in. Work installed without such information from the **Design Professional** shall be relocated at the **Contractor's** expense.

2.3.9. Tests. When test boring or soil test information are included with the Contract Documents or otherwise made available to the **Contractor** and such test boring or soil test information was obtained by the **City** for use by the **Design Professional** in the design of the Project or Work, the **City** does not hold out such information to the **Contractor** as an accurate or approximate indication of subsurface conditions, and no claim for extra cost of extension of time resulting from a reliance by the **Contractor** on such information shall be

allowed except as otherwise provided herein. Any such reports are not part of the Contract Documents.

2.3.10. Joining Work. Where the Work is to fit with existing conditions or work to be performed by others, the **Contractor** shall fully and completely join the Work with such conditions or work, unless otherwise specified.

2.4. Organization.

2.4.1. Except as provided in M.G.L. c. 149, §44F, the organization of the Specifications into divisions, sections, and articles, and the arrangement of Plans shall not control the **Contractor** in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

2.5. References.

2.5.1. Where codes, manuals, specifications, standards, requirements and publications of public and private bodies are referred to in the Contract Documents whether specifically or by implication, references shall be understood to be to the latest revision prior to the date of receiving bids, except where otherwise indicated. Where statutes are referred to in the Contract Documents whether specifically or by implication, references shall be understood to be to the latest revision.

2.5.2. References herein to particular paragraphs or Articles are solely to facilitate finding additional information with regard to the specific matters and are not to be construed in any way as limiting the possible paragraphs and Articles in which such matters may be found elsewhere in this document.

2.6. Reuse of Design Professional's Written Instruments.

2.6.1. Neither the **Contractor** nor any Subcontractor or Supplier shall have or acquire any title to or ownership rights in any of the Plans, Specifications, or other documents prepared by the **Design Professional** and shall not reuse any of such Plans, Specifications, or other documents without prior written consent of the **City** and the **Design Professional**.

2.7. Written Material of the Contractor.

2.7.1. All written material prepared or collected by the **Contractor** in the course of completing the Work shall be the exclusive property of the **City** and shall not be used by the **Contractor** for any purpose other than the purpose of this Contract.

2.8. Modifying Words.

2.8.1. In the interest of simplicity, modifying words such as “all” and “any” may be

omitted, but the fact that such words may be absent from one sentence and appear in another is not intended to affect the interpretation of either statement.

2.9. Use of Certain Words and Terms.

2.9.1. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe a requirement, direction, review, or judgment of the **City** or of the **Design Professional** as to the Work, it is intended that such requirement, direction, review, or judgment will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise).

2.9.2. The use of any such term or adjective shall not be effective to change the duties and responsibilities of the **City** or the **Design Professional** from those assigned in the Contract Documents or to assign any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of the Contract Documents.

2.9.3. When the words "Contractor," "Subcontractor," Sub-subcontractor," and "Supplier" are used, they are intended to include their employees and agents, unless otherwise specified.

2.10. Modification of the Contract Documents.

2.10.1. Major Modifications . Major Modifications may affect the Contract Sum or the Contract Time. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways, all of which must contain a written endorsement by the **City**:

2.10.1.1. a formal written amendment;

2.10.1.2. a Change Order;

2.10.1.3. a **Construction Change** Directive; or

2.10.1.4. the **Design Professional's** written interpretation, clarification, or decision.

2.10.2. Minor Modifications. Minor modifications do not affect the Contract Sum or the Contract Time. The requirements of the Contract Documents may be supplemented and minor variations and deviations of the Work may be authorized in one or more of the following ways:

2.10.2.1. a Field Order; or

2.10.2.2. the **Design Professional's** approval of a Shop Drawing or Sample.

ARTICLE 3: THE CITY

3.1. Signatory.

3.1.1. All documents which require a signature or an endorsement by the **City** must be signed by the Mayor in order to be deemed ratified by the **City**.

3.2. Requirements to Provide Documents.

3.2.1. To the extent they are available, the **City** shall furnish surveys describing physical characteristics, legal limitations, and utility locations for the site of the Project, and a legal description of the Site.

3.2.2. The **City** shall obtain and pay for necessary approvals, easements, assessments, and charges that are customarily secured prior to the execution of the Contract.

3.2.3. The **City** shall furnish information or services required of the **City** hereunder with reasonable promptness after receipt from the **Contractor** of a written request for such information or services.

3.2.4. The **City** shall provide the **Contractor**, at no charge, such copies of the Project Manual as are reasonably necessary for the execution of the Work.

3.3. Clerk of the Works.

3.3.1. The **City** may engage a Clerk of the Works for this Project, in which case the **City** shall, upon request of the **Contractor**, provide the **Contractor** with a written statement of the duties, responsibilities, and limitations of authority of such Clerk of the Works. Except as expressly set forth in such written statement, the Clerk of the Works shall have no authority to approve Work, to approve Change Orders, or to exercise any of the power and authority of the **City** or the **Design Professional**. The Clerk of the Works shall observe the **Contractor's** operations and construction activities for compliance with the Plans and Specifications. The Clerk of the Works shall have access to all areas of the Project at all times. The **Contractor** shall fully cooperate with the Clerk of the Works in the performance of the Clerk's duties.

3.4. City's Right to Perform Construction and to Award Separate Contracts.

3.4.1. The **City** reserves the right to perform construction or operations at the Site with its own forces or others. If the **Contractor** claims that a delay or additional cost is involved because of such action by the **City**, the **Contractor** shall make such Claim as provided

elsewhere in the Contract Documents.

3.4.2. When the separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "**Contractor**" in the Contract Documents in each case shall mean the **Contractor** who executes each separate City-Contractor Agreement.

3.4.3. The **City** shall provide for coordination of the activities of the **City's** own forces and of each separate contractor with the Work of the **Contractor**, who shall cooperate with them. The **Contractor** shall afford each other person access to the Site and shall properly coordinate its Work with that of the persons performing other work. The **Contractor** shall participate with other separate contractors and the **City** in reviewing their construction schedules when directed to do so. The **Contractor** shall make any revisions to the construction schedules deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the **Contractor**, separate contractors, and the **City** until subsequently revised.

3.5. Limitations on the City's Responsibilities.

3.5.1. The **City** shall not supervise, direct, or have control or authority over, nor be responsible for the **Contractor's** means, methods, techniques, sequences, or procedures of construction or the safety precautions and programs incident thereto, or for any failure of the **Contractor** to comply with laws, codes and regulations applicable to the furnishing or performance of the Work. The **City** will not be responsible for the **Contractor's** failure to perform or furnish the Work in accordance with the Contract Documents. The **City** is not responsible for the acts or omissions of the **Contractor**, any Subcontractor, Supplier, or anyone for whose acts the **Contractor**, any Subcontractor or Suppliers may be liable.

3.5.2. The **City's** authority to review any of the **Contractor's** progress schedules, or its decision to raise or not to raise any objections about such schedules shall not impose on the **City** any responsibility for the timing, planning, scheduling, or execution of the Work, nor in any way give rise to any duty or responsibility on the part of the **City** to exercise this authority for the benefit of the **Contractor**, any Subcontractor or Supplier or any other party.

3.5.3. The **City's** decision to raise or not to raise objections with regard to any aspects of the **Contractor's** insurance shall in no way give rise to any duty or responsibility on the part of the **City** to or for the benefit of the **Contractor**, any Subcontractor, any Supplier, or any other party.

3.6. Reservation of Rights .

3.6.1. The **City** reserves the right to correct at any time any error in any progress payment that may have been made.

3.6.2. Should defective Work be discovered subsequent to final payment, the **City** reserves the right to make a claim and recover all costs and professional fees associated therewith, including the cost of removing and/or replacing the defective Work.

3.7. Waivers .

3.7.1. All waivers by the **City** are valid only to the extent that they are signed by the **City**. Any such waivers pertain only to the specific matter contained in the waiver and not to any similar, subsequent matters.

ARTICLE 4: THE DESIGN PROFESSIONAL

4.1. City's Representative.

4.1.1. The **Design Professional** is the **City's** representative (1) during construction, (2) until final payment is due, and (3) with the **City's** concurrence, from time to time during the correction period described in Article 10. The **Design Professional** will advise and consult with the **City**. The **Design Professional** will have authority to act on behalf of the **City** only to the extent provided in the Contract Documents, unless otherwise modified by a written instrument in accordance with other provisions of the Contract.

4.1.2. The duties, responsibilities, and the limitations of authority of the **Design Professional** as the **City's** representative during construction are set forth in the Contract Documents and shall not be extended without the written consent of the **City** and the **Design Professional**.

4.2. Administration of the Contract .

4.2.1. The **Design Professional** will provide administration of the Contract as described in the Contract Documents, unless the **City** has engaged a construction manager.

4.3. Visits to the Site.

4.3.1. The **Design Professional** will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. However, the **Design Professional** will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of on-site observations as an architect, engineer, or landscape architect, the **Design Professional** will keep the **City** informed of progress of the Work in writing and will endeavor to guard the **City** against defects and deficiencies in the Work.

4.4. Communications Facilitating Contract Administration.

4.4.1. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the **City** and the **Contractor** shall endeavor to communicate through the **Design Professional**. Communications by and with the **Design Professional's** consultants shall be through the **Design Professional**. Communications by and

with Subcontractors and Suppliers shall be through the **Contractor**. Communications by and with **City** employees and separate contractors shall be through the **City**.

4.4.2. When it deems it necessary or expedient, the **City** may communicate directly with the **Contractor**, any Subcontractors, Suppliers, or consultants.

4.5. Certification of Applications for Payment.

4.5.1. Based on the **Design Professional's** observations and evaluations of the **Contractor's** applications for payment, the **Design Professional** will review and certify the amounts due the **Contractor** and will issue certificates for payment in such amounts.

4.6. Rejection of Work.

4.6.1. The **Design Professional** will have authority to reject or disapprove Work (1) that does not conform to the Contract Documents; (2) that the **Design Professional** believes to be defective; and (3) that the **Design Professional** believes will not produce a completed Project conforming to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Whenever the **Design Professional** considers it necessary or advisable for implementation of the intent of the Contract Documents, the **Design Professional** will have authority to require additional inspection or testing of the Work in accordance with Article 9, whether or not such Work is fabricated, installed, or completed. However, neither this authority of the **Design Professional** nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the **Design Professional** to the **Contractor**, Subcontractors, Suppliers, or other persons performing portions of the Work.

4.7. Review of Submittals.

4.7.1. The **Design Professional** will review or take other appropriate action upon the **Contractor's** submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents and only to the extent that the **Design Professional** believes desirable to protect the **City's** interest. The **Design Professional's** action will be taken with reasonable promptness, while allowing sufficient time in the **Design Professional's** professional judgment to permit adequate review, taking into account the time periods set forth in the latest schedule prepared by the **Contractor** and approved by the **Design Professional**. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the **Contractor** as required by the Contract Documents. The **Design Professional's** review of the **Contractor's** submittals shall not relieve the **Contractor** of the obligations under Article 5. The **Design Professional's** review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The **Design Professional's** approval of a specific item shall not indicate approval of an assembly of which the item is a

component. After the rejection of the second resubmittal of any one Submittal, the **Contractor** shall bear the cost of the review of each subsequent resubmittal.

4.8. Preparation of Change Orders and Construction Change Directives.

4.8.1. The **Design Professional** will prepare Change Orders and **Construction Change** Directives and may authorize minor Modifications in the Work as provided in Article 11.

4.9. Inspections.

4.9.1. The **Design Professional** will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; will receive and forward to the **City** for the **City's** review and records written warranties and related documents required by the Contract and assembled by the **Contractor**; and will issue a final certificate for payment upon the **Contractor's** compliance with all of the requirements of the Contract Documents.

4.10. Interpretations, Clarifications, and Decisions.

4.10.1. The **Design Professional** will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of either the **City** or the **Contractor**. The **Design Professional's** response to such requests will be made with reasonable promptness and within the time set forth in the Agreement between the **City** and the **Design Professional**. Any such written interpretations, clarifications, and decisions shall be binding on the **Contractor**.

4.10.2. Interpretations, clarifications, and decisions of the **Design Professional** will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. The **Design Professional** will not be liable to the **Contractor**, any Subcontractor, or Supplier for results of interpretations, clarifications, or decisions so rendered in good faith.

4.10.3. The **Design Professional** may, as the **Design Professional** judges desirable, issue additional drawings or instructions indicating in greater detail the construction or design of the various parts of the Work; such drawings or instructions may be effected by a Field Order or other notice to the **Contractor**, and provided such drawings or instructions are reasonably consistent with the previously existing Contract Documents, the Work shall be executed in accordance with such additional drawings or instructions without any additional cost or an extension of the Contract Time.

4.10.4. The **Design Professional's** decisions on matters relating to aesthetic effect must be consistent with the **City's** and will be final.

4.11. Limitation on the Design Professional's Responsibilities .

4.11.1. Neither the **Design Professional's** authority to act under the provisions of the

Contract Documents nor any decision made by the **Design Professional** in good faith to exercise or not to exercise such authority shall give rise to any duty or responsibility of the **Design Professional** to the **Contractor**, any Subcontractor, any Supplier, any surety for any of them or any other person.

4.11.2. The **Design Professional** will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, since these are solely the **Contractor's** responsibility as provided in Article 5. The **Design Professional** will not be responsible for the **Contractor's** failure to carry out the Work in accordance with the Contract Documents. The **Design Professional** will not have control over or charge of and will not be responsible for acts or omissions of the **Contractor**, Subcontractors, Suppliers, or of any other persons performing portions of the Work.

ARTICLE 5: THE CONTRACTOR

5.1. Relationship with the City.

5.1.1. The **Contractor** is an independent contractor and not an employee of the **City.** The **Contractor** is engaged by virtue of the Contract to perform only those services contained therein. The **Contractor** is not authorized to contract on behalf of the **City** or to incur any liability on the part of the **City**.

5.2. Code of Conduct.

5.2.1. M.G.L. c. 268A establishes standards of conduct for officials and employees of the **City**. The **Contractor** shall familiarize itself with the statute and act accordingly.

5.3. Quality Assurance.

5.3.1. The **Contractor** shall be responsible for ensuring that it, all Subcontractors, Suppliers, and all persons employed to do the Work under the Contract Documents perform in a professional manner, provide a high quality of service and Work, and perform in accordance with the Contract Documents.

5.4. Supervision.

5.4.1. Competence and Efficiency. The **Contractor** shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills, attention and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

5.4.2. Construction Means, Methods, Techniques, Etc. The **Contractor** shall be solely responsible for and have control over construction means, methods, techniques,

sequences, and procedures and for coordinating all portions of the Work under the Contract. Where the Contract Documents refer to particular construction means, methods, techniques, sequences, or procedures or indicate or imply that such are to be used in the Work, such mention is intended only to indicate that the operations of the **Contractor** shall be such as to produce at least the quality of Work implied by the operations described. The actual determination of whether or not the described operations may be safely and suitably employed on the Work shall be the responsibility of the **Contractor**, who shall notify the **Design Professional** in writing, prior to implementation, of the actual means, methods, techniques, sequences, or procedures which will be employed on the Work, if these differ from those mentioned in the Contract Documents. All loss, damage, liability or cost of correcting defective work arising from the employment of any construction means, methods, techniques, sequences, or procedures shall be borne by the **Contractor**, notwithstanding that such construction means, methods, techniques, sequences, or procedures are referred to, indicated or implied by the Contract Documents, unless the **Contractor** has given timely notice to the **City** and the **Design Professional** in writing that such means, methods, techniques, sequences, or procedures are not safe or suitable, and the **City** has then instructed the **Contractor** in writing to proceed at the **City's** risk.

5.4.3. Variance between the Contract Documents and Statutes, Ordinances, Codes, Rules, and Regulations. The **Contractor** shall promptly notify the **Design Professional** and the **City** in writing of any variances between the Contract Documents and statutes, ordinances, codes, rules, and regulations. If the **Contractor,** without written notice to the **Design Professional** and the **City,** performs Work knowing that it is contrary to statutes, ordinances, codes, rules, and regulations, the **Contractor** shall assume full responsibility for such Work and shall bear the costs associated therewith, i.e., replacement, repairs, removal, and fines.

5.4.4. Acts and Omissions. The **Contractor** shall be responsible to the **City** for the acts and omissions of all persons performing or supplying the Work.

5.4.5. Inspections. The **Contractor** shall be responsible for inspection of portions of Work already performed under this Contract to determine whether such portions are in proper condition to receive subsequent Work.

5.5. Personnel.

5.5.1. Suitability. The **Contractor** shall provide competent, properly licensed and/or certified, suitably qualified, and reliable personnel to perform the Work required by the Contract Documents. The **Contractor** shall enforce strict discipline and maintain good order at the site at all times. The **Contractor** shall not employ any Subcontractor, Supplier, or other person, whether initially or as a substitute, against whom the **City** may have reasonable objection. Acceptance of any Subcontractor or other person by the **City** shall not constitute a waiver of any right of the **City** to reject defective Work.

5.5.2. Sexual Harassment. Sexual harassment is an unlawful practice under M.G.L. c. 151B. The **Contractor**, Subcontractors, and all other persons responsible for any portion of the Work shall refrain from engaging in sexual harassment. The **Contractor** shall be responsible for any acts of sexual harassment committed by any persons responsible for any portion of the

Work. The **Contractor** shall take appropriate action against any such individuals.

5.5.3. Weapons and Illegal Drugs. No weapons or illegal drugs are permitted on the Site. It is the responsibility of the **Contractor** to ensure that no weapons or illegal drugs are brought to the Site.

5.5.4. Maximum Work Day and Work Week. (*Reference:* M.G.L. c. 149, §§30 and 34;). No laborer, worker, mechanic, foreperson or inspector working within this Commonwealth in the employ of the **Contractor**, Subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the Contract, shall be required or permitted to work more than eight (8) hours in any one day or more than forty-eight (48) hours in any one week, or more than six (6) days in any one week, except in cases of emergency.

5.5.5. Lodging. (*Reference:* M.G.L. c. 149, §25;). Every employee under this Contract shall lodge, board and trade where and with whom he or she elects, and neither the **Contractor** nor its agents or employees shall, either directly or indirectly, require as a condition of the employment of any person that the employee shall lodge, board or trade at a particular place or with a particular person.

5.5.6. Wage Rates. (*Reference:* M.G.L. c. 149, §27). Mechanics and apprentices, teamsters, chauffeurs and laborers performing Work shall be paid no less than the minimum rate of wages included in the bid documents and the Project Manual and which are made part of the Contract. They shall continue to be the minimum rate of wages for said employees during the life of the Contract. The **Contractor** shall keep a legible copy of the wage rates posted in a conspicuous place at the site during the life of the Contract. These rates of wages shall include payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans as provided in M.G.L. c. 149, §26;, and such payments shall be considered as payments to persons under M.G.L. c. 149, §27 performing work as therein provided. If the **Contractor** does not make payments to a health and welfare plan, a pension plan and a supplementary unemployment benefit plan, where such payments are included in the rates of wages, the **Contractor** shall pay the amount of said payments directly to each employee engaged in the Work. If the **Contractor** pays less than the rate of wages, including payments to health and welfare funds and pension funds, or the equivalent payments in wages to any person performing Work within the classifications as determined by the Commissioner of Labor and Industries, and if the **Contractor** takes or receives for its own use or the use of any other person, as a rebate, refund or gratuity, or in any other guise, any part or portion of the wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, paid to such person for Work done or service rendered on the Project, the **Contractor** will be subject to the penalties set forth in M.G.L. c. 149, §27. Notwithstanding the foregoing and the requirements of 5.5.7.1 and 5.5.7.2 below, if the Contract is federally funded, federal labor standards apply, including Davis Bacon minimum wage rates and payroll reporting requirements. See the “Federal Requirements” section at the end of these contract documents.

5.5.7. Payroll Records of Employees. (*Reference:* M.G.L. c. 149, §27B;). The **Contractor** and all Subcontractors who are subject to M.G.L. c. 149, §§27 and 27A shall keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs, and laborers

performing Work showing the name, address and occupational classification of each such employee, the hours worked by and the wages paid to all such employees. The **Contractor** and the Subcontractors shall submit a copy of said record to the **City** on a weekly basis.

5.5.7.1. (*Reference:* M.G.L. c. 149, §27B;). The **Contractor** and all Subcontractors who are subject to M.G.L. c. 149, §§27 and 27A shall preserve their payroll records for a period of three (3) years from the date of completion of the Contract.

5.5.7.2. (*Reference:* M.G.L. c. 149, §27B). The **Contractor** and all Subcontractors who are subject to M.G.L. c. 149, §§27 and 27A shall furnish to the Commissioner of Labor and Industries and the **City** within fifteen (15) days after completion of their portion of the Work a statement executed by the **Contractor** or Subcontractor or by any authorized officer or employee of the **Contractor** or Subcontractor who supervises the payment of wages in the form found in M.G.L. c.149, §27B.

5.6. Superintendence.

5.6.1. Employment of a Superintendent. The **Contractor** shall employ a competent, properly licensed superintendent, reasonably acceptable to the **City**, and necessary assistants who shall be in attendance at the Site full time during the progress of the Work until the date of Substantial Completion and for such additional time thereafter as the **Design Professional** or the **City** may determine to be necessary for the expeditious completion of the Work, including final completion. If continually in the employ of the Contractor, the same Superintendent shall be assigned to this project.

5.6.2. Removal/Replacement of a Superintendent. The **Contractor** shall remove the superintendent if requested to do so in writing by the **City** and shall promptly replace such superintendent with a competent person reasonably acceptable to the **City**. The superintendent shall represent the **Contractor**, and communications given to the superintendent shall be as binding as if given to the **Contractor**. The **Contractor** shall not replace the superintendent without written notice to the **City** and the **Design Professional**.

5.6.3. Registered Professional Engineer or Registered Land Surveyor. The **Contractor** shall retain a competent Registered Professional Engineer or Registered Land Surveyor, acceptable to the **Engineer**, who shall establish the exterior lines and required elevations of all buildings and structures to be erected on the site and shall establish sufficient lines and grades for the construction of associated Work such as, but not limited to, roads, utilities, and site grading. The Engineer or Land Surveyor shall certify as to the actual location of the constructed facilities in relation to property lines, building lines, easements, and other restrictive boundaries.

5.6.4. Building Grades, Lines, Etc.; The **Contractor** shall establish the building grades; lines; levels; and column, wall and partition lines required by the various Subcontractors in laying out their Work.

5.6.5. Coordination and Supervision. The **Contractor** shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work. The **Contractor** and all Subcontractors shall at all times afford each trade, any separate contractor, or the **City**, every reasonable opportunity for the installation of Work and the storage of materials.

5.6.6. Job Meetings. There shall be job meetings held on a weekly basis, or more often if required by the **City**. The **Contractor** shall arrange for and attend weekly job meetings with the **Design Professional** and such other persons as the **Design Professional** may from time to time wish to have present. The **Contractor** shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by the **Contractor's** own superintendent. An authorized representative of any Subcontractor or Sub-subcontractor shall attend such meetings if the representative's presence is requested by the **Design Professional**. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, Change Orders, time schedules and workforce power. Any notices required under the Contract may be served on such representatives.

5.7. Materials, Labor, Equipment, Etc.

5.7.1. Provision of. Unless otherwise provided in the Contract Documents, the **Contractor** shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the Work.

5.7.2. Quality and Use of. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by the **Design Professional**, the **Contractor** shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

5.7.3. Discrepancies or Defects. If the **Contractor** is unable to perform its Work because of discrepancies or defects in the work of the **City's** own forces or of a separate contractor, the **Contractor** shall immediately notify the **Design Professional** and the **City** in writing of the conditions that render unable to so perform. Failure to notify the **Design Professional** constitutes an acknowledgment and acceptance of the other work as being fit and proper for integration with the **Contractor's** Work except for latent or non-apparent defects and deficiencies in the other work.

5.8. Contractor's Management and Financial Statement Requirements. (*Reference:* M.G.L. c. 30, §39R)

5.8.1. The words defined herein shall have the meaning stated below whenever

they appear in this Paragraph:

5.8.1.1. "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to M.G.L. c.149, §44A-H or M.G.L. c. 30, §39M, inclusive.

5.8.1.2. "Contract" means any contract awarded or executed pursuant to M.G.L. c. 149, §44A-H or M.G.L. c. 30, §39M, which is for an amount or estimate amount that exceed the dollar amount set forth in M.G.L. c. 30, §39R.

5.8.1.3. "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

5.8.1.4. "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his/her residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the **City**.

5.8.1.5. "Audit," when used in regard to financial statement, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

5.8.1.6. "Accountant's Report," when used in regard to financial statements, means a document in which an independent certified accountant indicates the scope of the audit which s/he has made and sets forth his/her opinion regarding the financial statements taken as a whole with listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefore shall be stated. An accountant's report shall include as part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

5.8.1.7. "Management," when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the Contractor.

5.8.1.8. Accounting terms, unless otherwise defined herein shall have a

meaning in accordance with generally accepted accounting principles and auditing standards.

5.8.2. The Contractor shall make, and keep for at least six (6) years after final payment, books, Records, and accounts that in reasonable detail accurately and fairly reflect the transactions and dispositions of the Contractor.

5.8.3. Until the expiration of six (6) years after final payment, the Office of the Inspector General, and the Deputy Commissioner of the Division of Capital Asset Management shall have the right to examine any books, documents, papers or Records of the Contractor or of its Subcontractors that directly pertain to, and involve transactions relating to, the Contractor or its Subcontractors.

5.8.4. The Contractor shall describe any change in the method of maintaining Records or recording transactions which materially affect any statements filed with the **City**, including in its description the date of the change and reasons therefore, and shall accompany said description with a letter from the Contractor's Independent Certified Public Accountant approving or otherwise commenting on the changes.

5.8.5. The Contractor shall file a Statement of Management on internal accounting controls as set forth below prior to the execution of the Contract.

5.8.6. The Contractor shall file prior to the execution of the contract and shall continue to file annually, an Audited Financial Statement for the most recent completed fiscal year as set forth below.

5.8.7. The Contractor shall file with the **City** a Statement of Management as to whether the system of internal accounting controls of the Contractor and its subsidiaries reasonably assures that:

5.8.7.1. transactions are executed in accordance with Management's general and specific authorization;

5.8.7.2. transactions are recorded as necessary to permit preparation of financial statements in conformity with generally accepted accounting principles, and to maintain accountability for assets;

5.8.7.3. access to assets is permitted only in accordance with Management's general or specific authorization; and

5.8.7.4. the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action is taken with respect to any difference.

5.8.7.5. The Contractor shall also file with the **City** a statement prepared

and signed by an Independent Certified Public Accountant stating that s/he has examined the Statement of Management on internal accounting controls, and expressing an opinion as to:

5.8.7.5.1. whether the representation of Management in response to this paragraph and paragraphs 5.8.2. through 5.8.6 above are consistent with the result of Management's evaluation of the system of internal accounting controls; and

5.8.7.5.2. whether such representations of Management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

5.8.8. The Contractor shall annually file with the Commissioner of the Division of Capital Asset Management during the term of the contract a financial statement prepared by an Independent Certified Public Accountant on the basis of an Audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report. Such statements shall be made available to the **City** upon request.

5.9. Taxes.

5.9.1 The **Contractor** shall pay all sales, consumer, use, and other similar taxes for the Work or portions thereof which are provided by the **Contractor** which are legally enacted when bids are received, whether or not yet effective or merely scheduled to go into effect. However, the **Contractor** shall not pay, and the **City** shall not reimburse or pay the **Contractor** for, any sales taxes for building supplies or materials for which an exemption is provided in M.G.L. c. 64H, §6(f). The **City's** tax exemption number to be used by the **Contractor** in this regard is E04-600-1414.

5.10. Permits, Licenses, and Fees.

5.10.1 Unless otherwise provided, the **Contractor** shall obtain and pay the fees for all permits, licenses, and inspections that are necessary for the proper execution and completion of the Work and which are customarily secured after execution of the Contract and which are legally required. All fees for permits, licenses, and inspections required by any **City** department shall be waived.

5.11. Notices Required By Statutes, Ordinances, Codes, Rules, Regulations, and Orders of the City.

5.11.1 The **Contractor** shall give notices required by statutes, ordinances, codes, rules, regulations, and orders of the **City** bearing on performance of the Work.

5.12. Additional Information from Design Professional.

5.12.1. The **Contractor** shall perform the Work in accordance with the Contract

Documents and submittals approved pursuant to Article 4.

5.12.2. The **Contractor** shall give the **Design Professional** timely notice of any additional Plans, Specifications, or instructions required to define the Work in greater detail, or to permit the proper progress of the Work.

5.12.3. The **Contractor** shall not proceed with any Work not clearly and consistently defined in detail in the Contract Documents, but shall request additional drawings or instructions from the **Design Professional** as provided in the previous Paragraph. If the **Contractor** proceeds with such Work without obtaining further drawings, Specifications, or instructions, the **Contractor** shall correct Work incorrectly done at the **Contractor's** own expense.

5.13. "Or equal."

5.13.1. Requirements for Substitutions. (*Reference:* M.G.L. c. 30, §39M(b).) Where products or materials are prescribed by manufacturer name, trade name, or catalog reference, the words "or approved equal" shall be understood to follow. An item shall be considered equal to the item so named or described if, in the opinion of the **Design Professional**:

5.13.1.1. it is at least equal in quality, durability, appearance, strength, and design;

5.13.1.2. it performs at least equally the function imposed by the general design for the Work;

5.13.1.3. it conforms substantially, even with deviations, to the detailed requirements for the items as indicated by the Specifications.

5.13.2. Net Savings. No proposed substitution will be permitted unless the **Contractor** certifies that the proposed substitution will yield a net savings to the **City** and will not extend the Contract Time.

5.13.3. Contractor's Expense. Any structural or mechanical changes made necessary to accommodate substituted equipment under this paragraph (including but not limited to engineering fees) shall be at the expense of the **Contractor** or **Subcontractor** responsible for the Work item.

5.13.3.1. Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the **Contractor**, notwithstanding approval or acceptance of such substitution by the **City** or the **Design Professional**, unless such substitution was made at the written request or direction of the **City** or the **Design Professional**.

5.13.3.2. All data to be provided by the **Contractor** in support of any proposed "or equal" or substitute item will be at the **Contractor's** expense.

5.13.4. Meeting Requirements. The **Contractor** shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The **Design Professional** may require the **Contractor** to produce reasonable evidence that a material meets such requirements, such as certified reports of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the **Design Professional,** would lead to a reasonable certainty that any material used, or proposed to be used, in the Work meets the requirements of the Contract Documents. All such data shall be furnished at the **Contractor's** expense. This provision shall not require the **Contractor** to pay for periodic testing of different batches of the same material, unless such testing is specifically required by the Contract Documents to be performed at the **Contractor's** expense.

5.13.5. Named Manufacturer's Product. In all cases in which a manufacturer's name, trade name, or other proprietary designation is used in connection with materials or articles to be furnished under this Contract, whether or not the phrase "or equal" is used after such name, the **Contractor** shall furnish the product of the name manufacturer(s) without substitution, unless a written request for a substitute has been submitted by the **Contractor** and approved in writing by the **Design Professional** as provided in the following paragraph.

5.13.6. Deviations. If the **Contractor** proposes to use a material which while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the **Contractor** shall inform the **Design Professional** in writing of the nature of such deviations at the time the material is submitted for approval and shall request written approval of the deviation from the requirements of the Contract Documents.

5.13.7. Rejection of Deviations. In requesting approval of deviations or substitutions, the **Contractor** shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that otherwise attainable. If, in the opinion of the **Design Professional**, the evidence presented by the **Contractor** does not provide a sufficient basis for such reasonable certainty, the **Design Professional** may reject such substitution or deviation without further investigation.

5.13.8. Consistent Character and Quality of Design. The Contract Documents are intended to produce a building of consistent character and quality of design. All components of the building including visible items of mechanical and electrical equipment have been selected to have a coordinated design in relation to the overall appearance of the Project. The **Design Professional** shall judge the design and appearance of proposed substitutes on the basis of their suitability in relation to the overall design of the Project, as well as for their intrinsic merits. The **Design Professional** will not approve as equal to materials specified proposed substitutes that, in the **Design Professional's** opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the Project. In order to permit coordinated design of color and finishes the **Contractor** shall, if required by the **Design Professional**, furnish the substituted material in any color, finish, texture, or pattern which would have been available from the manufacturer originally specified, at no additional cost to the **City**.

5.13.9. Warranty. The warranties provided herein shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by

law.

5.13.10. Design Professional's Approval. The **Design Professional** will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed, or utilized without the **Design Professional's** prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. The **City** may require the **Contractor** to furnish at the **Contractor's** expense a special performance guarantee or other surety with respect to any "or equal" or substitute. The **Design Professional** will record the time required by the **Design Professional** and its consultants in evaluating substitutes proposed or submitted by the **Contractor** and in making changes in the Contract Documents (or in the provisions of any other direct contract with the **City** for work on the Project) occasioned thereby. Whether or not the **Design Professional** accepts a substitute item so proposed or submitted by the **Contractor**, the **Contractor** shall reimburse the **City** for the charges of the **Design Professional** and its consultants for evaluating each such proposed substitute item.

5.14. Substitute Construction Methods or Procedures.

5.14.1 If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, the **Contractor** may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to the **Design Professional**. The **Contractor** shall submit sufficient information to allow the **Design Professional**, in the **Design Professional's** sole discretion, to determine whether the substitute proposed is equivalent to that expressly called for by the Contract Documents.

5.15. Contractor's Progress Schedule.

5.15.1. Before Starting Construction. Within ten (10) days after the date of the Notice to Proceed, the **Contractor** shall submit to the **Design Professional** for review:

5.15.1.1. a preliminary progress schedule indicating the times (number of days or dates) for starting and completing the various stages of the Work;

5.15.1.2. a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; and

5.15.1.3. a refined schedule of values for all of the Work which will include quantities and prices of items aggregating the Contract Sum and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

5.15.2. Review of Progress Schedule. At least ten (10) days prior to the commencement of construction, the **Design Professional**, the **Contractor,** and any other appropriate persons will meet to review and discuss the acceptability to the **Design Professional** of the progress schedule. The **Contractor** will have an additional ten (10) days to make corrections and adjustments and

to complete and resubmit the schedule. No progress payment shall be made to the **Contractor** until the schedule is submitted to and found acceptable by the **Design Professional** as provided below.

5.15.3. Acceptability of Progress Schedule. The progress schedule will be acceptable to the **Design Professional** if, according to the **Design Professional**, it provides an orderly progression of the Work to completion within any specified time frame, but such acceptance will neither impose on the **Design Professional** responsibility for the sequencing, scheduling, or progress of the Work nor interfere with or relieve the **Contractor** from the **Contractor's** full responsibility therefore. The **Contractor's** schedule of Submittals must be acceptable to the **Design Professional** in providing a workable arrangement for reviewing and processing the required Submittals. The **Contractor's** schedule of values must be acceptable to the **Design Professional** as to form and substance.

5.15.4. Sepia and Copies. After the **Design Professional** has approved the schedule, the **Contractor** shall submit to the **Design Professional** one (1) sepia and four (4) copies bearing the **Contractor's** stamp of approval as a representation to the **City** that the **Contractor** has determined or verified all data on that progress schedule and that the **Contractor**, the Subcontractors and Suppliers have reviewed and coordinated the sequences in that progress schedule with the requirements of the Work.

5.15.5. Adjustment of Schedule. The **Contractor** shall adhere to the established progress schedule which may be adjusted from time to time as follows: the **Contractor** shall submit to the **Design Professional** for acceptance proposed adjustments in the progress schedule that will not change the Contract Time. Such adjustments will conform generally to the progress schedule then in effect and will comply with any provisions of the requirements applicable thereto.

5.15.6. During Construction. The **Contractor** shall submit monthly progress schedules to the **Design Professional**. The schedules shall stay current with the **Contractor's** approach to the Work remaining.

5.15.7. Schedule of Submittals. The **Contractor** shall prepare and keep current, for the **Design Professional's** approval, a schedule of Submittals that is coordinated with the **Contractor's** construction schedule and allows the **Design Professional** reasonable time to review Submittals.

5.16. Project Coordination.

5.16.1. In General. The **Contractor** shall be responsible for the proper coordination of the Work of all of the trades.

5.16.2. Coordination with Subcontractors. The **Contractor** shall coordinate the work of each Subcontractor with the Work of every other Subcontractor whose Work affects the other.

5.16.3. Coordination with the City's Own Forces or Separate Contractors. The

Contractor shall coordinate its operations with those of the **City's** own forces or separate contractors. The **Contractor** shall provide the **City's** own forces and separate contractors a reasonable opportunity for the handling, unloading and storage of their materials and equipment and execution of their work. The **Contractor** shall connect and coordinate its Work with theirs.

5.16.4. Coordination with Utility Companies. The **Contractor** shall coordinate its operations with all the appropriate utility companies to assure that the utilities required on the Project are available and functioning properly pursuant to the requirements of the Contract Documents.

5.17. Project Photographs.

5.17.1. In General. The **Contractor** shall take, at its own expense, interior and exterior photographs at the site, from different vantages as directed by the **Design Professional** or the **City**, before beginning any Work and thereafter, at a minimum, on the first work day of each month until final completion of the Work, including final Site photos. Photos shall be taken of any Work that will be buried or concealed while the Work is still exposed. The photographs shall be taken by a skilled commercial photographer. The number of photographs required shall be at the discretion of the **City** or the **Design Professional**. One aerial photo shall be required a) prior to commencement of the work and b) at the completion of the work. See Section 01320 – Construction Progress Documentation.

5.17.2. Prints and Digital Media. Within fourteen (14) days after the photographs have been taken, the **Contractor** shall cause prints to be made and delivered to the **City** and the **Design Professional**. All photographs shall be 8” x 10”. Each print shall state the date of the photograph, the name of the Project, the description of the view and the name and address of the photographer. The **City** shall receive one glossy print of each photo as well as all prints in digital form on compact disc. The **Design Professional** shall receive one glossy print.

5.17.3. Failure to Comply. Should the **Contractor** fail to adhere to any requirement set forth in the previous two paragraphs, the **City** may have the photographs taken at the **Contractor's** expense or receive a set-off against the **Contractor's** next application for payment.

5.18. Record Documents and Samples at the Site.

5.18.1 The **Contractor** shall maintain in a safe place at the site one record copy of all Plans, Specifications, Modifications, Change Orders, **Construction Change** Directives, Field Orders and written interpretations and clarifications in good order and annotated to show all changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to the **Design Professional** for reference. Upon completion of the Work, these record documents, Samples and Shop Drawings will be delivered by the **Contractor** to the **Design Professional** for the **City**.

5.19. Submittals.

5.19.1. Purpose. The purpose of Submittals is to demonstrate for those portions of the

Work for which Submittals are required the way the **Contractor** proposes to conform to the information given and the design concept expressed in the Contract Documents.

5.19.2. Submittal Procedure. Within ten (10) days from the Notice to Proceed, the **Contractor** shall submit to the **Design Professional** a completed Submittals schedule. The **Contractor** shall review, approve, and submit to the **Design Professional** Submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the **City** or of separate contractors. Submittals made by the **Contractor** that are not required by the Contract Documents may be returned without action. The schedules shall be updated and resubmitted each month. All Submittals will be identified as the **Design Professional** may require and in the number specified in the General Requirements. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show the **Design Professional** the materials and equipment that the **Contractor** proposes to provide and to enable the **Design Professional** to review the information for the limited purposes stated below.

5.19.3. Samples. The **Contractor** shall also submit Samples to the **Design Professional** for review and approval in accordance with said accepted schedule of Submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which it is intended and otherwise as the **Design Professional** may require to enable the **Design Professional** to review the Submittal for the limited purposed stated below. The numbers of each Sample to be submitted will be as specified in the Specifications. Unless otherwise specified in the Specifications, three (3) specimens of each Sample shall be submitted.

5.19.3.1. The Samples shall be of sufficient size to permit proper evaluation of material. Where variations in color or other characteristics are to be expected, samples showing the minimum range of variation shall be submitted. Materials exceeding the range of variation of the approved Samples will not be approved on the Work.

5.19.3.2. All costs associated with delivery of Samples will be paid by the **Contractor**.

5.19.4. Contractor's Verifications. Before submitting each Submittal, the **Contractor** shall have determined and verified:

5.19.4.1. all field measurements, quantities, dimensions specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

5.19.4.2. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

5.19.4.3. all information relative to the **Contractor's** sole responsibilities in respect of means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto.

5.19.5. Contractor's Representations. By approving and providing Submittals, the **Contractor** thereby represents that the **Contractor** has determined and verified all dimensions, quantities, field dimensions, relations to existing Work, coordination with Work to be installed later, coordination with information on previously accepted Submittals and verification of compliance with all the requirements of the Contract Documents. The accuracy of all such information is the responsibility of the **Contractor**. In reviewing Submittals, the **Design Professional** shall be entitled to rely upon the **Contractor's** representation that such information is correct and accurate.

5.19.6. Coordination. The **Contractor** shall also have reviewed and coordinated each Submittal with other Submittals and with the requirements of the Work and the Contract Documents.

5.19.7. Stamp or Specific Written Indication. Each Submittal will bear a stamp or specific written indication that the **Contractor** has satisfied the **Contractor's** obligations under the Contract Documents with respect to the **Contractor's** review and approval of that Submittal.

5.19.8. Written Notice of Variations. At the time of each Submittal, the **Contractor** shall give the **Design Professional** specific written notice of such variations, if any, that the Submittal may have from the requirements of the Contract Documents. Such notice is to be in a written communication separate from the Submittal. Moreover, the **Contractor** shall make a specific notation on each Submittal to the **Design Professional** for review and approval of each such variation.

5.19.9. Review and Approval by the Design Professional. The **Contractor** shall perform no portion of the Work requiring a Submittal until the respective Submittal has been approved by the **Design Professional**. Such Work shall be in accordance with approved Submittals.

5.19.9.1. The **Design Professional** will review and approve Submittals in accordance with the schedule of Submittals accepted by the **Design Professional** as required above. The **Design Professional's** review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated in the Contract Documents. The **Design Professional's** review and approval will not extend to means, method, technique, sequences, or procedures of construction (except where a particular means, method, technique, sequences or procedures of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

5.19.10. Deviations. The **Contractor** shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the **Design Professional's** approval of Submittals unless the **Contractor** has specifically informed the **Design Professional** in writing of such deviation at the time of Submittal and the **Design Professional** has given written

approval to the specific deviation. The **Contractor** shall not be relieved of responsibility for errors or omissions in Submittals by the **Design Professional's** approval thereof.

5.19.11. Revisions. The **Contractor** shall make corrections required by the **Design Professional** and shall return the required number of corrected copies of Submittals and submit as required new Submittals for review and approval. The **Contractor** shall direct specific attention, in writing or on resubmitted Submittals, to revisions other than those requested by the **Design Professional** on previous Submittals. Unless such written notice has been given, the **Design Professional's** approval of a resubmitted Submittal shall not constitute approval of any changes not requested on the prior Submittal.

5.19.12. Related Work. Where a Submittal is required by the Contract Documents or the schedule of Submittals accepted by the **Design Professional**, any related Work performed prior to the **Design Professional's** review and approval of the pertinent Submittal will be at the sole expense and responsibility of the **Contractor**.

5.19.13. Informational Submittals. Informational Submittals upon which the **Design Professional** is not expected to take responsive action may be so identified in the Contract Documents.

5.19.14. Certification. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the **City** shall be entitled to rely upon such certifications, and neither the **City** nor the **Design Professional** shall be expected to make any independent examination with respect thereto.

5.20. Continuing the Work.

5.20.1. The **Contractor** shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with the **City**. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as otherwise provided herein or as the **City** and the **Contractor** may agree in writing.

5.21. Use of Site; **Access to Work.**

5.21.1. The right of possession of the premises and the improvements made thereon by the **Contractor** shall remain at all times in the **City**. The **Contractor's** right to entry and use thereof arises solely from the permission granted by the **City** under the Contract Documents. The **Contractor** shall confine the **Contractor's** apparatus, the storage of materials, and the operations of the **Contractor's** workers to limits indicated by law, ordinance, the Contract Documents and permits and/or directions of the **Design Professional** and shall not unreasonably encumber the premises with the **Contractor's** materials. The **City** shall not be liable to the **Contractor**, the Subcontractors, Suppliers, or anyone else with respect to the conditions of the premises, except for a condition caused directly and solely by the negligence of the **City**.

5.21.2. At all times, the **City** and the **Design Professional** shall have access to the Work.

5.22. Protection of Persons and Property.

5.22.1. In General. The **Contractor** shall be responsible for initiating, maintaining, and supervising all health and safety precautions and programs in connection with the performance of the Contract. The **Contractor** is responsible for the implementation of all Federal, State, and local health and safety requirements.

5.22.2. The **Contractor** shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to:

5.22.2.1. employees on the site and other persons who may be affected thereby;

5.22.2.2. the Work, materials, and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the **Contractor**, Subcontractors, or Sub-subcontractors;

5.22.2.3. other property at the site or adjacent or in close proximity thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and

5.22.2.4. any other property of the **City**, whether or not forming part of the Work, located at the site or adjacent thereto in areas to which the **Contractor** has access.

5.22.3. Notices and Compliance. The **Contractor** shall give notices and comply in all other respects with applicable laws, ordinances, rules, regulations, codes, and lawful orders of public authorities bearing on the safety of persons or property or their protection from damage, injury, or loss. The **Contractor** shall notify owners of adjacent and nearby properties of underground facilities and utility owners when prosecution of the Work may affect them and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

5.22.4. Erection and Maintenance of Safeguards. The **Contractor** shall erect and maintain, as required by existing conditions and the terms of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent and nearby sites and utilities.

5.22.5. Hazardous Materials and Equipment. When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the **Contractor** shall exercise utmost care and carry on such activities under the supervision of properly qualified personnel.

5.22.6. Damage to Property. The **Contractor** shall promptly remedy damage and loss to property referred to above. If the damage or loss is due in whole or in part to the **Contractor's** failure to take the precautions required herein, the **Contractor** shall bear the cost,

subject to any reimbursement to which the **Contractor** is entitled under property insurance required by the Contract Documents. The **Contractor** shall be fully and solely responsible for all Work and other operations carried out on adjacent properties. The insurance required under Article 8 shall cover such Work or operations, and the **Contractor** shall indemnify and defend the **City**, the **Design Professional**, and the owners of such adjacent or nearby properties from and against all claims, suits, losses, or costs arising out of such Work or operations.

5.22.7. Fire Protection Equipment and Services. The **Contractor** shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean and all combustible rubbish shall be promptly removed from the site.

5.22.8. Protection of Excavations, Trenches, etc. The **Contractor** shall at all times protect excavations, trenches, buildings and materials from rain water, ground water, backup or leakage of sewers, drains and other piping, and from water of any other origin and shall remove promptly any accumulation of water. The **Contractor** shall provide and operate all pumps, piping, and other equipment necessary to this end.

5.22.9. Snow and Ice Removal. The **Contractor** shall remove snow and ice that might result in damage or delay.

5.22.10. Safety Representative. The **Contractor** shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

5.22.11. Weather Protection. (*Reference:* M.G.L. c. 149, §44F(1).) The **Contractor** shall install weather protection and furnish adequate heat in the protected area from November 1 through March 31.

5.22.12. Security. The **Contractor** shall provide, within the Contract Sum, a sufficient number of security personnel at the Site at all times when the **Contractor's** personnel are not present, from commencement of the Work until Substantial Completion to assure that the Site, the facility, and the Work, and all materials and equipment stored at the Site are fully and completely protected against loss or damage due to vandalism, theft, or malicious mischief. If the **Contractor** elects, in addition, to use guard dogs for this purpose, each dog shall at all times be accompanied by an adult handler. If the **Contractor** fails to comply with the requirements of this paragraph, then the **City** may provide appropriate security and charge the cost thereof to the **Contractor**. The **City's** provision of such security, or failure to do so, shall not relieve the **Contractor** of its responsibility to pay for loss or damage due to vandalism, theft, or malicious mischief at the Site.

5.22.13. Hazard Communication Programs. The **Contractor** shall be responsible for coordinating any exchange of material safety data sheets or other hazard

communications information required to be made available to or exchanged between or among employers at the site in accordance with laws, codes and regulations.

5.22.14. Noise Pollution Control. The **Contractor** shall comply with all applicable provisions of Somerville Municipal Code §9-109.

5.23. Cutting and Patching.

5.23.1. In General. Unless otherwise provided in the Contract Documents, the **Contractor** shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly, including the work of the City or of separate contractors.

5.23.2. Damage to Work of City or of Separate Contractor. The **Contractor** shall not damage or endanger a portion of the Work or fully or partially completed construction of the **City** or separate contractors by cutting, patching, or otherwise altering such construction, or by excavation. The **Contractor** shall not cut or otherwise alter such construction by the **City** or a separate contractor except with prior written consent of the **City** and of such separate contractor; such consent shall not be unreasonably withheld. The **Contractor** shall not unreasonably withhold from the **City** or a separate contractor the **Contractor's** consent to cutting or otherwise altering the Work.

5.23.3. Damage Caused by Contractor. Should the **Contractor** cause damage to the work or property of any separate contractor at the Site, or should any claim arising out of the **Contractor's** performance of Work at the Site be made by any separate contractor against the **Contractor**, the **City**, the **Design Professional**, or any of the **Design Professional's** consultants, the **Contractor** shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by arbitration or at law. The **Contractor** shall, to the fullest extent permitted by laws and regulations, indemnify and hold harmless the **City**, the **Design Professional**, and the **Design Professional's** consultants from and against all claims, damages, losses and expenses (including, but not limited to, fees of the Design Professional, the Design Professional's consultants, attorneys, and other professionals, and court and arbitration or mediation costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any separate contractor against the **City**, the **Design Professional**, or any of the **Design Professional's** consultants, to the extent based on a claim arising out of the **Contractor's** performance of the Work. Should a separate contractor cause damage to the Work or property of the **Contractor** or should the performance of work by any separate contractor at the site give rise to any other claim, the **Contractor** shall not institute any action, legal or equitable, against the **City**, the **Design Professional**, or any of the **Design Professional's** consultants, or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from the **City**, the **Design Professional**, or any of the **Design Professional's** consultants, on account of any such damage or claim. If the **Contractor** delays at any time in performing or furnishing Work by any act or neglect of a separate contractor and the City and the Contractor are unable to agree as to the extent of any adjustment in the Contract Time attributable thereto, the **Contractor** may make a claim for an extension of time in accordance with Article 16. An extension of the Contract Time shall be the **Contractor's** exclusive remedy

with respect to the **City**, the **Design Professional**, and the **Design Professional's** consultants, for any delay, disruption, interference, or hindrance caused by any separate contractor.

5.24. Cleaning Up.

5.24.1. During the progress of the Work, the **Contractor** shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract or other debris. At the completion of the Work, the **Contractor** shall remove from and about the Project all waste materials, rubbish, and debris, and the **Contractor's** tools, construction equipment, machinery, and surplus materials. Surplus materials to be provided to the **City** by specifications shall be stored in a clean, safe and secure area as directed by the **City**. The **Contractor** shall leave the site clean and ready for occupancy by the **City** at Substantial Completion of the Work. Immediately prior to the **Design Professional's** inspection for Substantial Completion, the **Contractor** shall completely clean the premises. Concrete and ceramic surfaces shall be cleaned and washed. Resilient coverings shall be cleaned, waxed and buffed. Woodwork shall be dusted and cleaned. Sash, fixtures and equipment shall be thoroughly cleaned. Stains, spots, dust, marks and smears shall be removed from all surfaces. Hardware and all metal surfaces shall be cleaned and polished. Glass and plastic surfaces shall be thoroughly cleaned by professional window cleaners. All damaged, broken or scratched glass or plastic shall be replaced by the **Contractor** at the **Contractor's** expense. The **Contractor** shall restore to original condition all property not designated for alteration by the Contract Documents.

5.24.2. If the **Contractor** fails to clean up as provided herein, the **City** may do so and charge the cost thereof to the **Contractor**.

5.25. Royalties and Patents.

5.25.1 The **Contractor** shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. To the fullest extent permitted by law, the **Contractor** shall indemnify and hold harmless the **City** and the **Design Professional** from and against all claims, costs, losses, and damages arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the work or resulting from the incorporation in the work of any invention, design, process, product, or device not specified in the Contract Documents.

5.26. Contractor's Obligation to Perform.

5.26.1. The **Contractor's** obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of the **Contractor's** obligation to perform the Work in accordance with the Contract Documents:

5.26.1.1. observations by the **Design Professional**;

5.26.1.2. recommendation of any progress or final payment by the **Design Professional**;

5.26.1.3. the issuance of a certificate of Substantial Completion or any payment by the **City** to the **Contractor** under the Contract Documents;

5.26.1.4. use or occupancy of the Work, Project, or Site, or any part thereof, by the **City**;

5.26.1.5. any acceptance by the **City** or any failure to do so;

5.26.1.6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptance by the **Design Professional**;

5.26.1.7. any inspection, test, or approval by others; or

5.26.1.8. any correction of defective Work by the **City**.

5.27. Indemnification; **and Covenant Not To Sue.**

5.27.1. To the fullest extent permitted by law, the **Contractor** shall assume the defense of, indemnify and hold harmless the **City**, the **Design Professional**, the **Design Professional's** consultants, and agents and employees of any of them, from and against claims, damages, losses, and expenses, including, but not limited, to attorneys' fee, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting there from, caused in whole or in part by alleged negligent acts or omissions of the **Contractor**, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this paragraph.

5.27.2. In claims against any person or entity indemnified under the foregoing paragraph by an employee of the **Contractor**, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under the foregoing paragraph shall not be limited by a limitation on the amount or type of damages, compensation or benefits payable by or for the **Contractor** or a Subcontractor under Workers' Compensation laws, disability benefit acts or other employee benefit acts.

5.27.3. The obligations of the **Contractor** in this Article shall not extend to the liability of the **Design Professional**, the **Design Professional's** consultants, and agents or employees of any of them arising out of (1) the preparation of maps, Plans, opinions, reports, surveys, Change Orders, designs, or Specifications, or (2) directions or instructions given by the **Design Professional**, the **Design Professional's** consultants and agents or employees of any of them, provided such instructions or directions are the primary cause of the injury or damage.

5.27.4. The **Contractor**, or any successor, assign, or subrogee of the **Contractor** agrees not to bring any civil suit, action, or other proceeding in law, equity or arbitration against the **Design Professional**, or the officers, employees, agents, or consultants of the **Design Professional**, for the enforcement of any action which the **Contractor** may have arising out of or in any manner connected with the Work. The **Contractor** shall assure that this covenant not to sue is contained in all subcontracts and sub-subcontracts of every tier and shall assure its enforcement. The **Design Professional**, its officers, employees, agents, and consultants are intended third-party beneficiaries of this covenant not to sue, and are entitled to enforce this covenant in law or equity.

5.28. Survival of Obligations.

5.28.1 All representations, indemnifications, warranties, and guarantees made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Work and termination or completion of the Contract.

ARTICLE 6: SUBCONTRACTORS

6.1 Use of Subcontractors.

6.1.1 The **Contractor** shall use the Subcontractors named in the **Contractor's** Bid.

6.2 Substitution of Subcontractors.

6.2.1 The **Contractor** shall not substitute another Subcontractor therefore without notice to the **City** and the **City's** prior written consent of such substitution.

6.3 Names of Subcontractors.

6.3.1 Upon execution of the Contract with the **City**, the **Contractor** shall provide in writing to the **City**, through the **Design Professional,** the names, addresses, telephone numbers, and fax numbers of all persons proposed for each principal portion of the Work.

6.4. Objections to Subcontractors.

6.4.1 The **Contractor** shall not use any Subcontractor against whom the **City** has a reasonable objection. The **Contractor** shall not be required to contract with any person or entity against whom it has a reasonable objection.

6.5. Form of the Subcontract.

6.5.1 All Work performed by a Subcontractor shall be through an appropriate subcontract. The form of subcontract shall be submitted to the **City's Law Department for its** approval, which shall not be unreasonably withheld or delayed.

6.6. Content of the Subcontract.

6.6.1. In addition to all statutorily mandated provisions and provisions required elsewhere in the Contract Documents, each subcontract shall expressly provide that:

6.6.1.1. Each subcontract agreement for a portion of the Work is assigned by the **Contractor** to the **City** provided that:

6.6.1.1.1. the assignment is effective only after termination of the Contract by the **City** or the **Contractor** and only for those subcontract agreements which the **City** accepts by notifying the Subcontractor in writing; and

6.6.1.1.2. the assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

6.6.1.2. Each Subcontractor is bound by the requirements of the Contract Documents for the express benefit of the **City.**

6.6.1.3. Each Subcontractor shall assume toward the **Contractor** all the obligations that the **Contractor** assumes toward the **City** and the **Design Professional**, unless otherwise provided by law.

ARTICLE 7: PERFORMANCE AND PAYMENT BONDS

7.1. Form of Bonds.

7.1.1 The performance and labor and material or payment bonds shall be in the form required by the **City**, copies of which are included in the Project Manual. The **City** reserves the right to reject any bond that does not conform to the **City's** requirements.

7.2. Furnished by the Contractor. (*Reference:* M.G.L. c. 30, §39M(c);, M.G.L. c. 149, §29).

7.2.1 The **Contractor** shall furnish a performance bond and a labor and materials or payment bond, each with a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the **City** and each in the sum of the Contract Sum, the premiums for which are to be paid by the **Contractor** and are included in the Contract Sum. The bonds shall remain in effect until final payment is made. The sum of the performance bond shall increase each time the Contract Sum is increased as a result of a Change Order.

7.3. Submission to the City.

7.3.1 The **Contractor** must submit the performance and a labor and materials or payment bonds to the **City** upon the **Contractor's** execution of the Agreement.

ARTICLE 8: INSURANCE REQUIREMENTS

8.1 Insurance Certificates.

8.1.1 Prior to starting work on this project, the contractor shall deposit with the **City**, certificates from insurers clearly stating that the required insurance policies have been issued to the **Contractor** and will remain in effect during the time period required to complete this contract. ACCORD forms will not be accepted. The certificates must be in a form satisfactory to the **City**. The insurance shall include all major divisions of coverage, and shall be on a comprehensive general basis including: Premises and Operations (including X-C-U), Owners and Contractors Protective, Products and Completed Operations, Owned, Non-owned or Hired and/or Leased Motor Vehicles. Such insurance shall be written for not less than any limits of liability, required by law or the following limits, whichever are greater.

8.2 Minimum Coverages. The **Contractor** shall possess and maintain throughout the contract period/project, insurance in the kinds and amounts as provided in Appendix D.
The **Contractor** may purchase and maintain excess liability insurance in the in the umbrella form in order to satisfy the limits of liability required for the insurance to be purchased and maintained in accordance with the required requirements set forth above (in addition to the umbrella limits required). Evidence of such excess liability shall be delivered to the **City** in the form of a certificate and the certificate indicating the policy numbers and limits of liability of all underlying insurance.

8.3 Additional Insured. The **City** shall be named as an additional insured on each certificate, and the certificate must have the endorsement of the insurance agency.

8.4 Notice. Each certificate shall contain a notation that the insurer will give 30 days notice to the **City** prior to cancellation, change or non-renewal of policy.

8.5 Carrier Rating. Insurance carriers MUST have an A.M. Best rating of "A" or better.

8.6 Material Breach. Failure of the contractor to provide and continue in force such insurance shall be deemed a material breech of contract and shall operate as immediate termination thereof.

ARTICLE 9: TESTS AND INSPECTIONS

9.1. Access.

9.1.1 The **City**, the **Design Professional**, and all other persons designated by the **City** shall have access to the Work at reasonable times for observing, inspecting, and testing. The **Contractor** shall provide them with proper and safe conditions for such access and advise them of the **Contractor's** site safety procedures and programs so that they may comply therewith as

applicable.

9.2. Tests and Inspections.

9.2.1. The **Contractor** shall give the **Design Professional** timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

9.2.2. Unless otherwise provided, the **Contractor** shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the **City**, or with the appropriate public authority and shall bear all related costs of tests, inspections, and approvals. If the laws or regulations of any public body having jurisdiction require any Work or part thereof specifically to be inspected, tested, or approved by an employee or other representative of such public body, the **Contractor** shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith and furnish the **Design Professional** with the required certificates of inspection, testing, or approval.

9.2.3. The **Contractor** shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for the **Design Professional's** acceptance of materials or equipment to be incorporated into the Work, or of materials, mix designs, or equipment submitted for approval prior to the **Contractor's** purchase thereof for incorporation into the Work.

9.2.4. If any Work that is to be inspected, tested, or approved is covered by the **Contractor**, Subcontractor, or Sub-subcontractor without the prior written consent of the **Design Professional**, it must be uncovered for observation, inspection, testing, or approval, if requested by the **Design Professional**. The **Contractor** must recover the Work at its own expense.

9.2.5. The **Contractor** shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the **Design Professional** in the **Design Professional's** administration of the Contract or by tests, inspections, or approvals required or performed by persons other than the **Contractor**.

ARTICLE 10

UNCOVERING AND CORRECTING WORK

10.1. Uncovering Work.

10.1.1. If a portion of the Work is covered contrary to the **Design Professional's** request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the **Design Professional**, be uncovered for the **Design Professional's** observation and be replaced, both at the **Contractor's** expense and without change in the Contract Time.

10.1.2. If a portion of the Work has been covered which the **Design Professional** has not specifically requested to observe prior to its being covered, the **Design Professional** may request to see such Work, and it shall be uncovered by the **Contractor**. If it is found that such Work is in accordance with the Contract Documents, costs of uncovering and replacing shall, by appropriate Change Order, be charged to the **City**. If it is found that such Work is defective or not in accordance with the Contract Documents, the **Contractor** shall pay all claims, costs, losses, and damages caused by, arising out of or resulting from such uncovering, exposure, observation, inspection, and testing and of satisfactory replacement of reconstruction (including, but not limited to, all costs of repair or replacement of work of others); and the **City** shall be entitled to an appropriate decrease in the Contract Sum. The **City** may take such decrease by reducing the then current application for payment accordingly or subsequent applications, if necessary, until the decrease is paid in full.

10.2. Correcting Work.

10.2.1. The **Contractor** shall promptly correct Work rejected by the **Design Professional** or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed, or completed. The **Contractor** shall bear all costs of correcting such rejected Work including additional testing and inspections and compensation for the **Design Professional's** services and expenses made necessary thereby and any cost, loss, or damages to the **City** resulting from such failure or defect.

10.2.2. If, within one (1) year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established in Article 15, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the **City** to do so, unless the **City** has previously given the **Contractor** a written acceptance of such condition. This period of one (1) year shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work. This obligation to correct under this paragraph shall survive acceptance of the Work under the Contract and termination of the Contract. The **City** shall give such notice promptly after discovery of the condition.

10.2.3. The **Contractor** shall correct, remove, or replace portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the **Contractor** nor accepted by the **City**.

10.2.4. If the **Contractor** fails within a reasonable time to correct nonconforming Work, or to remove and replace rejected Work, or fails to perform the Work in accordance with the Contract Documents, the **City** may correct it in accordance with the provisions herein. If the **Contractor** does not proceed with correction, removal, or replacement of such nonconforming Work within seven (7) days from the date of written notice from the **Design Professional**, the

City may correct it and store any salvageable materials or equipment at the **Contractor's** expense. If the **Contractor** does not pay costs of any such removal and storage within ten (10) days after written notice, the **City** may upon ten (10) additional days' written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the **Contractor**, including compensation for the **Design Professional's** services and expenses made necessary thereby. If such proceeds of sale do not cover all the costs that the **Contractor** should have born, the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the **Contractor** are not sufficient to cover such amount, the **Contractor** shall pay the difference to the **City**.

10.2.5. The **Contractor** shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the **City** or separate contractors caused by the **Contractor's** correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

10.2.6. Nothing contained in this paragraph shall be construed to establish a period of limitation with respect to other obligations that the **Contractor** might have under the Contract Documents. Establishment of the time period of one (1) year as described in the above paragraph related only to the specific obligation of the **Contractor** to correct the Work and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced nor to the time within which proceedings may be commenced to establish the **Contractor's** liability with respect to the **Contractor's** obligations other than specifically to correct the Work.

10.3. Acceptance of Nonconforming Work.

10.3.1 If, instead of requiring correction or removal and replacement of defective or nonconforming Work, the **City** prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the **City** may do so instead of requiring its removal and correction, in which case the **Contractor** shall pay all claims, costs, losses, and damages attributable to the **City's** evaluation of and determination to accept such defective or non-conforming Work. The Contract Sum will be reduced as appropriate. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 11: CHANGES IN THE WORK

11.1. In General.

11.1.1. The Contract Sum constitutes the total compensation (subject to authorized adjustments) payable to the **Contractor** for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by the **Contractor** shall be at the **Contractor's** expense without any change in the Contract Sum.

11.1.2. Without invalidating the Contract and without notice to any surety, the **City** may, at any time or from time to time, order additions to, deletions from, or revisions in the Work.

Such additions, deletions, or revisions will be authorized by a Change Order, a Modification or a **Construction Change** Directive. Upon receipt of any such document, the **Contractor** shall promptly proceed with the Work involved that will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

11.1.3. The **Contractor** shall not be entitled to an increase in the Contract Sum or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents as amended, modified, or supplemented, except as otherwise provided herein.

11.2. Change Orders.

11.2.1. (*Reference:* M.G.L. c. 30, §39I;). The **Contractor** shall perform all the Work required by this Contract in conformity with the Plans and Specifications contained herein. No willful and substantial deviation from said Plans and Specifications shall be made unless authorized in writing by the **City** and the **Design Professional** in charge of the Work who is duly authorized by the **City** to approve such deviations. In order to avoid delays in the prosecution of the Work required by such Contract, such deviation from the Plans or Specifications may be authorized by a written order of the **City** or the **Design Professional** so authorized to approve such deviation. Within thirty (30) days thereafter, such written order shall be confirmed by a certificate of the **City** stating: (1) If such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures, or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefore; (2) that the specified deviation does not materially injure the Project as a whole; (3) that either the work substituted for the Work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the **City** and the **Contractor** and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the **City**.

11.3. Construction Change Directive.

11.3.1. A **Construction Change** Directive shall be used in the absence of total agreement on the terms of a Change Order.

11.3.2. Upon request of the **City** or the **Design Professional**, the **Contractor** shall without cost to the **City** submit to the **Design Professional** in such form as the **Design Professional** may require, an accurate written estimate of the cost of any proposed extra work or change. The estimate shall indicate the quantity and unit cost of each item of materials, and the number of hours of work and hourly rate for each class of labor, as well as the description and amounts of all other costs chargeable under the terms of this Article. Unit labor costs for the installation of each item of materials shall be shown if required by the **Design Professional**. If required by the **Design Professional**, in order to establish the exact cost of new Work added or of previously required Work omitted, the **Contractor** shall obtain and furnish to the **Design Professional** bona fide proposals from recognized Suppliers for furnishing any material included in such Work. Such estimates shall be furnished promptly so as to occasion no delay in the Work, and shall be furnished at the **Contractor's** expense.

11.3.3. The **Contractor** shall state in the estimate any extension of time required for the completion of the Work if the change or extra Work is ordered. The **Contractor** shall document, through a critical path analysis, or some other clearly delineated explanation, how the proposed change affects other aspects of the Work, and why it would require an extension of time. The **Contractor** shall promptly revise and resubmit such estimate if the **Design Professional** determines that it is not in compliance with the requirements of this Article, or that it contains errors of fact or mathematical errors.

11.3.4. If the **Construction Change** Directive provides for an adjustment to the Contract Sum**,** the adjustment shall be based on one of the following methods, as selected by the **City**, selection of which does not require the consent of the **Contractor**:

11.3.4.1. by unit prices stated in the Contract Documents or otherwise mutually agreed upon; or

11.3.4.2. by Cost and Percentages estimated by the **Contractor** as provided herein and accepted by the **City**, whereupon the **Contractor's** estimate shall become a fixed price which shall not be changed by any variation in the actual cost of executing the Work covered by the change; or

11.3.4.3. by actual Cost determined after the Work covered by the change is completed, plus Percentage; or

11.3.4.4. by submission to arbitration or a court, which shall determine the fair value of the Work covered by the change.

11.3.5. "Cost" shall mean the estimated or actual net increase or decrease in cost to the **Contractor**, Subcontractor, or Sub-subcontractor for performing the Work covered by the change, including actual payments for materials, equipment rentals, expendable items, wages, and associated benefits to the workers and to supervisors employed full time at the Site, insurance, bonds, and other provable direct costs, but not including any administrative, accounting or expediting costs, or other indirect or overhead costs, or any wages or benefits of supervisory personnel not assigned full time to the Site, or any amount for profit or fee to the **Contractor**, Subcontractor, or Sub-subcontractor.

11.3.6. "Percentage" shall mean an allowance to be added to or subtracted from the Cost in lieu of overhead and profit and of any other expense that is not included in the Cost of the Work covered by the change, as defined above. Percentage for a Sub-subcontractor shall be 8% of any net increase or decrease of Cost of any Work performed by the Sub-subcontractor's own forces plus 4% of any net increase or decrease in Cost of any Work performed for the Sub-subcontractor by lower tier Sub-subcontractors. Percentage for a Subcontractor shall be 12% of any net increase or decrease of Cost of any Work performed by the Subcontractor's own forces plus 4% of the Cost of Work performed by Sub-subcontractors. Percentage for the **Contractor** shall be 15% of any net increase or decrease of Cost of any Work performed by the **Contractor's** own forces plus 5% of any net increase or decrease in the Cost for all other Work

covered by the change. When the **Contractor** is also performing Work as a Subcontractor or Sub-subcontractor, the **Contractor** shall only be entitled to a total of no more than 15% of any net increase or decrease of Cost of any Work.

11.3.7. When in the reasonable judgment of the **Design Professional** a series of **Construction Change** Directives or Change Orders effect a single change, Percentage shall be calculated on the cumulative net increase or decrease in Cost, if any.

11.3.8. If unit prices are stated in the Contract Documents or are subsequently agreed upon, and if quantities originally contemplated are so changed in a Proposed Change Order or **Construction Change** Directive that the application of such unit prices to quantities of Work proposed will cause substantial inequity to the **City** or the **Contractor**, the applicable unit prices shall be equitably adjusted.

11.3.9. If the **City** elects to determine the Cost of the Work as provided in method (11.3.4.1) using unit prices stated in the Contract Documents or subsequently agreed upon, the unit prices shall be subject to the prior paragraph. Notwithstanding the inclusion of unit prices in the Contract Documents, it shall be the **City's** option to require the Cost of any given change to be determined by one of the other methods stated in 11.3.4. If the **City** elected to determine the Cost of the change by unit prices and the nature of the work is such that its extent cannot readily be measured after the completion of such work or any subsequent Work, the **Contractor** shall keep daily records, available at all times to the **Design Professional** for inspection, of the actual quantities of such Work put in place, and delivery receipts or other adequate evidence, acceptable to the **Design Professional**, indicating the quantities of materials delivered to the Site for use in such unit price Work, and distinguishing such from other similar material delivered for use in Work include in the base Contract Sum. If so required by the **Design Professional**, materials for use in unit price Work shall be stored apart from all other materials on the Project.

11.3.10. If the **City** elects to determine the Cost of the Work as provided in methods 11.3.4.3. or 11.3.4.4. or if the method of determining the Cost has not been established before the Work is begun, the **Contractor** shall keep detailed daily records of labor and material costs applicable to the Work.

11.3.11. Upon receipt of a **Construction Change** Directive, the **Contractor** shall promptly proceed with the change in the Work involved and advise the **Design Professional** in writing of the **Contractor's** agreement or disagreement with the method, if any, provided in the **Construction Change** Directive for determining the proposed adjustment in the Contract Time.

11.3.12. A **Construction Change** Directive signed by the **Contractor** indicates the agreement of the **Contractor** therewith, including adjustment in the Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

11.3.13. If the **Design Professional** and the **Contractor** do not agree with the adjustment in the Contract Time or the method for determining it, the adjustment or the method shall be referred to the **Design Professional** for determination.

11.4. Minor Changes in the Work.

11.4.1. The **Design Professional** has the authority to order minor changes in the Work. "Minor changes" as used in this paragraph mean changes which are so insignificant as to not affect the Contract Sum or the Contract Time and which are not inconsistent with the intent of the Contract Documents. Any minor change shall be committed to a written order which shall be binding on both the **City** and the **Contractor** and which shall be promptly carried out by the **Contractor**.

11.5. Certificate of Appropriations. (*Reference:* M.G.L. c. 44, §31C;). This Contract shall not be deemed to have been made until the **City's** auditor has certified thereon that an appropriation in the amount of this Contract is available therefor and that an officer or agent of the **City** has been authorized to execute said Contract and approve all requisitions and change orders. No order to the **Contractor** for a change in or addition to the Work, whether in the form of a drawing, plan, detail or any other written instruction, unless it is an order which the **Contractor** is willing to perform without any increase to the Contract price, shall be deemed to be given until the auditor has certified thereon that an appropriation in the amount of such order is available therefore; but such certificate shall not be construed as an admission by the **City** of its liability to pay for such work. The certificate of the auditor that an appropriation in the amount of this Contract or in the amount of such order is available shall bar any defense by the **City** on the grounds of insufficient appropriation.

ARTICLE 12: CHANGE IN THE CONTRACT TIME

12.1. Date of Commencement.

12.1.1 The date of commencement of the Work is the date established in the Notice to Proceed. The date shall not be postponed by the failure to act of the **Contractor** or persons or entities for whom the **Contractor** is responsible.

12.2. Progress and Completion.

12.2.1. Time is of the essence; all time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the **Contractor** confirms that the Contract Time is a reasonable period for performing the Work.

12.2.2. The **Contractor** shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

12.2.3. Within five (5) working days of award of contract, the **Contractor** shall submit to the **Design Professional** a progress schedule showing for each class of Work included in the schedule of values, the percentage of completion to be obtained and the total dollar value of Work to be completed as of the first of each month until Substantial Completion. All

calculations shall be on the basis of Work in place, but may include, at the **Design Professional's** discretion, the value of materials delivered but not in place.

12.2.4. The progress schedule shall be based on an orderly progression of the Work, allowing adequate time for each operation (including adequate time for submission and review of submittals), and leading to a reasonable certainty of Substantial Completion by the date established in the Agreement. The progress schedule will be reviewed by the **Design Professional** for compliance with the requirements of this Article and will be accepted by the **Design Professional** or returned to the **Contractor** for revision and resubmittal. Unless specifically required by law, no payment under this Contract shall be due until the progress schedule has been approved by the **Design Professional**. The **Design Professional's** review of the progress schedule shall not impose any duty on the **Design Professional** or the **City** with respect to the timing, planning, scheduling, or execution of the Work. In particular, if the **Contractor** proposes a progress schedule indicating a date of Substantial Completion which is earlier than the Contract Time, the **Contractor** shall not be entitled to additional payment or compensation of any kind if, for any reason, the full Contract Time is required to achieve Substantial Completion of the Work.

12.2.5. If in any Application for Payment, the total value of the completed Work in place, as certified by the **Design Professional**, is less than 90% of the total value of the Work in place estimated in the progress schedule, the **City** may, at the **City's** option, require the **Contractor** to accelerate the progress of the Work without cost to the **City** by increasing the workforce or hours or Work or by other reasonable means approved by the **Design Professional**.

12.2.6. If each of three successive applications, as certified by the **Design Professional**, indicate that the actual Work completed is less than 90% of the values estimated in the progress schedule to be completed by the respective dates, the **City** may at the **City's** option, treat the **Contractor's** delinquency as a default justifying the action permitted under Article 18.

12.2.7. If the **Design Professional** has determined that the **Contractor** should be permitted to extend the time for completion as provided below, the calendar dates in the progress schedule shall be adjusted accordingly to retain their same relationship to the adjusted date of Substantial Completion, and the dollar value of the Work to be completed as of the first of each month shall be adjusted pro rata.

12.2.8. If the **Contractor** fails to submit any application for payment in any month, the **Design Professional** shall, for the purpose of this evaluation of progress, certify separately to the actual value of the Work in place completed as of the first of the month to the best of the **Design Professional's** knowledge.

12.2.9. Nothing herein shall limit the **City's** right to liquidated or other damages for delays by the **Contractor** or to any other remedy which the **City** may be entitled or may possess under other provisions of the Contract Documents or by law.

12.3. Delays and Extensions of Time.

12.3.1. If the **Contractor** is delayed at any time in the progress of the Work by an act or neglect of the **City** or the **Design Professional**, or of an employee of either, or of a separate contractor employed by the **City**, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, or other causes (except weather) beyond the **Contractor's** control, or by delay authorized by the **City**, or by other causes which the **Design Professional** determines may justify delay, then the Contract Time shall be extended by Change Order or **Construction Change** Directive for such reasonable time as the **Design Professional** may determine.

12.3.2. Claims relating to time shall be made in accordance with applicable provisions of Article 16.

12.3.3. No claim for extension of time shall be allowed on account of failure of the **Design Professional** to furnish Plans, Specifications or instructions or to return Shop Drawings or Samples until fifteen (15) days after receipt by the **Design Professional** by registered or certified mail of written demand for such instructions, Plans, Specifications, or Samples, and then not unless such claim is reasonable.

12.3.4. No extensions of time shall be granted because of seasonal or abnormal variations in temperature, humidity or precipitation, which conditions shall be wholly at the risk of the **Contractor**, whether occurring within the time originally scheduled for completion or within the period of any extension granted. There shall be no increase in the Contract Sum on account of any additional costs of operations or conditions resulting therefrom.

12.3.5. The **Contractor** hereby agrees that the **Contractor** shall have no claim for damages of any kind against the **City** or the **Design Professional** on account of any delay in the commencement of the Work and/or any hindrance, delay, or suspension of any portion of the Work, whether such delay is caused by the **City**, the **Design Professional**, or otherwise, except as and to the extent expressly provided under M.G.L. c. 30, §39O, in the case of written orders by the **City**. The **Contractor** acknowledges that the **Contractor's** sole remedy for any such delay and/or suspension will be an extension of time as provided in this Article.

12.3.6. (*Reference:* M.G.L. c. 30, §39O;). (a) The **City** may order the **Contractor** in writing to suspend, delay, or interrupt all or any part of the Work for such period of time as it may determine to be appropriate for the convenience of the **City**, provided however that if there is a suspension, delay, or interruption for fifteen (15) days or more due to a failure of the **City** to act within the time specified in this Contract, the **City** shall make an adjustment in the Contract prices for any increase in the cost of performance of this Contract under this provision for any suspension, delay, interruption, or failure to act to the extent that such is due to any cause for which this Contract provides for an equitable adjustment of the Contract price under any other Contract provisions.

(b) The **Contractor** must submit the amount of a claim under provision (a) to the **City** in writing as soon as practicable after the end of the suspension, delay, interruption, or failure to act and, in any event, not later than the date of final payment under this Contract and, except for costs due to a suspension order, the **City** shall not approve any costs in the claim incurred more

than twenty (20) days before the **Contractor** notified the **City** in writing of the act or a failure to act involved in the Claim.

In the event a suspension, delay, interruption, or failure to act of the **City** increases the cost of performance to any Subcontractor, that Subcontractor shall have the same rights against the **Contractor** for payment for an increase in the cost of its performance as provisions (a) and (b) give the **Contractor** against the **City**, but nothing in provisions (a) and (b) shall in any way change, modify, or alter any other rights which the **Contractor** or the Subcontractor may have against each other.

12.4. Liquidated Damages.

12.4.1. If the **Contractor** shall fail to achieve Substantial Completion within the Contract Time, it shall be liable to pay the **City** the daily amount specified in the Agreement, not as a penalty, but as a fixed and agreed upon damages for breach of contract. The said amount is fixed and agreed upon because of the difficulty of ascertaining the **City's** actual damages. It is mutually understood that the said amount is a reasonable approximation or estimate thereof as of the date of the Agreement. The **City** may elect to withhold said amount from periodic or final payments due to the **Contractor**, in addition to retainage and other back charges.

12.5. Changes in the Contract Time.

12.5.1. In Writing. The Contract Time may only be changed by a Change Order or a Modification. Any claim for an adjustment of the Contract Time shall be based on a written notice delivered to the party making the claim to the other party and to the **Design Professional** promptly (but in no event later that seven (7) days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within thirty (30) days after such occurrence and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Time shall be determined by the **Design Professional** in accordance with Article 16. No claim for an adjustment in the Contract Time will be valid if not submitted in accordance with the requirements of this paragraph.

12.5.2. Early Completion. The Contract Time shall not be changed due to a delay in the **Contractor's** early completion date.

ARTICLE 13: PAYMENTS

13.1. Schedule of Values.

13.1.1. The **Contractor** shall submit to the **Design Professional** a schedule of values which shall subdivide the Work into its component parts and shall include quantities, direct craft labor worker hours, labor cost and material/equipment cost. Labor cost shall include an appropriate amount of construction equipment costs, supplemental costs, administrative expenses, contingencies, and profit. The **Contractor** shall prepare the schedule of values in such

form and supported by such data to substantiate its accuracy as the **Design Professional** may require and shall be revised if later found by the **Design Professional** to be inaccurate. This schedule, unless objected to by the **Design Professional**, shall be used as a basis for reviewing the **Contractor's** applications for payment.

13.2. Content and Submission of Applications for Payment.

13.2.1. At least ten (10) days before the date established for each progress payment, the **Contractor** shall submit to the **Design Professional** six (6) copies of an itemized application for payment for Work completed in accordance with the schedule of values. Such application shall be in a form or format established or approved by the **Design Professional** and shall be supported by documentation substantiating the **Contractor's** right to payment.

13.2.2. When **Construction Change** Directives have set forth an adjustment to the Contract Sum but have not yet been included in Change Orders, the value established by the **City** may be included in the application.

13.2.3. Applications covering Work of Subcontractors or Suppliers shall not include requests for payments of amounts the **Contractor** does not intend to pay to a Subcontractor or Supplier because of a dispute or other reason. The **Contractor** shall not be paid for any Work performed by a Subcontractor unless and until the **City** receives for that Subcontractor a certificate of insurance that conforms to the requirements of the Contract Documents .

13.2.4. Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the Site for subsequent incorporation in the Work. If approved in advance by the **City**, payment may similarly be made for materials and equipment suitably stored off the Site at a location agreed upon in writing. Payment for materials and equipment stored on or off the Site shall be conditioned upon the application for payment being accompanied by a bill of sale, an invoice, or other documentation warranting that the **City** has received the materials and equipment free and clear of all liens, claims, security interests, or encumbrances, hereinafter collectively referred to as "liens," and evidence that the materials and equipment are covered by appropriate insurance and other arrangements to protect the **City's** interest therein.

13.2.5. Each application for payment or periodic estimate requesting payment shall be accompanied by, at the **City's** option, a certificate from each Subcontractor stating that the Subcontractor has been paid all amounts due the Subcontractor on the basis of the previous periodic payment to the **Contractor**, or else stating the amount not so paid and the reason for the discrepancy. In the event of any such discrepancy, the **Contractor** shall furnish the **Contractor's** own written explanation to the **City** through the **Design Professional**. Such waiver or certificate shall be in a form acceptable to the **City**.

13.3. False Applications for Payment .

13.3.1. (*Reference:* M.G.L. c. 266, §§67B). Any person who makes or presents to any claim upon or against any employee or department of the **City**, knowing such claim to be false,

fictitious, or fraudulent shall be punished by a fine or not ore than ten thousand dollars ($10,000) or by imprisonment in the state prison for not more than five (5) years, or in the house of correction for not more than two and one-half years, or both.

13.4. Review of Applications for Payment.

13.4.1. The **Design Professional** shall review each application for payment and will reject any application that (1) is not accompanied by the required documentation or (2) contains errors, mathematical or otherwise.

13.4.2. Within five (5) business days after receipt of an application for payment, the **Design Professional** will either (1) return the application to the **Contractor** with a written explanation as to why it was rejected or (2) issue to the **City** a certificate for payment, with a copy to the **Contractor**, for such amount as the **Design Professional** determines is properly due. In the event an application is returned to the **Contractor**, the date of receipt of the application shall be the date of receipt of the corrected application.

13.4.3. The **Design Professional** or the **City** may make changes to any application submitted by the **Contractor**.

13.4.4. By recommending any payment, the **Design Professional** will not thereby be deemed to have represented that: (1) exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work beyond the responsibilities specifically assigned to the **Design Professional** in the Contract Documents or (2) that there may not be other matters or issues between the parties that might entitle the **Contractor** to be paid additionally by the **City** or entitle the **City** to withhold payment to the **Contractor**. The **Design Professional's** approval of the application for payment and the accompanying documentation shall indicate that to the best of the **Design Professional's** knowledge, information, and belief, the Work has progressed to the point indicated by the **Contractor**, and that the quality of the Work is in accordance with the Contract Documents, subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests specified in the Contract Documents, final determination of quantities and classifications for unit price work and any other qualifications so stated.

13.4.5. The **Design Professional's** recommendation of any payment shall not mean that the **Design Professional** is responsible for the **Contractor's** means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of the **Contractor** to comply with laws and regulations applicable to the furnishing or performance of Work, of for any failure of the **Contractor** to perform or furnish Work in accordance with the Contract Documents.

13.4.6. No certificate given or payment made shall be evidence of the performance of this Contract, either wholly or in part and no payment, whether made upon the final certificate or otherwise, shall be construed as an acceptance of defective work or materials.

13.5. Decisions to Withhold Certification.

13.5.1. The **Design Professional** may refuse to recommend the whole or any part of any payment if, in the **Design Professional's** opinion, it would be incorrect to make the representations to the **City** referred to above.

13.5.2. If the **Contractor** and the **Design Professional** cannot agree on a revised amount, the **Design Professional** will promptly approve a certificate for payment for the amount for which the **Design Professional** is able to make such representations to the **City**. The **Design Professional** may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a certificate for payment previously issued, to such extent as may be necessary in the **Design Professional's** opinion to protect the **City** from loss because of:

13.5.2.1. defective Work not remedied;

13.5.2.2. third party claims filed or reasonable evidence indicating probable filing of such claims;

13.5.2.3. failure of the **Contractor** to make payments properly to Subcontractors or for labor, materials or equipment;

13.5.2.4. reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

13.5.2.5. damage to the **City** or another contractor;

13.5.2.6. reasonable evidence that the Work will not be completed within the Contract Time, and that retainage currently held by the **City** would not be adequate to cover actual or liquidated damage for the anticipated delay;

13.5.2.7. persistent failure to carry out the Work in accordance with the Contract Documents; or

13.5.2.8. failure of mechanical trade or electrical trade subcontractors to comply with mandatory requirements for maintaining record drawings. The **Contractor** shall check record drawings each month. Written confirmation that the record drawings are current will be required by the **Design Professional** before approval of the **Contractor's** monthly payment requisition.

13.5.3. When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

13.6. Progress Payments.

13.6.1. After the **Design Professional** has issued a certificate for payment, the **City** shall

make payment in the manner and within the time provided in the Contract Documents.

13.6.2. (*Reference:* M.G.L. c. 30, §39G;). The **City** shall pay the amount due pursuant to any periodic, Substantial Completion or final estimate within thirty-five (35) days after receipt of written acceptance for such estimate from the **Contractor**. In the case of periodic payments, the **City** may deduct from its payment a retention based on its estimate of the fair value of its claims against the **Contractor**, a retention for direct payments to Subcontractors based on demands for same in accordance with M.G.L. c. 30, §39F; and a retention to secure satisfactory performance of the contractual work, not exceeding five percent (5%) of the approved amount of any periodic payment, and the same right to retention shall apply to bonded Subcontractors entitled to direct payment under M.G.L. c. 30, §39F; provided, that a five percent (5%) value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

13.6.3. No periodic, Substantial Completion or final estimate or acceptance or payment thereof shall bar the **Contractor** from reserving all rights to dispute the quantity and amount of, or the failure of the **City** to approve a quantity and amount of, all or part of any Work item or extra Work item.

13.7. Final Payment.

13.7.1. After final inspection and after the **Contractor** has completed all the required corrections to the satisfaction of the **Design Professional** and the **City** and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, bonds, certificates, or other evidence of insurance, certificates of inspection, marked-up record documents, and all other documents called for in the Contract Documents, as well as any surplus materials requested by the **City,** the **Contractor** may make an application for final payment as provided below.

13.7.2. (*Reference:* M.G.L. c. 30, §39G;). Within thirty (30) days after receipt by the **City** of a notice from the **Contractor** stating that all of the Work required by the Contract has been completed, the **City** shall prepare and forthwith send to the **Contractor** for acceptance a final estimate for the quantity and price of the Work done and all retainage on the Work less all payments made to date, unless the **City's** inspection shows that Work required by the Contract remains incomplete or unsatisfactory, or that documentation required by the Contract has not been completed.

13.7.3. The making and acceptance of final payment will constitute a waiver of all claims by the **Contractor** against the **City** other than those previously made in writing and still unsettled.

13.8. Payments to Subcontractors.

13.8.1. Neither the **City** nor the **Design Professional** shall have an obligation to pay or see to the payment of money to a Subcontractor, Sub-subcontractor, or Supplier except as may otherwise be required by law.

13.8.2. (*Reference:* M.G.L. c. 30, §39F;) (1)(a) Forthwith after the **Contractor** receives payment on account of a periodic estimate, the **Contractor** shall pay to each Subcontractor the amount paid for the labor performed and the materials furnished by that Subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the **Contractor**.

(b) Not later than the sixty-fifth day after each Subcontractor substantially completes its Work in accordance with the Plans and Specifications, the entire balance due under the subcontract, less amounts retained by the **City** as the estimated cost of completing the incomplete and unsatisfactory items of Work, shall be due the Subcontractor; and the **City** shall pay that amount to the **Contractor**. The **Contractor** shall forthwith pay to the Subcontractor the full amount received from the **City** less any amount specified in any court proceeding barring such payment and also less any amount claimed due from the Subcontractor by the **Contractor**.

(c) Each payment made by the **City** to the **Contractor** pursuant to paragraphs (a) and (b) of M.G.L. c. 30, §39F(1);, for the labor performed and the materials furnished by a Subcontractor shall be made to the **Contractor** for the account of that Subcontractor; and the **City** shall take reasonable steps to compel the **Contractor** to make each such payment to each such Subcontractor. If the **City** has received a demand for direct payment from a Subcontractor for any amount which has already been included in a payment to the **Contractor** or which is to be include in a payment to the **Contractor** for payment to the Subcontractor as provided in paragraphs (a) and (b) of M.G.L. c. 30, §39F(1), the **City** shall act upon the demand as provided in M.G.L. c. 30, §39F.

(d) If, within seventy (70) days after the Subcontractor has substantially completed the subcontract Work, the Subcontractor has not received from the **Contractor** the balance due under the subcontract including any amount due for extra labor and materials furnished to the **Contractor**, less any amount retained by the **City** as the estimated cost of completing the incomplete and unsatisfactory items of Work, the Subcontractor may demand direct payment of that balance from the **City**. The demand shall be by a sworn statement delivered to or sent by certified mail to the **City**, and a copy shall be delivered to or sent by certified mail to the **Contractor** at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract Work. [The demand letter shall indicate the certified mail number assigned by the postal service or the date of delivery to the **Contractor**.] Any demand made after substantial completion of the subcontract Work shall be valid even if delivered or mailed prior to the seventieth day after the Subcontractor has substantially completed the subcontract Work. Within ten (10) days after the Subcontractor has delivered or so mailed the demand to the **City** and delivered or so mailed a copy to the **Contractor**, the **Contractor** may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the **City**, and a copy shall be delivered to or sent by certified mail to the Subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract, including any amount due for extra labor and materials furnished to the

Contractor and of the amount due for each claim made by the **Contractor** against the Subcontractor.

(e) Within fifteen (15) days after receipt of the demand by the **City**, but in no event prior to the seventieth day after substantial completion of the subcontract Work, the **City** shall make direct payment to the Subcontractor of the balance due under the subcontract, including any amount due for extra labor and materials furnished to the **Contractor**, less any amount (i) retained by the **City** as the estimated cost of completing the incomplete or unsatisfactory items of Work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the **Contractor** in the sworn reply; provided that the **City** shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to or for which the sworn reply does not contain the detailed breakdown required by the previous paragraph. The **City** shall make further direct payments to the Subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this paragraph.

(f) The **City** shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of the previous paragraph in an interest-bearing joint account in the names of the **Contractor** and the Subcontractor in a bank in Massachusetts selected by the **City** or agreed upon by the **Contractor** and the Subcontractor and shall notify the **Contractor** and the Subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the **Contractor** and the Subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to the previous paragraph shall be made out of amounts payable to the **Contractor** at the time of receipt of a demand for direct payment from a Subcontractor and out of amounts which later become payable to the **Contractor** and in the order of receipt of such demands from Subcontractors. All direct payments shall discharge the obligation of the **City** to the **Contractor** to the extent of such payment.

(h) The **City** shall deduct from payments to a **Contractor** amounts that, together with the deposits in interest-bearing accounts pursuant to paragraph (f), are sufficient to satisfy all unpaid balances of demands for direct payment received from Subcontractors. All such amounts shall be earmarked for such direct payments, and the Subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the **Contractor**.

(i) If the Subcontractor does not receive payment as provided in paragraph (a) or if the **Contractor** does not submit a periodic estimate for the value of the labor or materials performed or furnished by the Subcontractor and the Subcontractor does not receive payment for same when due less the deductions provided for in paragraph (a), the Subcontractor may demand direct payment by following the procedure in paragraph (d) and the **Contractor** may file a sworn reply as provided in that same paragraph. A

demand made after the first day of the month following that for which the Subcontractor performed or furnished the labor and materials for which the Subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the **Contractor**. Thereafter the **City** shall proceed as provided in paragraphs (e), (f), (g), and (h). "Subcontractor" as used in this paragraph (1)(i) shall mean a person approved by the **City** in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the **Contractor**.

(2) Any assignment by a Subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of M.G.L. c. 149, §29; shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the **City** or which are on deposit pursuant to paragraph (g) shall be subordinate to the rights of all Subcontractors who are entitled to be paid under this section and who have not been paid in full.

(3) A **Contractor** or a Subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in herein by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A Subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in paragraph (f) by a petition in equity in the superior court against the **City** and the **Contractor** shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. M.G.L. c. 231, §§59 and 59B shall apply to such petitions. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to §§59 and 59B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any Subcontractor with the petition of one or more Subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other that the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will present unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a Subcontractor filing a demand for direct payment for which no funds due the **Contractor** are available for direct payment shall have a right to file a petition in court of equity against the **City** claiming a demand for direct payment is premature, and such Subcontractor must file the petition before the **City** has made a direct payment to the Subcontractor and has made a deposit of the disputed portion as provided in part (iii) of paragraph (e) and in paragraph (f).

(4) In any petition to collect any claim for which a Subcontractor has filed a demand for direct payment the court shall, upon motion of the **Contractor**, reduce by the amount of any deposit of a disputed amount by the **City** as provided in part (iii) of paragraph (e) and in paragraph (f) any amount held under a trustee writ or pursuant to a

restraining order or injunction.

ARTICLE 14: SUBSTANTIAL COMPLETION

14.1. Substantial Completion.

14.1.1. Upon Substantial Completion of the Work, the **Contractor** shall present in writing to the **City** its certification that the Work has been substantially completed and include in its certification (1) a list of items to be completed or corrected, (2) all special warranties required by the Contract Documents, endorsed by the **Contractor** and in a form reasonably acceptable to the **Design Professional** and (3) the permits and certificates referred to in 13.7.1., or elsewhere. The failure to include any item on the list mentioned in the preceding sentence does not alter the responsibility of the **Contractor** to complete all Work in accordance with the Contract Documents. When the **Design Professional** on the basis of an inspection determines that the Work or designed portion thereof is substantially complete and the other conditions have been met, the **Design Professional** will then prepare a certificate of Substantial Completion which shall establish the date of Substantial Completion, shall state the responsibilities of the **City** and the **Contractor** for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the **Contractor** shall complete the items listed therein. The certificate of Substantial Completion shall be submitted to the **City** and the **Contractor** for their written acceptance of the responsibilities assigned to them in such certificate.

14.1.2. Within twenty-one (21) days after receipt of the certification from the **Contractor**, the **City** shall present to the **Contractor** either a written declaration that the Work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the Contract sufficient to demonstrate that the Work has not been substantially completed. The **City** may include with such list a notice setting forth a reasonable time within which the **Contractor** must achieve Substantial Completion of the Work. If the **City** fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the **Contractor's** certification within the twenty-one (21) day period, the **Contractor's** certification shall take effect as the **City's** declaration that the Work has been substantially completed.

14.2. Partial Use or Occupancy of the Premises.

14.2.1. The **City** may occupy or use any completed or partially completed portion of the Work at any stage. Such partial occupancy or use may begin whether or not the portion is substantially complete, provided that the respective responsibilities of the **City** and the **Contractor** with respect to payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work, insurance, correction of the Work, and warranties shall be established by agreement of the **City** and the **Contractor** or, absent such agreement, shall be determined by the **Design Professional** subject to the right of either party to contest such determination as provided in Article 16.

14.2.2. Immediately prior to such partial occupancy or use, the **City**, the **Contractor** and the **Design Professional** shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

14.2.3. Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

14.2.4. (*Reference:* M.G.L. c. 30, §39G;). Within sixty-five (65) days after the effective date of a declaration of Substantial Completion, the **City** shall prepare and send to the **Contractor** for acceptance a Substantial Completion estimate for the quantity and price of the Work done and all but one percent (1%) retainage on that Work, including the quantity, price and all but one percent (1%) retainage for the undisputed part of each item and extra work item in dispute, but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory items and less the total periodic payments made to date for the Work. The **City** shall also deduct from the Substantial Completion estimate an amount equal to the sum of all demands for direct payment filed by Subcontractors and not yet paid to Subcontractors or deposited in joint accounts pursuant to M.G.L. c. 30, §39F.

14.2.5. (*Reference:* M.G.L. c. 30, §39G). If the **City** fails to prepare and send to the **Contractor** any Substantial Completion estimate required by the provisions herein on or before the date specified, the **City** shall pay to the **Contractor** interest on the amount which would have been due to the **Contractor** pursuant to such Substantial Completion estimate at the rate of three (3) percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the **City** sends that Substantial Completion estimate to the **Contractor** for acceptance or to the date of payment therefor, whichever occurs first. The **City** shall include the amount of such interest in the Substantial Completion estimate.

14.2.6. (*Reference:* M.G.L. c. 30, §39G). Within fifteen (15) days after the effective date of the declaration of Substantial Completion, the **City** shall send to the **Contractor** by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory items, and unless delayed by causes beyond its control, the **Contractor** shall complete all such items within forty-five (45) days after the receipt of such list or before the date for final payment and acceptance, whichever is later. If the **Contractor** fails to complete such Work within such time, the **City** may, subsequent to seven (7) days' written notice to the **Contractor** by certified mail, return receipt requested, terminate the Contract and complete the incomplete or unsatisfactory items and charge the cost of same to the **Contractor**.

14.3. Final Inspection.

14.3.1. Upon written notice from the **Contractor** that the entire Work or an agreed portion thereof is complete, the **Design Professional** will make a final inspection with the **City** and the **Contractor** and will notify the **Contractor** in writing of all particulars which this inspection reveals that the Work is incomplete or defective. The **Contractor** shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

ARTICLE 15: GUARANTEES AND WARRANTIES

15.1. In General.

15.1.1. All guarantees and warranties specifically called for by the Specifications shall expressly run to the benefit of the **City**.

15.2. Warranties.

15.2.1. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof, unless otherwise provided in the certificate of Substantial Completion.

15.2.2. The **Contractor** warrants that the materials and equipment furnished under the Contract will be new and of recent manufacture unless otherwise specified, and that all Work will be of good quality, free from faults and defects, and in conformance with the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The **Contractor's** warranty excludes remedy for damage or defect caused by abuse, Modifications not executed by the **Contractor**, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the **Design Professional**, the **Contractor** shall furnish satisfactory evidence as to the kind and quality of material and equipment.

15.2.3. The **Contractor** warrants that title to all Work covered by an application for payment will pass to the **City** either by incorporation in the construction or upon the receipt of payment by the **Contractor**, whichever occurs first, free and clear of all liens. The **Contractor** further agrees that the submission of any application for payment shall conclusively be deemed to waive all liens with respect to said Work to which the **Contractor** may then be entitled, provided that such waiver of the lien rights shall not waive the **Contractor's** right to payment for such Work.

15.2.4. The **Contractor** warrants and guarantees that title to all Work, materials, and equipment covered by any application for payment, whether incorporated in the Project or not, will pass to the **City** no later than the time of payment free and clear of all liens.

15.2.5. No materials or supplies for the Work shall be purchased by the **Contractor** or Subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The **Contractor** warrants that it has good title to all materials and supplies used by it in the Work, free from all liens.

15.2.6. The **Contractor** shall indemnify and hold the **City** harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workers, mechanics, material persons, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. The **Contractor** shall at the **City's** request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If the **Contractor** fails to do so, then the **City** may, after having served written notice on the **Contractor** either pay unpaid bills, of which the **City** has written notice, direct, or withhold from the **Contractor's** unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful

claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the **Contractor** shall be resumed, in accordance with the terms of this

Contract, but in no event shall the provisions of this sentence be construed to impose any obligations on the **City** to either the **Contractor** or its surety. In paying any unpaid bills of the **Contractor**, the **City** shall be deemed the agent of the **Contractor** and any payment so made by the **City** shall be considered as payment made under the Contract by the **City** to the **Contractor** and the **City** shall not be liable to the **Contractor** for any such payment made in good faith.

15.3. Extended Warranties and Guarantees.

15.3.1. Any defective Work that is either corrected or replaced will be warranted and guaranteed for a period of three (3) years from the date of such correction or replacement.

ARTICLE 17: EMERGENCIES

17.1. In an emergency affecting the health and safety of persons or property, the **Contractor** shall act to prevent threatened damage, injury, or loss.

17.2. In emergencies affecting the health, safety, or protection of persons, the Work or property at the Site or adjacent thereto, the **Contractor**, without special instruction or authorization from the **City** or the **Design Professional**, is obligated to act to prevent threatened damage, injury, or loss. The **Contractor** shall give the **Design Professional** prompt written notice if the **Contractor** believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If the **Design Professional** determines that a change in the Contract Documents is required because of the action taken by the **Contractor** in response to such an emergency, a **Construction Change** Directive or Change Order will be issued to document the consequences of such action.

ARTICLE 16: CLAIMS

16.1. In General.

16.1.1. Written Notice. A Claim must be made by written notice to the other party.
16.1.2. Content of Notice. The notice must include all written supporting data.
16.1.3. Burden of Proof. The party making the Claim must substantiate the Claim.

16.2. Time Limits on Claims.

16.2.1. Unless otherwise provided, all Claims must be made within twenty-one (21) days after the occurrence of the event giving rise to such Claim or within twenty-one (21) days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Any change or addition to a previously made Claim shall be made by a written notice within the twenty-one-day period in order to be valid.

16.3. Continuing Contract Performance.

16.3.1. Pending final resolution of a Claim including arbitration, unless otherwise agreed in writing, the **Contractor** shall proceed diligently with performance of the Contract and the **City** shall continue to make payments in accordance with the Contract Documents.

16.4. Types of Claims.

16.4.1. Claims for Differing Subsurface or Latent Physical Conditions. (*Reference:* M.G.L. c. 30, §39N;). If, during the progress of the Work, the **Contractor** or the **City** discovers that the actual subsurface or latent physical conditions encountered at the Site differ substantially or materially from those shown on the Plans or indicated in the Contract Documents, either the **Contractor** or the **City** may request an equitable adjustment in the Contract Sum of the Contract applying to Work affected by the differing Site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a **Contractor**, or upon its own initiative, the **City** shall make an investigation of such physical conditions, and if they differ substantially or materially from those shown on the Plans or indicated in the Contract Documents or from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Plans and Contract Documents and are of such a nature as to cause an increase or decrease in the cost of performance of the Work or a change in the construction methods required for the performance of the Work which results in an increase or decrease in the cost of the Work, the **City** shall make an equitable adjustment in the Contract Sum and the Contract shall be modified in writing accordingly.

16.4.2. Claims for Additional Cost. If the **Contractor** claims that any acts or omissions of the **City** or the **Design Professional**, including any instructions or orders, whether oral, written, by drawings, or otherwise, involve extra cost or time, and the **Contractor** has not received a written acknowledgment by the **City** or the **Design Professional** that extra payment will be made or time extended on account thereof, the **Contractor** shall promptly so notify the **Design Professional** in writing of such Claim and shall proceed with the Work relating to such Claim and all rights of both parties with respect to such Claim shall be deemed to have been reserved. No Claim by the **Contractor** on account of such acts, omissions, instructions, or orders shall be valid unless the **Contractor** has so notified the **Design Professional** before proceeding.

16.4.2.1. Under no circumstances shall a Claim be made for additional cost where adverse weather conditions are the basis for the Claim.

16.4.3. Claims for Additional Time. If the **Contractor** wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The **Contractor** shall have the burden of demonstrating the effect of the claimed delay on the Contract Time and shall furnish the **Design Professional** with such documentation relating thereto as the **Design Professional** may reasonably require. Under no circumstances shall the **Contractor** make a Claim for an increase in the Contract Time due to a change in the **Contractor's** early completion date. If the increase in the Contract Time extends beyond the Contract Time established by the

City, only the time that so extends beyond the Contract Time shall be reviewed and considered. In the case of a continuing delay, only one Claim is necessary.

16.4.3.1. Under no circumstances shall a Claim be made for additional time where adverse weather conditions are the basis for the Claim.

16.4.4. Claims for Injury to Person or Damage to Property. Should either party to the Contract suffer injury to person or damage to property because of any error, omission, or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, a Claim will be made in writing to the other party within twenty-one (21) days of the occurrence of the act giving rise to the injury or damage.

16.5. Review of Claims.

16.5.1. Initial Referral. All Claims, the bases of which arise prior to final payment or the earlier termination of the Contract, shall be referred initially to the **Design Professional** for action as provided herein.

16.5.2. Time Period and Action. The **Design Professional** shall review Claims and shall do one of the following within fourteen (14) days of receipt of the Claim:

16.5.2.1. defer any action with respect to all or any part of a Claim for the purpose of requesting and receiving additional information from either party;

16.5.2.2. decline in writing to render a decision for any reason which it deems appropriate (including, but not limited to, the fact that the Claim involves allegations of fault on the part of the **Design Professional**); or

16.5.2.3. render a decision on all or a part of the Claim.

16.5.3. If the **Design Professional** requests additional information, the **Design Professional** shall take action with respect to the Claim no later than fourteen (14) days after receipt of the additional information. The **Design Professional** shall notify the parties in writing of its disposition of such Claim. If the **Design Professional** renders a decision or declines to render a decision, either party may proceed in accordance with paragraph 16.7.

16.6. Decisions.

16.6.1. Decisions by the City or the Design Professional. (*Reference:* M.G.L. c. 30, §39P;). In every case in which this Contract requires the **City**, any official, or its **Design Professional** to make a decision on interpretation of the Specifications, approval of equipment, material or any other approval, or progress of the Work, the decision shall be made promptly and, in any event, no later than fourteen (14) days after the written submission for decision; but if such decision requires extended investigation and study, the **City**, the official, or the **Design Professional** shall, within fourteen (14) days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the

thirty-day period and the date by which the decision will be made.

16.6.2. When Decision of the Design Professional is Final and Binding. The decision of the **Design Professional** shall be final and binding on the parties, unless a party files suit or a demand for arbitration within thirty (30) days after the date of the decision.

16.6.3. When Decision of the Design Professional is Not Final and Binding. (*Reference:* M.G.L. c. 30, §39J). Notwithstanding any contrary provision of this Contract, no decision by the **City** or by the **Design Professional** on a dispute, whether of fact or of law, arising under said Contract shall be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, arbitrarily, is unsupported by substantial evidence, or is based upon error of law.

16.6.4. Resolved Claims. If a Claim is resolved, the **Design Professional** shall obtain or prepare the appropriate documentation and provide the **City** and the **Contractor** with a copy of same.

16.7. Arbitration.

16.7.1. Controversies and Claims Subject to Arbitration. Any controversy or Claim arising out of or related to the Contract, or the breach thereof, shall be settled by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association, and judgment upon the award rendered by the arbitrator or arbitrators may be entered in any court having jurisdiction thereof, except controversies or Claims relating to aesthetic effect, subject to the provisions of paragraph 16.7.7. In any such arbitration in which the amount stated in the demand is $100,000 or less, the American Arbitration Association shall appoint a single arbitrator in accordance with such Rules, who shall be a lawyer. In any such arbitration in which the amount stated in the demand is in excess of $100,000, the demand shall include the name of an arbitrator appointed by the claimant. The respondent shall appoint a second arbitrator and shall notify the claimant in writing of such appointment within thirty (30) days of receipt of the demand, failing which the matter shall be decided by the arbitrator named in the claimant's demand. Within thirty (30) days after the claimant's receipt of notice of the appointment of the second arbitrator, the two arbitrators shall appoint a neutral arbitrator and shall notify the parties in writing of such appointment, failing which either party may apply to the American Arbitration Association to appoint such neutral arbitrator. If such neutral arbitrator is appointed by the American Arbitration Association, he or she shall be a lawyer.

16.7.2. Rules for Arbitration. If the neutral arbitrator is appointed by the American Arbitration Association, the said Association shall administer the arbitration and its Construction Industry Arbitration Rules shall govern all aspects of the proceeding including the enforcement of any award. If the neutral arbitrator is not appointed by the American Arbitration Association, then the panel of arbitrators shall act as the administrator of the arbitration but the Construction Industry Arbitration Rules of the Association shall nonetheless govern all aspects of the proceeding, including the enforcement of any award, provided however that the arbitration panel shall have all of the powers and duties conferred on the Association pursuant to said rules. In addition, the following rules shall govern the selection of arbitrators and the proceedings:

16.7.2.1. Neither party may appoint as arbitrator an employee or an owner of that party, nor the parent, spouse, or child of an employee or owner of that party.

16.7.2.2. After the neutral arbitrator has been appointed, neither party may engage in *ex parte* communication with any arbitrator.

16.7.3. When Arbitration May Be Demanded. Demand for arbitration of any Claim, the basis of which arises prior to final payment or the earlier termination of the Contract may not be made before the earlier of (1) the date on which the **Design Professional** has rendered a written decision on the Claim or has notified the parties in writing that such decision will not be rendered or (2) forty-five (45) days following receipt by the **Design Professional** of a written request for a decision sent by registered or certified mail to both the **Design Professional** and the other party to this Contract.

16.7.3.1. In no event shall a demand for arbitration be made after the date when the institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations.

16.7.4. Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract Documents shall include, by consolidation or joinder or in any other manner, the **Design Professional**, the **Design Professional's** employees or consultants, except by written consent containing specific reference to the Contract and signed by the **Design Professional**, the **City**, the **Contractor,** and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the **City**, the **Contractor**, a separate contractor, and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the **City**, the **Contractor,** or a separate contractor shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a dispute not described therein or with a person or entity so named or described herein. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Contract shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

16.7.5. Claims and Timely Assertion of Claims. A party who files a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded. When a party fails to include a Claim through oversight, inadvertence, or excusable neglect, or when a Claim has matured or been acquired subsequently, the arbitrator or arbitrators may permit amendment.

16.7.6. Award Final. The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

16.7.7. The City's Reservation of Rights. Notwithstanding any provision contained in this Article 16 or elsewhere in the Contract Documents, the **City** reserves the following rights in connection with Claims between the **City** and the **Contractor**, which rights may be exercised by the **City** unilaterally, in the **City's** sole discretion, and without the consent of the **Contractor**:

16.7.7.1. the right to institute legal action against the **Contractor** in any court of competent jurisdiction in lieu of demanding arbitration, in which case the dispute or disputes which are the subject of such action shall be decided by such court, and not by arbitration;

16.7.7.2. the right to obtain from any court of competent jurisdiction a stay of any arbitration instituted by the **Contractor**, provided that the application for such stay is made before the appointment of the neutral arbitrator in such arbitration, in which case the dispute or disputes which are the subject of such arbitration shall be decided by such court and not by arbitration;

16.7.7.3. the right to require the **Contractor** to join as a party in any arbitration between the **City** and the **Design Professional** relating to the Project, in which case the **Contractor** agrees to be bound by the decision of the arbitrator or arbitrators in such arbitration.

16.7.8. In case the **City** elects to proceed in accordance with 16.7.7.1. or 16.7.7.2. above, the word "litigation" shall be deemed to replace the word "arbitration" wherever the latter word appears in the Contract Documents.

ARTICLE 18: TERMINATION OR SUSPENSION OF THE CONTRACT

18.1. Suspension by the City.

18.1.1. At any time and without cause, the **City** may suspend the Work or any portion thereof for a period of not more than ninety (90) days by notice in writing to the **Contractor** and the **Design Professional** that will fix the date on which Work will be resumed. The **Contractor** shall resume Work on the date so fixed. The **Contractor** shall be allowed an adjustment in the Contract Sum or an extension of the Contract Time, or both, directly attributable to any such suspension if the **Contractor** makes an approved Claim therefor.

18.1.2. If the Work is defective, if the **Contractor** fails to provide a sufficient number of skilled workers or suitable materials or equipment, or if the **Contractor** defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the **City** to begin and prosecute correction of such default or neglect with diligence and promptness, the **City** may correct such deficiencies, without prejudice to other remedies the **City** may have. In such case, an appropriate **Construction Change** Directive shall be issued deducting from payments then or thereafter due to the **Contractor** the cost of correcting such deficiencies including compensation for the **Design Professional's** additional services and expenses made necessary by such default, neglect, or failure and any and all direct, indirect, or consequential costs associated with the order to stop the

Work. If such payments then or thereafter due the **Contractor** are not sufficient to cover such amounts, the **Contractor** shall immediately pay the difference to the **City**. The **Contractor** shall remain responsible for maintaining progress and shall not be entitled to any increase in the Contract Time or the Contract Sum.

18.2. Termination by the Contractor.

18.2.1. If, through no act or fault of the **Contractor**, a Subcontractor, or a Sub-subcontractor, the Work is suspended for a period of more than ninety (90) days by the **City**, or under an order of court or other public authority, or the **Design Professional** fails to act on any application for payment within thirty (30) days after it is submitted in proper form and content or the **City** fails for thirty (30) days to pay the **Contractor** any sum finally determined to be due, then the **Contractor** may terminate the Contract upon seven (7) days' written notice to the **City**, provided that the **City** does not remedy such suspension or failure within that time.

18.3. Termination by the City.

18.3.1. If the **Contractor** is adjudged a bankrupt, or if the **Contractor** makes a general assignment for the benefit of the **Contractor's** creditors, or if a receiver is appointed on account of the **Contractor's** insolvency, or if the **Contractor** persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or if the **Contractor** fails to make prompt payment to Subcontractors or for materials or labor, or persistently disregards laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction or disregards an instruction, order, or decision of the **Design Professional**, or otherwise is guilty of substantial violation of any provision of the Contract, then the **Contractor** shall be in default, and the **City** may, without prejudice to any other right or remedy and upon written notice to the **Contractor**, take possession of all materials, tools, appliances, equipment, construction equipment and machinery and vehicles, offices and other facilities on the Project Site, and all materials intended for the Work, wherever stored, and, seven (7) days after such notice, may terminate the employment of the **Contractor**, accept assignment of any or all subcontracts pursuant to Paragraph __, and finish the Work by whatever method the **City** may deem expedient. The **City** shall be entitled to collect from the **Contractor** all direct, indirect, and consequential damages suffered by the **City** on account of the **Contractor's** default, including without limitation additional services and expenses of the **Design Professional** made necessary thereby. The **City** shall be entitled to hold all amounts due to the **Contractor** at the date of termination until all of the **City's** damages have been established, and to apply such amounts to such damages.

18.3.2. (*Reference:* Somerville Municipal Code Chapter 2.117, Section 2.117.110C). In the event the **Contractor** or any of its agents or employees violates any provision of Somerville Municipal Code Chapter 2.117 that is applicable to **City** contractors in connection with the awarding, administration, or performance of the Contract, the **City** may terminate the Contract.

ARTICLE 19: AMERICANS WITH DISABILITIES ACT; (42 U.S. 12131)

19.1. On July 26, 1994, the Americans with Disabilities Act ("the Act") became effective for employers of fifteen or more employees.

19.2. The Act protects against discrimination of the basis of "disability," which is defined as a physical or mental impairment that substantially limits at least one "major life activity;" or discrimination against an individual who has a record of such impairment; or discrimination against an individual being regarded - even if inaccurately - as having such impairment. The Act also expressly prohibits job discrimination that is based on any individual's relationship or association with a disabled person.

19.3. If the **Contractor** is subject to the Act, it must comply with its provisions.

ARTICLE 20: WRITTEN NOTICE TO THE PARTIES

20.1. In General.

20.1.1. All written communications from the **Design Professional** to the **Contractor** shall be copied to the **City**. All written communications from the **Contractor** to the **Design Professional** shall be copied to the **City**. All written communications from the **Contractor** to the **City** shall be copied to the **Design Professional**.

20.2. Addresses.

20.2.1. To the City. Written notice to the **City** shall be sent or hand-delivered to:

Purchasing Director
City of Somerville
93 Highland Avenue
Somerville, MA 02143

City Solicitor
Law Department
93 Highland Avenue
Somerville, MA 02143

20.2.2. To the Contractor. Both the address given on the bid form upon which the Agreement is founded and the **Contractor's** office at or near the Site of the Work are hereby designated as places to either of which notices, letters, and other communications to the **Contractor** shall be certified, mailed, or delivered. Delivery of any notice, letter, or other communication to the **Contractor** at or depositing same in a postpaid wrapper directed to either place shall be deemed sufficient service thereof upon the **Contractor**. Written notice shall be deemed to have been duly served on the **Contractor** if it is sent or hand-delivered to any member or officer of the **Contractor**. The date of said service shall be the date of such delivery or mailing. The address may be changed at any time by an instrument in writing, executed and

acknowledged by the **Contractor** and delivered to the **City** and to the **Design Professional**. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter. or other communication upon the **Contractor** personally. Moreover, any notice, letter, or other communication required under the Contract may be served on the **Contractor's** representative at job meetings. The **Contractor** shall provide the **City** with its change of address seven (7) days prior to its effective date.

20.2.3. To the Design Professional. Written notice to the **Design Professional** shall be sent or hand-delivered to the address appearing on the Project Manual. Written notice shall be deemed to have been duly served on the **Design Professional** if it is sent or hand-delivered to any member or officer of the **Design Professional**.

ARTICLE 21: MISCELLANEOUS PROVISIONS

21.1. Governing Law.

21.1.1. This Contract shall be governed by the laws of the Commonwealth of Massachusetts.

21.2. Venue.

21.2.1. Venue for any court action or proceeding shall be Middlesex County in the Commonwealth of Massachusetts only. The **Contractor**, all Subcontractors, and Suppliers waive any and all jurisdictional and venue defenses.

21.3. Successors and Assigns.

21.3.1. The **Contractor** shall not assign, in whole or in part, its rights and obligations under the Contract Documents without prior written consent of the **City**. An assignment without the prior written consent of the **City** shall not relieve the **Contractor** of its obligations thereunder.

21.3.2. The **City** and the **Contractor** respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents.

21.4. Statutory Limitation Period.

21.4.1. It is expressly agreed that the obligations of the **Contractor** hereunder arise out of contractual duties, and that the failure of the **Contractor** to comply with the requirements of the Contract Documents shall constitute a breach of contract, not a tort, for the purpose of applicable statutes of limitations and repose. Any cause of action which the **City** may have on account of such failure shall be deemed to accrue only when the **City** has obtained actual knowledge of such failure, not before.

21.5. Rights and Remedies.

21.5.1. Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

21.5.2. No action or failure to act by the **City**, the **Design Professional,** or the **Contractor** shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

PART 2 - SAMPLE CONSTRUCTION CONTRACT

- Sample Contract
- Certificate of Authority
- Appendix A – Scope of Work (including Technical Specifications)
- Appendix B – Contractor's Bid Price; Form for General Bid (From Bid Book)
- Appendix C – General Terms and Conditions
- Appendix D – Insurance Requirements
- Appendix E – Wage Rates and Living Wage (From Bid Book)
- Appendix F – Certificate of Good Standing (for corporations; from Bid Book)
- Appendix G – Procurement documentation (Advertisements and Notice to Bidders)
- Appendix H – Statement of Management
- Appendix I – Performance Bond and Payment Bond, if contract over $2000
- Appendix J – Prevailing Wage Rates and Compliance Form

S A M P L E C O N T R A C T

CONTRACT NUMBER

A-
PURCHASE ORDER # AND AMOUNT

BID NUMBER

Department of Capital Projects and Planning
ISSUING DEPARTMENT

XXXXX xx , 20XX – YYYYY yy, 20XX
CONTRACT PERIOD

CITY OF SOMERVILLE

PUBLIC CONSTRUCTION CONTRACT

CONTRACTOR: Vendor
Address
Townname, MA, Zip Code

FOR: **REPAIRS TO SOMERVILLE HIGH SCHOOL AUDITORIUM KITCHEN AND CAFETERIA**

ACCORDING TO SPECIFICATIONS CONTAINED HEREIN

CITY OF SOMERVILLE
OWNER-CONTRACTOR PUBLIC CONSTRUCTION AGREEMENT

AGREEMENT made this _____day of _____, 2014, by and between the City of Somerville, a Massachusetts municipal corporation, acting by and through its Purchasing Department, with a usual address of 93 Highland Ave., Somerville, MA 02143 ("City", "Owner" or "Awarding Authority") and the following General Contractor ("Contractor" or "General Contractor"):

GENERAL CONTRACTOR:
Name:
Address:
Telephone: Fax:
E-Mail:

PROJECT: Repairs to Somerville High School
Auditorium, Kitchen and Cafeteria

PROJECT MANAGER:
Name: Skip Bandini, Director, Capital Projects & Planning
Address: One Franey Road, Somerville, MA 02145
Telephone: (617) 625 - 6660
E-Mail**: sbandini@somervillema.gov**

DESIGN PROFESSIONAL:

Contact: Fabrizio Caruso, Project Manager
CDR Maguire, Inc.
211 Congress Street, 11th Floor
Boston, MA 02110
Phone: (617) 778 - 1440
Fax; (617) 348 - 2143

Profession: Architect [X] Landscape Architect [ ] Engineer [ ]

THIS CONTRACT IS A:

___ Public Works Contract estimated to cost more than $10,000 subject to the bidding requirements of G.L. c. 30, § 39M

___ Public Building Contract estimated to cost under $10,000, subject to the price quote requirements of G.L. c. 149 §44A (2)(A)

___ Public Building Contract estimated to cost more than $10,000 but less than $25,000, subject to the written response requirements of G.L. c. 149, §44A(2)(B) of the General Laws

___ Public Building Contract estimated to cost more than $25,000 but less than $100,000, subject to the bidding requirements of G.L. c. 149, §44A(2)(C) and G.L. c. 30, § 39M

_X_ Public Building Contract estimated to cost more than $100,000, subject to the bidding requirements of G.L. c. 149, §44A(D).

Section 1: CONTRACT DOCUMENTS/APPENDICES

The Contract Documents consist of this Agreement; the notice of award of the Contract; the Notice to Proceed; the entire Project Manual; Change Orders; Construction Change Directives; the Contractor's Bid and all accompanying documents; and the Design Professional's written interpretations and clarifications issued on or after the issuance of the Notice to Proceed. Shop Drawing submittals and reports or drawings utilized by the Design Professional in preparing the Contract Documents are not Contract Documents.

The following Appendices are hereby attached or incorporated by reference as part of this Agreement.

_X_ Certificate of Authority

_*_ Appendix A - Scope of Services - Misc. Bid Documents: includes a brief description of the Project, the Plans and Technical Specifications (Plans on File) and Addenda issued during the bid process

_X_ Appendix B - Contractor's Bid Price; Form for General Bid

_X**_ Appendix C - General Conditions

_X**_ Appendix D - Insurance Requirements with Contractor's Insurance Certificate(s)

_X_ Appendix E - Wage Rates; Living Wage

_X_ Appendix F - Certificate of Good Standing (for corporations)

__X__ Appendix G - Procurement Documentation (includes Advertisement; Notice to Bidders)

__X__ Appendix H - Statement of Management (over $100,000)

__X__ Appendix I - Performance Bond and Payment Bond, if contract is over $2,000

X = Attached
* = Included in the Project Manual and incorporated herein by reference
** = Attached and also duplicated in the Project Manual

Section 2: THE CONTRACTOR'S WORK.

The Contractor's "Work" refers to the services and the entire completed construction or the various separately identifiable parts thereof required by the Contract Documents, including all labor, materials, and equipment furnished, furnished and incorporated into the Project, or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

Section 3: PROJECT DATES.

(a) Contract Period: The Contract shall begin on:

(b) Date of Commencement of Work: The Date of Commencement of the Work shall be stipulated by a written Notice to Proceed given by the City to the Contractor on or before

(c) Date of Substantial Completion: The Contractor shall achieve Substantial Completion of the Work on or before _____, time being of the essence. Substantial Completion means that the Work has been completed and the Site or the facility is opened for full and intended public use, except for minor incomplete or unsatisfactory items that do not materially impair the usefulness of the Work. The Design Professional shall decide what constitutes "minor," "incomplete," "unsatisfactory," and "materially" and the Design Professional's decision shall be final.

(d) Dates of Final Completion:

The Date of Final Completion shall be;

Section 4. CONTRACT SUM/LIQUIDATED DAMAGES

(a) Contract Sum: The Contract Sum shall be $_____ .

(b) Liquidated Damages: The Contractor and the City agree to a Liquidated Damages sum of $500.00 per calendar day for failure to meet the deadlines set forth in Sections 3(c), or (d).

SIGNATURE PAGE FOLLOWS

IN WITNESS WHEREOF, the City and the Contractor have executed this Contract as a sealed instrument as of the date first written above.

CITY OF SOMERVILLE

I hereby certify that the total contract amount is $_____, and that an unencumbered balance of $_____ is available for the first fiscal year of this contract. I further certify that a sum of $_____ is hereby encumbered against the appropriate account for the purposes of this contract. Further, I certify that as funds become available, I will encumber additional sums as are required under this contract.

_____
Edward Bean, City Auditor

_____
Joseph A. Curtatone
Mayor

_____
Skip Bandini
Director, Capital Projects & Planning

.
_____
Angela M. Allen, Purchasing Director

Approved as to form:

_____
Francis X. Wright, Jr., City Solicitor

VENDOR:

_____
Signature of Authorized Agent of Vendor

Printed Name:
Title:

Vendor Address:

Federal Tax ID: #_____

FOR CORPORATIONS ONLY:

_____
Clerk's Signature

_____
Clerk's Name

APPENDIX A

Scope of Services – Miscellaneous Bid Documents

Includes a brief description of the project
The Plans and Technical Specifications (Plans on File)
And addenda issued during the bid process.

APPENDIX B
Contractor's Bid Price - Form for General Bid
(From Bid Book)

APPENDIX C
General Terms and Conditions
(From Bid Manual)

APPENDIX D

INSURANCE REQUIREMENTS

APPENDIX D - INSURANCE REQUIREMENTS
INSURANCE SPECIFICATIONS
INSURANCE REQUIREMENTS FOR AWARDED VENDOR ONLY:

Prior to commencing performance of any work or supplying materials or equipment covered by these specifications, the contractor shall furnish to the Office of the Purchasing Director a Certificate of Insurance evidencing the following:

A. GENERAL LIABILITY - Comprehensive Form

Bodily Injury Liability.....….....$ One Million
Property Damage Liability.....$ Two Million

B. COVERAGE FOR PAYMENT OF WORKER'S COMPENSATION BENEFIT PURSUANT TO CHAPTER 152 OF THE MASSACHUSETTS GENERAL LAWS IN THE AMOUNT AS LISTED BELOW:

Workers Compensation.….....$Statutory
Employer's Liability..….....…….$ Statutory

C. AUTOMOBILE LIABILITY INSURANCE AS LISTED BELOW:

Bodily Injury Liability...…….....$ Statutory

l. A contract will not be executed unless a certificate (s) of insurance evidencing above-described coverage is attached.

2. Failure to have the above-described coverage in effect during the entire period of the contract shall be deemed to be a breach of the contract.

3. All applicable insurance policies shall read:
"CITY OF SOMERVILLE" as a certificate holder and as an additional insured for general liability only along with a description of operation in the space provided on the certificate.

4. Please comply with our requirement of a **thirty (30) day** notice of cancellation and note on certificate.

Certificate Should Be Made Out To:
City Of Somerville
Purchasing Department
93 Highland Avenue
Somerville, MA 02143

Note: If your insurance expires during the life of this contract, you shall be responsible to submit a new certificate(s) covering the period of the contract. No payment will be made on a contract with an expired insurance certificate.

APPENDIX E
WAGE RATES AND LIVING WAGE FORM

STATE PREVAILING WAGE RATES
SOMERVILLE LIVING WAGE RATES FORM
RESPONSIBLE EMPLOYER ORDINANCE

INSERT MANUALLY

APPENDIX F

CERTIFICATE OF GOOD STANDING (FOR CORPORATIONS)

INSERT DOCUMENT FROM BID MANUAL HERE

Certificate of Good Standing: If the bidder is a corporation, a Certificate of Good Standing shall be provided with executed contracts. Certificate of Good Standing available online at: http://corp.sec.state.ma.us/corp/Certificates/Certificate_Request.asp or call Tel: (617) 727-9640 for more information.

APPENDIX G

PROCUREMENT DOCUMENTATION

ADVERTISEMENTS, NOTICE TO BIDDERS, ETC.

APPENDIX H

STATEMENT OF MANAGEMENT FOR CONTRACTS OVER $100,000

STATEMENT OF MANAGEMENT

In accordance with M.G.L. Chapter 30, Section 39R, the undersigned successful bidder states that its system of internal accounting controls and that of its subsidiaries reasonably assure (1) that transactions are executed in accordance with management's general and specific authorization; (2) that transactions are recorded as necessary to permit preparation of financial statements in conformity with generally accepted accounting principles, and to maintain accountability for assets; (3) that access to assets is permitted only in accordance with management's general or specific authorization, and (4) that the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Executed this _____day of _____

On behalf of _____
(Successful bidder name)

_____
(Address and telephone of successful bidder)

_____
(Name and title of person signing statement)

By:_____
(Signature)

CERTIFIED PUBLIC ACCOUNTANT STATEMENT

In accordance with M.G.L. 30, Section 39R I, _____ a certified public accountant, state that I have examined the above Statement of Management on internal accounting controls, and that in my opinion (1) the representations of management are consistent with the result of management's evaluation of the system of internal accounting controls; and (2) that such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the above referenced successful bidder's financial statements.

_____

(Signature)

_____

(Business name, address and telephone number)

APPENDIX I

PERFORMANCE BOND AND PAYMENT BOND

FOR CONTRACTS OVER $2000

PERFORMANCE BOND

We, the undersigned,

_____,
(Name of Contractor)

_____,
(Address of Contractor)

_____, hereinafter called Principal, and
(Corporation, Partnership, or Individual)

_____,
(Name of Surety)

_____, (Address of Surety)

hereinafter called Surety, are held and firmly bound unto CITY OF SOMERVILLE, 93 Highland Avenue, Somerville, MA 02143, hereinafter called Owner, in the penal sum of Dollars

($_____) in lawful money of the United States, for the payment of which sum well and truly to be made. We hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

The condition of this obligation is such that the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20____, a copy of which is attached hereto and made a part hereof, for the project known as Repairs to Somerville High School Auditorium, Kitchen and Cafeteria and the Principal and Surety bind themselves to the Owner for the performance of the contract.

Now, therefore, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the

original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety and during the guaranty period set forth in the contract, and if it shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by a reason of failure to do so, and shall reimburse and repay the Owner all outlay and expenses which the Owner may incur in making good any default, then this obligation shall be void; otherwise, this bond shall remain in full force and effect; provided, further, that the said Surety for value received hereby agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder of the specifications accompanying the same shall in any wise affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications. Provided, further, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed on this _____day of , 20____.

CONTRACTOR AS PRINCIPAL	SURETY
_____	_____
(Signature)	(Signature)
Name and Title:	Name and Title:
SEAL	SEAL

Payment Bond

We, the undersigned,

_____,
(Name of Contractor)

_____,
(Address of Contractor)

_____, hereinafter called Principal, and
(Corporation, Partnership, or Individual)

_____,
(Name of Surety)

_____, (Address of Surety)

hereinafter called Surety, are held and firmly bound unto CITY OF SOMERVILLE, 93 Highland Avenue, Somerville, MA 02143, hereinafter called Owner, in the penal sum of Dollars

($_____) in lawful money of the United States, for the payment of which sum well and truly to be made. We hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

The condition of this obligation is such that the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20___, a copy of which is attached hereto and made a part hereof, for the project known as Repairs to Somerville High School Auditorium, Kitchen and Cafeteria.

Now, therefore, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or

modification thereof, including all amounts due for materials used in connection with the work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise this bond is remain in full force and effect. Provided, further, that the said Surety for value received hereby agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder of the Specifications accompanying the same shall in any wise affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

Provided, further, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed on this _____day of , 20___.

CONTRACTOR AS PRINCIPAL	SURETY
----------	----------
(Signature)	(Signature)
Name and Title:	Name and Title:
SEAL	SEAL

PART III TECHNICAL SPECIFICATIONS – DIVISIONS 1 AND 2

SECTION 008600 – LIST OF DRAWINGS

PART 1 – GENERAL

1.1 LIST OF DRAWINGS

A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents.

B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

Drawing Number	Drawing Title
-	Cover Sheet
GENERAL	
----	COVERSHEET
ARCHITECTURAL DEMOLITION	
AD101	CAFETERIA/ KITCHEN DEMO FLOOR PLAN
AD102	AUDITORIUM DEMO FLOOR PLAN
AD103	AUDITORIUM BALCONY DEMO FLOOR PLAN
AD104	CAFETERIA/ KITCHEN DEMO RCP
AD105	AUDITORIUM DEMO RCP
AD106	INTERIOR DEMO ELEVATIONS
AD107	PHOTO REFERENCES FOR DEMO
AD108	PHOTO REFERENCES FOR DEMO
ARCHITECTURAL	
A001	SYMBOLS AND ABBREVIATIONS
A010	CODE DATA SHEET
A101	CAFETERIA/ KITCHEN FLOOR PLAN
A102	AUDITORIUM FLOOR PLAN
A103	AUDITORIUM BALCONY FLOOR PLAN
A121	CAFETERIA/ KITCHEN RCP
A122	AUDITORIUM RCP
A123	AUDITORIUM BALCONY RCP
A401	STAIR AND RAILING DETAILS
A511	INTERIOR DETAILS
A512	STRUCTURAL DETAILS
A602	FINISH SCHEDULE AND OPENINGS
A630	CAFETERIA/ KITCHEN FLOOR FINISH PLAN
A631	AUDITORIUM FLOOR FINISH PLAN
A632	AUDITORIUM BALCONY FLOOR FINISH PLAN
A701	INTERIOR ELEVATIONS

MECHANICAL DEMO

HD201 HVAC CAFETERIA/ KITCHEN DEMO FLOOR PLAN
HD202 HVAC AUDITORIUM DEMO FLOOR PLAN
HD203 HVAC AUDTIORIUM BALCONY DEMO FLOOR PLAN
HD204 HVAC ROOF DEMO FLOOR PLAN

MECHANICAL

H000 HVAC LEGEND, NOTES AND ABBREVIATIONS
H201 HVAC CAFETERIA/ KITCHEN FLOOR PLAN
H202 HVAC AUDITORIUM FLOOR PLAN
H203 HVAC AUDITORIUM BALCONY FLOOR PLAN
H204 HVAC ROOF PLAN
H500 HVAC CONTROLS SEQUENCES
H501 HVAC CONTROLS SEQUENCES
H700 HVAC DETAILS
H701 HVAC DETAILS
H702 HVAC DETAILS
H800 HVAC SCHEDULES

ELECTRICAL DEMO

ED201 FIRE ALARM CAFETERIA/ KITCHEN FLOOR PLAN
ED202 FIRE ALARM AUDITORIUM FLOOR PLAN
ED203 FIRE ALARM AUDITORIUM BALCONY FLOOR PLAN

ELECTRICAL

E000 ELECTRICAL LEGEND, NOTES AND ABBREVIATIONS
E100 ELECTRICAL KITCHEN AND AUDITORIUM ROUTING PLANS
E201 ELECTRICAL LIGHTING CAFETERIA/ KITCHEN FLOOR PLAN
E202 ELECTRICAL LIGHTING AUDITORIUM FLOOR PLAN
E203 ELECTRICAL LIGHTING AUDITORIUM BALCONY FLOOR PLAN
E301 ELECTRICAL POWER CAFETERIA/ KITCHEN FLOOR PLAN
E302 ELECTRICAL POWER AUDITORIUM FLOOR PLAN
E303 ELECTRICAL POWER AUDITORIUM BALCONY FLOOR PLAN
E401 ELECTRICAL FIRE ALARM CAFETERIA/ KITCHEN FLOOR PLAN
E402 ELECTRICAL FIRE ALARM AUDITORIUM FLOOR PLAN
E403 ELECTRICAL FIRE ALARM AUDITORIUM BALCONY FLOOR PLAN
E500 ELECTRICAL SCHEDULES AND DETAILS

AUDIO VISUAL DEMO

AVD201 AUDIO VISUAL CAFETERIA/ KITCHEN DEMO FLOOR PLAN
AVD202 AUDIO VISUAL AUDITORIUM DEMO FLOOR PLAN
AVD203 AUDIO VISUAL AUDITORIUM BALCONY DEMO FLOOR PLAN

AUDIO VISUAL

AV000 AUDIO VISUAL LEGEND, NOTES AND ABBREVIATIONS
AV201 AUDIO VISUAL CAFETERIA/ KITCHEN FLOOR PLAN
AV202 AUDIO VISUAL AUDITORIUM FLOOR PLAN
AV203 AUDIO VISUAL AUDITORIUM BALCONY FLOOR PLAN

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 008600

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 PROJECT DESCRIPTION

A. Work includes demolition and repairs of the damage sustained from Hurricane Sandy to the historic Somerville High School, 81 Highland Ave Somerville, MA 02143 as shown on the Contract Documents and as indicated in the Project Manual dated March 3, 2014 and the Drawings dated March 3, 2014 prepared by CDR Maguire Inc.

1. The Work includes but is not necessarily limited to:

a. Repairs and replacement of materials, elements, equipment, and fixtures in the basement level kitchen, limited work in the cafeteria, and in the auditorium including the stage, fly loft, and mezzanine with balcony.

b. Selective demolition, remediation, masonry cutting and patching, metal framing, wood work, reinstallation of aluminum windows, curtains, reinstalling rigging, stage lighting, fire extinguishers and cabinets, minimal insulation, firestopping, interior finishes, railings, Heating-Ventilating-Air-Conditioning, electrical systems, lighting, alarm signal systems, central clock system, data and video distribution, telephone and intercom systems.

1.2 OWNER'S ENVIRONMENTAL PROJECT REQUIREMENTS

A. The Work to include Owner related requirements on Construction Manager relating to Noise, Traffic Management, Rodent Control and Hours of Operation. Refer to applicable specifications relating to each of these items.

1.3 OWNER-FURNISHED ITEMS

A. Owner Furnished and Installed Items to be coordinated with the base bid work scope of work:

1. Free-standing furniture, fixtures and equipment.
2. Auditorium Seating.

1.4 MISCELLANEOUS PROVISIONS

A. Accessibility Compliance:

1. Full compliance with Americans with Disabilities Act (ADA), and Massachusetts Architectural Accessibility Board (MAAB), prohibiting discrimination on basis of disability by public accommodations, is required for work of this Project.
2. This Project has been designed to and requires full compliance with ADA regulations, whether or not specific references or notes to ADA are made on Drawings or in Specifications.

1.5 COORDINATION RESPONSIBILITIES

A. Coordinate work of various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.

B. Verify characteristics of elements of interrelated operating equipment are compatible; coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Mechanical/Electrical:

1. Coordinate space requirements and installation of mechanical and electrical work indicated diagrammatically on Drawings.
2. Follow routing shown for pipes, ducts, and conduits, as closely as practicable.
3. Make runs parallel with lines of building.
4. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and repairs.
5. In finished areas, except as otherwise shown, conceal pipes, ducts, and wiring in construction.
6. Coordinate locations of fixtures and outlets with finish elements.

D. Subcontractor Coordination:

1. Ensure subcontractors are knowledgeable of all Division 01, General Requirements, Sections, and are responsible for conforming to applicable requirements and instructions stated.
2. Assume responsibility for administering work performed by subcontractors according to Division 01, General Requirements.

E. Installation Sequencing:

1. Examine materials and installations performed by others before starting next stage or adjacent work.
2. Notify Architect immediately of unsatisfactory conditions that hinder or restrict correct installation of next stage or adjacent work.
3. Start of next stage or adjacent work will be construed as acceptance of previous or adjacent work, whether or not conditions are satisfactory.
4. Any work requiring subsequent removal or replacement due to unsatisfactory or defective work shall not be at expense of Owner.

F. Contract Document Review:

1. Before execution of work, review all Drawings and Specifications and immediately report all errors, discrepancies, and/or omissions discovered to Architect, in writing, with one set of Contract Documents marked in red pencil clearly indicating discrepancies.
2. Omissions from Drawings and/or Specifications or misdescription of details of work that are manifestly necessary to carry out intent of Drawings and Specifications, or are customarily performed, shall not relieve Contractor from performing such omitted or misdescribed details of work; but shall be performed as if fully and correctly set forth and described in Drawings and Specifications, using most appropriate method, with

final approval issued by Architect to alleviate conflicts of scheduling, Drawings, Details, and/or Specifications.

3. Design Intent:

   a. Purpose of Drawings is to graphically depict characteristics and extent of Project.
   b. Specifications included as part of Project Manual are provided to state material type, function, and source of materials.
   c. Reference standards used in Specifications describe, by inference, specific materials and may include recommended methods of installation or application based on industry standards.

4. Refer to procedures for processing modification to Contract Documents due to changes to correct errors in Contract Documents, except where changes or clarifications were issued as Addenda during Bidding Process.

1.6 WORK UNDER OTHER CONTRACTS

A. Work to be performed under separate contracts may include, but may not be limited to, the following:

1. Removal, remediation, and reinstallation of kitchen equipment.
2. Installation of Owner provided auditorium seating.
4. Work by Owners Own Forces: The Owner's own employees and service contractors may perform maintenance and service functions to construction, furnishings and equipment within the building.
5. Certain construction testing.

1.7 AS-BUILT SURVEY

A. Review As-Built Survey from previous Abatement and Selective Demolition Contractor for agreement of status of existing building elements and deficiencies. Note all deficiencies in the survey and document the status of finishes and materials that will need to be remedied in the new work.

1.8 CONSTRUCTION MANAGER USE OF PREMISES

A. Construction Manager has full use of premises. However, limit use of the premises to construction activities in areas indicated for work.

1. Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
2. Confine the parking of workers' and construction vehicles, and the storage of construction materials to a designated staging area to be determined by the Construction Manager with approval by the Owner.
3. Keep driveways and building entrances clear at all times. Do not use these areas for parking or storage of materials. Maintain egress from designated building entrances to safe areas away from the building. Coordinate construction schedule and sequencing with the Owner prior to the commencement of work to assure safe public use of all building entrances and exits at all times for daytime and evening activities as needed by

the school department. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

1.9 MAINTENANCE OF THE EXISTING BUILDING

A. Maintain and secure the existing building throughout renovation and construction process. Repair damage caused by construction operations. Schedule and perform operations so as to protect the building during the construction period. Maintain existing refrigeration rooms in kitchen area that are scheduled to be salvaged. Provide weathertight and secure temporary partitions to enclose the entire building until new work is secured and weathertight.

1.10 OWNER OCCUPANCY

A. The Owner will not occupy the site or existing building during construction.

1.11 SITE VISITS

A. A pre-bid conference and site visit will be held on Tuesday, March 11, 2014 at 10:00 AM, Somerville High School, 81 Highland Avenue Somerville, MA 02143. Participants shall convene at the main entrance at this address, located on the concourse.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION – (Not Used)

END OF SECTION 011000

SECTION 012000 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for Project meetings including:

1. Pre-Construction Conference.
2. Progress Meetings.

B. Attendees: Owner, Architect and their consultants, Contractor and its superintendent, major subcontractors, manufacturers, suppliers, and other concerned parties shall each be represented by persons familiar with and authorized to conclude matters relating to work.

1.2 PRE-CONSTRUCTION CONFERENCE

A. The Architect will conduct a pre-construction conference after execution of the Agreement and prior to commencement of construction activities to review responsibilities and personnel assignments, construction schedule, sequencing, contract requirements and coordination with Owner.

1. Agenda: Discuss significant items that could affect progress, critical sequencing, use of the premises, procedures for processing payment applications, Change Orders and equipment deliveries. The Construction Manager shall submit the following at this meeting:
    a. Proposed Construction Schedule.
    b. Project Directory (list of major subcontractors, suppliers, and all project participants, include phone and fax numbers).
    c. Proposed Schedule of Values (Application for Payment Continuation Form).

1.3 PROGRESS MEETINGS

A. The OPM will conduct progress meetings at regular intervals and will notify the Architect, Owner and Construction Manager of scheduled dates.

1. Agenda: Review minutes of the previous progress meeting. Review significant items that could affect progress on a 2 week look-ahead of planned construction activities. Include topics appropriate to the current status of the Project.

B. Contractor's Construction Schedule:

1. Review progress since last meeting.
2. Determine where each activity is in relation to Contractor's Construction Schedule, whether on time, ahead of, or behind schedule.
3. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so.
4. Discuss whether Schedule revisions are required to ensure current and subsequent activities will be completed with Contract Time.
5. Review present and future needs of each entity present, including such items as:

a. Interface requirements.
b. Time.
c. Sequences.
d. Deliveries.
e. Off-Site fabrication problems.
f. Access.
g. Site utilization.
h. Temporary facilities and services.
I. Work hours.
j. Hazards and risks.
k. Housekeeping.
l. Quality and work standards.
m. Change Orders.
n. Documentation of information for Payment Requests.

C. Reporting:

1. By 3 days after each meeting, distribute copies of meeting minutes to each party present and to parties who should have been present.
2. Include brief summary, in narrative form, of progress since previous meeting and report.

D. Schedule Updating:

1. Revise Construction Schedule after each progress meeting where revisions to Schedule have been made or recognized.
2. Issue revised Schedule concurrently with Report of each meeting.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 012000

SECTION 012500 - PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes administrative and procedural requirements for processing substitution requests for specified products, materials, equipment, or methods of construction in Specification Sections when made after Contract award.

B. Related Sections:

1. Division 01 Section “Submittal Procedures”; for requirements related to submitting Construction Manager's Construction Schedule and submittal Schedule.
2. Division 01 Section “Product Requirements”; for requirements governing Construction Manager's selection of products and product options specified in Specification Sections.

C. Definitions:

1. General: Definitions in this Article do not change or modify meaning of other terms used in Contract Documents.
2. Substitutions: Changes in products, materials, equipment, and methods of construction required by Contract Documents and proposed by Construction Manager after Contract Award are considered requests for substitutions; substitutions will be processed as Change Order Requests.
3. Nonsubstitutions: Following criteria are not considered to be requests for substitutions:

    a. Substitutions requested during bidding period and accepted by Addendum before Contract award are included in Contract Documents and are not subject to requirements specified in this Section for substitutions.
    b. Revisions to Contract Documents requested by Owner or Architect.
    c. Specified options of products and construction methods included in Contract Documents.
    d. Construction Manager's determination of, and compliance with, governing regulations and orders issued by governing authorities.

D. Deviations from Plans and Specifications:

M.G.L. c.30, ' 39I: *Deviations from plans and specifications.*

Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans

M.G.L. c.30, ' 39I: *Deviations from plans and specifications.*

and specifications contained therein. No willful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating:

(1) if such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor;

(2) that the specified deviation does not materially injure the project as a whole;

(3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and

(4) that the deviation is in the best interest of the contracting authority.

Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

Whoever violates any provision of this section willfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both.

1.3 SUBMITTALS

A. Substitution Request Submittal:

1. General:

a. Architect will consider substitution request if request is received according to requirements of Division 01 Section “Submittal Procedures” Specifications.
b. Request received not in compliance with time requirements of Division 0 Specifications may be considered or rejected, at Architect's discretion.

2. Submit 3 copies of each substitution request for consideration, using forms and procedures required for Change Order Proposals.
3. Identify product or fabrication or installation method to be replaced in each request, including related Specification Section and Drawing numbers.
4. Provide complete documentation showing compliance with requirements for substitutions, and following information, as appropriate:

a. Coordination information, including list of changes or modifications needed to other parts of work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

b. Detailed comparison of significant qualities of proposed substitution with those of work specified, in tabular format with significant qualities including elements applicable to product, material, equipment, or method of construction being proposed for substitution to include such items as performance, life cycle cost, resale value, adjustments due to incompatibility with other work, energy usage, risks of delays, physical properties, weight, size, durability, and visual effect.
c. Product data, including drawings and description of products and fabrication and installation procedures.
d. Samples, where applicable or requested.
e. Statement indicating substitution's effect on Construction Manager's Construction Schedule compared to Schedule without approval of substitution, indicating effect of proposed substitution on overall Contract Time.
f. Cost information, including proposal of net change, if any, in Contract Sum.
g. Construction Manager's certification that proposed substitution conforms to requirements in Contract Documents in every respect and is appropriate for applications indicated.
h. Construction Manager's waiver of rights to additional payment or time that may subsequently become necessary because of failure of substitution to perform adequately.

B. Architect's Action:

1. On receipt of product substitution request, Architect will perform initial analysis of request and submit fee proposal to Construction Manager for cost of processing substitution request; Architect reserves right to waive fee on case-by-case (submittal) basis, dependent on extent of review and determination whether substitution conforms to intent of M.G.L. Chapter 30, ' 39M.
2. Construction Manager shall countersign fee proposal and return with payment.
3. If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of request for substitution.
4. Architect will notify Construction Manager of acceptance or rejection of substitution within two weeks of receipt of request, or one week of receipt of additional information or documentation, whichever is later.
5. Acceptance will be in form of Change Order, with acceptance by Architect for suitability only; Construction Manager to hold Architect harmless for compliance with design and codes for use of substitution.
6. Use product specified, if Architect cannot make decision on use of proposed substitute within time allocated.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Conditions for Substitution Consideration:

1. General:

a. Architect will receive and consider Construction Manager's substitution request when one or more of following conditions are satisfied, as determined by Architect.

b. If following conditions are not satisfied, Architect will return substitution request without action, except to record noncompliance with these requirements.

2. Extensive revisions to Contract Documents are not required.
3. Proposed substitution, with changes, are in keeping with general intent of Contract Documents.
4. Substitution request is timely, fully documented, and properly submitted; incomplete requests are subject to immediate rejection.
5. Specified product or construction method cannot be provided within Contract time.
6. Substitution request is directly related to “Or Equal” clause or similar language in Contract Documents.
7. Requested substitution offers Owner substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume, such as compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

B. Rejection of Substitution Request:

1. If substitution request is result of Construction Manager's failure to pursue work promptly or coordinate construction activities, substitution request is subject to immediate rejection and Construction Manager shall be assessed for all penalties for such failures.
2. If substitution request is rejected, arrange for and deliver specified product or begin specified construction method.
3. Adjust Construction Schedule and Submittal Schedule accordingly to accommodate Construction Manager's failure to pursue work and coordinate construction activities.
4. Due to Construction Manager's failure to pursue work and coordinate construction activities as defined in this Section, Owner may assess penalties for damages resulting due to extended Construction Schedule and inability of Owner to take possession of Project for each calendar day of delay until work is Substantially Complete, at rate established by Owner when Construction Manager's failure is discovered.

C. Submittal's Disclaimer:

1. Construction Manager's submission of shop drawings, product data, or samples under requirements of Division 01 Section “Submittal Procedures” for construction products, materials, equipment, and construction methods not complying with Contract Documents, do not constitute acceptable or valid substitution request.
2. Architect's inadvertent acceptance of such submissions of shop drawings, product data, or samples under requirements of Division 01 Section “Submittal Procedures” for construction products, materials, equipment, and construction methods not complying with Contract Documents does not constitute approval of such submissions.
3. When Architect discovers submission of any shop drawings, product data, or samples under requirements of Division 01 Section “Submittal Procedures” for construction products, materials, equipment, and construction methods not complying with Contract Documents, Construction Manager shall immediately remove nonconforming work and shall pay for corrections to work due to nonconforming work.

PART 3 - EXECUTION

Not Used

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications, consisting of following:

1. Minor changes in work, using Architect's Supplementary Instructions where change:

a. Does not involve other work.
b. Issues can be quickly resolved.
c. Does not change Construction Schedule or Contract sum.

2. Change Orders initiated by any party to Contract may be required for many reasons including, but not limited to:

a. Changes in Project scope made at Owner’s request.
b. Changes in Project scope to correct latent problems discovered during demolition or construction operations.
c. Changes made at Contractor's request.
d. Changes made to more accurately achieve Project design intent.
e. Changes to correct Contractor's errors.
f. Changes to correct Contract Documents errors.
g. Changes for Contractor delay claims.

3. Construction Change Directives.

B. Changes during bidding issued as Addenda to Bidding Documents do not constitute construction modification to executed Contract.

1.3 SUBMITTALS

A. Form Preparation:

1. Use following standard forms to request changes to Contract to speed processing time and allow Architect to complete review promptly and forward documents to Owner for implementation.
2. Comply with procedures published on form for completing form.

B. Applicable Forms:

1. AIA Document G701: To authorize Change Order.

2. AIA Document G709: To request proposal for Change Order.
3. AIA Document G710: To issue Architect's supplemental instructions.
4. AIA Document G714/CMa: To issue Construction Change Directive.

1.4 STATUTORY REGULATIONS FOR PUBLIC CONSTRUCTION CONTRACTS

M.G.L. c.7, '42E: The words defined in this section shall have the meanings set forth below whenever they appear in sections forty-two E to forty-two I, inclusive.

""Change order" shall mean a written order not requiring the consent of the contractor, signed by the project manager and designated as an approved change order, directing the contractor to make changes in the work within the general scope of the contract, or, any written or oral order from the project manager which causes any change in the work, provided that the contractor gives the commonwealth written notice stating the date, circumstances, and source of the order and that the contractor regards the order as a change order.

""Contract modification" shall mean any written alteration in plans or specifications, period of performance, price, quantity, or any other provision of the contract accomplished by mutual action of the parties to the contract.

The project manager may at any time, subject to the requirements set forth herein and in section thirty-nine I of chapter thirty, order changes in the work within the general scope of the contract, including but not limited to changes: (a) in the plans and specifications (including drawings and designs); (b) in the method or manner of performance of the work; in the commonwealth furnished facilities, equipment, materials, services or site; or (d) in the schedule for performance of the work. All such orders shall be written and designated to be change orders. All change orders or other contract modifications shall require the approval of the director when: (a) the cumulative cost of all previously approved increases in the contract price exceeds five per cent of the original contracted construction cost of the project, or such other percentage or dollar amount or criteria as designated by regulations of the commissioner; or (b) the preliminary estimate of the change in the contract price resulting from the change order or contract modification is $5,000 or more. The director may, after review of building projects for which the cumulative total of increases in the contract price has exceeded five per cent of the original contracted construction cost or such other percentage or dollar amount or criteria, direct the project manager as to those proposed changes, the preliminary estimated cost of which are under $5,000, that shall require the director's approval.

The commissioner shall promulgate regulations governing the procedures for obtaining preliminary estimates and giving notice to the contractor as to the necessity of obtaining the director's approval before any work pursuant to a change order or contract modification is commenced. Such procedures shall be designed so as to avoid delays in the progress of the project.

The project manager may delegate to the resident engineer, subject to approval by the director and notice to parties in interest, his authority to process and approve change orders when authorized to do so by regulations of the commissioner.

The provisions of section twenty A of chapter twenty-nine shall not apply to any change order request submitted and acted upon in accordance with sections forty-two E through forty-two I, inclusive, of this chapter.

M.G.L. c.7, '42F: Requests for change orders

Any request for a change order shall be processed promptly, in compliance with regulations promulgated by the commissioner, and otherwise according to the requirements of section thirty-nine P of chapter thirty. Requests shall be submitted to the project manager, who shall, after consultation with the designer and the using agency, approve or disapprove the request. The project manager shall, after obtaining any other required approvals or disapprovals, notify in writing the designer, the using agency and the requesting party of the request and shall issue a written change order or written notice of disapproval to the contractor. If the approval or disapproval would result in a deviation, as defined by regulations of the commissioner from (a) any study or program which must be prepared in accordance with the provisions of section seven K of chapter twenty-nine or (b) any other pre-design document which must be prepared in accordance with any other statute, appropriation or authorization or administrative directive consistent therewith, the decision made shall be subject to appeal by the using agency to the commissioner of administration. Such appeal shall set forth in writing the reasons therefor and a copy thereof shall be furnished to the commissioner at the time the appeal is filed with the commissioner. The commissioner shall, within ten days following the receipt of such appeal, render a written decision thereon, which shall be final and conclusive.

M.G.L. c.7, '42G: Contract price adjustments

If any change order under section 42E causes any change in the contractor's cost of performance of any work under the contract, whether or not that work is changed by any order, either the contractor or the project manager may request an equitable adjustment in the contract price. A request for such an adjustment shall be in writing and shall be submitted by the party making such claim to the other party before commencement of the pertinent work or as soon thereafter as possible, and in any event within thirty days of receipt by the contractor of an approved change order or the mailing or furnishing to the commonwealth by the contractor of written notice that the contractor regards an order as a change order. Except for claims on defective specifications, no claim for any change under this section shall be allowed for any costs incurred more than twenty days before the contractor gives written notice as required by this section. In the case of defective specifications for which the commonwealth is responsible, the equitable adjustment shall include any cost reasonably incurred by the contractor in attempting to comply with such defective specifications.

The project manager and the contractor shall by negotiation agree upon an equitable adjustment in the contract price before commencement of the pertinent work or as soon thereafter as possible. Notice of the adjustment shall be given to the Director. In the absence of agreement by the parties on an equitable adjustment in the contract price, the project manager shall unilaterally determine the costs attributable to the change order. Unilateral equitable adjustments of the project manager shall be reduced to writing and a copy mailed or otherwise furnished to the contractor. Such adjustments shall be final and conclusive unless, within thirty days from the date of receipt of such copy, the contractor mails or otherwise furnishes to the project manager a written appeal addressed to the commissioner, and otherwise complies with the requirements set forth in section thirty-nine Q of chapter thirty. The provisions of said section shall govern further appeal to the division of hearing officers.

M.G.L. c.7, '42H: Cost and pricing data for contract modifications

The contractor shall submit, in accordance with regulations of the commissioner, cost and pricing data to be used when negotiating adjustments for change orders or other contract modifications. Such cost and pricing data shall be based on generally accepted accounting principles and be in conformity with the guidelines promulgated by the commissioner. Cost estimators employed within the division of capital asset management and maintenance shall review and evaluate cost and pricing data submitted by the contractor.

The contractor shall certify that, to the best of his knowledge and belief, the cost and pricing data submitted was accurate, complete, and current as of the date of submission. Any change order or contract modification under which a certificate is required shall contain a provision that the price to the commonwealth, including profit or fee, shall be adjusted to exclude any significant sums by which the commonwealth finds that such price was increased because the contractor-furnished cost or pricing data was inaccurate, incomplete, or not current as of the date of submission.

The provisions of section thirteen of chapter two hundred and fifty-eight of the General Laws, and the provisions of section sixty-seven A to section sixty-seven C, inclusive, of chapter two hundred and sixty-six, shall fully apply to the cost and pricing data certification requirements of this section.

M.G.L. c.7, '42I: General principles for equitable adjustments in contract prices

Equitable adjustments in the contract price negotiated pursuant to section forty-two G or as part of a contract modification shall be made in accordance with the following general principles. The commissioner shall promulgate regulations designed to implement the provisions of this section.

1. Adjustments in the contract price shall be made to the maximum extent feasible on a fixed price basis prior to the execution of the change order or contract modification, if this can be done without adversely affecting the interests of the Commonwealth.

2. Where a fixed price cannot be set due to difficulty in estimating the scope of the change ordered, adjustment may be made on a lump-sum guaranteed maximum price basis calculated by use of unit prices specified in the contract or agreed upon by the parties.

3. Cost reimbursement or time-and-materials methods of price adjustment shall not be used, except where, in the written opinion of the commissioner, no other pricing method is possible. When such pricing method is used, the contractor shall provide complete and accurate information disclosing the costs incurred in performing changes. The contractor shall maintain separate accounts, by job order or other suitable accounting procedure, of all segregable direct cost of work, both changed and not changed, allocable to the change. The commissioner shall promulgate regulations setting forth cost principles which shall be used to determine the allowability of incurred costs for the purpose of reimbursing costs.

M.G.L. c.30, '39I: Deviations from plans and specifications.

Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans and specifications contained therein. No willful and substantial deviation from said

M.G.L. c.30, '39I: Deviations from plans and specifications.

plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating:

(1) if such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor;

(2) that the specified deviation does not materially injure the project as a whole;

(3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and

(4) that the deviation is in the best interest of the contracting authority.

Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

Whoever violates any provision of this section willfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both.

M.G.L. c.30, '39J: Public construction contracts; effect of decisions of contracting body or administrative board.

Notwithstanding any contrary provision of any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount of the contract is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, a decision, by the contracting body or by any administrative board, official or agency, or by any architect or engineer, on a dispute, whether of fact or of law, arising under said contract shall not be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily is unsupported by substantial evidence, or is based upon error of law.

M.G.L. c.30, '39N: Construction contracts; equitable adjustment in contract price for differing subsurface or latent physical conditions.

Every contract subject to M.G.L. c.149, '44A or subject to M.G.L. C.30, '39M shall contain the following paragraph in its entirety and an awarding authority may adopt reasonable rules or regulations in conformity with that paragraph concerning the filing, investigation and settlement of

M.G.L. c.30, '39N: Construction contracts; equitable adjustment in contract price for differing subsurface or latent physical conditions.

such claims:

If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly.

M.G.L. c.30, '39O: Contracts for construction and materials; suspension, delay or interruption due to order of awarding authority; adjustment in contract price; written claim.

Every contract subject to the provisions of M.G.L. c.30, '39M or subject to M.G.L. c.149, '44A shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.

(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority

M.G.L. c.30, '39O: Contracts for construction and materials; suspension, delay or interruption due to order of awarding authority; adjustment in contract price; written claim.

in writing of the act or failure to act involved in the claim.

M.G.L. c.30, '39P: Contracts for construction and materials; awarding authority's decisions on interpretation of specifications, etc.; time limit; notice.

Every contract subject to M.G.L. c.30, '39M or M.G.L. c.149, '44A which requires the awarding authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than 30 days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, architect or engineer shall, within 30 days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the 30 day period and the date by which the decision will be made.

1.5 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

B. Supplemental Instructions will be issued using AIA Document G710, Architect's Supplemental Instructions.

1.6 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Construction Manager's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use forms acceptable to Architect.

B. Construction Manager-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Construction Manager may initiate a claim by submitting a request for a change to Architect. Comply with provisions of M.G.L. c.30, '39N for processing changes for latent physical conditions.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Construction Manager's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use CSI Form 13.6A "Change Order Request (Proposal)" with attachments CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail" form provided by Owner. Sample copy is included in Project Manual form acceptable to Architect.
8. Definitions: Following defines typical reasons for changing Contract due to latent physical conditions:

    a. Unforeseen Conditions: Discovery of latent condition at variance with information presented in Contract Documents, where condition was not known or suspected, when work began and if condition was suspected, some investigation would have been authorized; unforeseen conditions require corrective action before Project can proceed and Change Order proposal is processed to correct problem caused by unforeseen condition.
    b. Subsurface Rock: Rock below-grade where none was expected; to be processed by Unit Prices established in Bidding Documents when it is expected that Contractor may encounter rock deposits; unforeseen subsurface rock conditions require corrective action before Project can proceed and Change Order proposal is processed to correct problem caused by unforeseen subsurface rock.
    c. Archaeological Artifacts: Discovery of archaeological artifact during excavation, requiring delay or halting of construction in compliance with community or state laws when findings of potential historical or archaeological significance are encountered; penalties may be imposed by community or state for not reporting findings and construction may not resume until community-approved archaeologist evaluates findings in situ for historical or archaeological significance and when findings are important, community or state can legally stop construction until findings are documented and removed, requiring Change Order proposal indicating Contract duration and cost change.
    d. Hazardous Substances: Discovery of suspected dangerous or hazardous substance during construction requires stoppage of construction operations when suspect

material proves to be dangerous or hazardous substance and no work may be performed in area until material has been rendered harmless or has been lawfully removed from site, requiring Change Order proposal indicating Contract duration and cost change.

e. Unrecorded Underground Utilities: Discovery of unforeseen underground utility lines not accurately documented, which delays construction progress while Owner tries to identify system and negotiate relocation with utility company and adjacent property owners, requiring Change Order proposal indicating Contract duration and cost change.

f. Unrecorded Building Utilities - Renovation Work: Discovery of utility services no longer located where original documents indicate, requiring relocation of essential utility services, additional cutting and patching, requiring Change Order proposal indicating Contract duration and cost change.

g. Unsound Building Structure - Renovation Work: Discovery of deteriorated or structurally unsound material that must be replaced or uncovering previously-covered surface disclosing construction that Owner wishes to keep rather than remove and requiring redesign of area, requiring Change Order proposal indicating Contract duration and cost change.

3. Change Statement:

a. Include statement outlining reasons for change and effect of change on Work.
b. Provide complete description of proposed change.
c. Indicate effect of proposed change on Contract Sum and Contract Time.

4. Changed Quantities:

a. Include List of Quantities of products required or eliminated and Unit Costs, with total amount of purchases and credits to be made.
b. If requested, furnish survey data to substantiate quantities.

5. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
6. Include costs of labor and supervision directly attributable to change.
7. Changed Construction Schedule:

a. Include updated Contractor's Construction Schedule that indicates effect of change including, but not limited to, changes in activity duration, start and finish times, and activity relationship.
b. Use available total float before requesting extension of Contract Time.

C. Allowance Processing and Adjustment:

1. General:

a. To adjust Allowance amounts, base each Change Order proposal on difference between purchase amount and Allowance, multiplied by final measurement of work-in-place.
b. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

2. Include installation costs in purchase amount only where indicated as part of Allowance.
3. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
4. Submit substantiation of change in scope of work, if any, claimed in Change Orders related to Unit-Cost Allowances.
5. Owner reserves right to establish quantity of work-in-place by independent quantity survey, measure, or count.

1.7 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Construction Manager on AIA Document G701.

1. Submit claims for increased costs because of change in scope or nature of Allowance described in Contract Documents, whether for Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit.
2. Submit claims within 21 days of receipt of Change Order or Construction Change Directive authorizing work to proceed.
3. Owner will reject claims submitted later than 21 days after such authorization.
4. Do not include Contractor's or subcontractor's indirect expense in Change Order cost amount, unless it is clearly shown that nature or extent of work has changed from what could have been foreseen from information in Contract Documents.
5. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of same scope and nature as originally indicated.

1.8 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714/CMa. Construction Change Directive instructs Construction Manager to proceed with a change in the Work, for subsequent inclusion in a Change Order in order to prevent delays to construction schedule.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time for disputed Change Order.
2. Refer to requirements of General Conditions for methods to determine amount of Contract Adjustment.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive. Furnish adequate supporting data to substantiate claims for additional compensation related to disputed Change Order.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 0126000

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Coordination Drawings.
4. Administrative and supervisory personnel.
5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Summary" for Owner provided equipment.
2. Division 01 Section "Construction Progress Documentation" for preparing and submitting the Construction Manager's Construction Schedule.
3. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
4. Division 01 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 DEFINITIONS

A. RFI: Request from Construction Manager seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors as coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Construction Manager's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.5 ADMINISTRATIVE PROCEDURES

A. Coordinate scheduling and timing of administrative procedures with other activities to avoid conflicts and ensure orderly progress. Such activities include:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

1.6 INSPECTION OF CONDITIONS

A. Demolition work should not commence until all conditions have been inspected under which Work is performed. Do not proceed until unsatisfactory conditions have been corrected. The Construction Manager shall verify all measurements and existing conditions at the site, shall be responsible for their correctness and shall perform the Work in conformity with same. Any

discrepancies in actual dimensions and dimensions indicated on the drawings must be brought to the attention of the Architect. No extra charge or compensation will be allowed on account of differences between actual dimensions and the dimensions indicated on the Drawings.

1.7 MANUFACTURER'S INSTRUCTIONS

A. Comply with manufacturer's installation instructions and recommendations to the extent that they are more stringent than requirements in Contract Documents.

B. Inspect material immediately upon delivery and again prior to installation. Reject damaged and defective items.

C. Provide attachment and connection devices and methods necessary for securing each construction element. Secure each construction element true to line and level. Allow for expansion and building movement.

1.8 VISUAL EFFECTS

A. Provide uniform appearance of all exposed Work. Refer questionable choices to the Architect for decision.

1.9 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings for installation of products and materials fabricated by separate entities for Architect’s review. Coordination Drawings shall be required for all areas of the facility, but are not subject to Architect’s approval.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable

    a. Prepare where careful coordination is needed for installation of products and materials fabricated by separate entities..
    b. Prepare where limited space availability necessitates maximum utilization of space for efficient installation of different components.
    c. Indicate relationship of components shown on separate Shop Drawings.
    d. Indicate required installation sequences.
    e. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
3. Number of Copies: Submit four opaque copies of each submittal. Architect will return one copy.

    a. Submit five copies where Coordination Drawings are required for operation and

maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.

4. Refer to mechanical and electrical individual specification sections for specific Coordination Drawing requirements for mechanical and electrical installations.
5. Indicate relationship between routing and location of Owner provided equipment and Construction Manager provided components. Owner shall provide drawings from vendors.

B. Staff Names: At pre-construction conference, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project. Comply with Owner's security requirements regarding personnel badge identification system.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.
2. Within 15 days of start of construction operations, submit list of Construction Manager's principal staff assignments, including superintendent and other personnel in attendance at Project site.

1.10 TRAFFIC MANAGEMENT PLAN

A. A pedestrian Traffic Management Plan (TMP) in accordance to the Manual of Uniform Traffic Control Devices (MUTCD) is required if access to any sidewalk or walkway is temporarily prohibited.

B. A TMP must be submitted (in addition to the above) if traffic flow is adversely affected by either the delivery of materials to the job site or by the "staging" of Construction Manager's equipment and/or materials at the job site.

C. A police detail is required if Construction Manager's/construction vehicles adversely affect the movement of traffic on City streets.

D. A truck route to/from the job site (for delivery vehicles) should be prepared and submitted for review and approval by Traffic and Parking.

E. Where possible the delivery of construction materials should be scheduled between the hours of 9:00AM and 2:30PM.

F. In the event that construction requires any on-street workspace, the Construction Manager must secure the necessary permits and permission from Traffic and Parking Department and the Public Works Department.

G. The City's permit parking provisions will be in effect for all Construction Manager's vehicles associated with this project. Any questions concerning these policies should be directed to the City's Parking Clerk.

H. Local residents should be notified where, when and the duration of use of any parking spaces that the Construction Manager might require to expedite work on this project. Traffic and Parking must approve any temporary occupancy of parking space by the Construction Manager.

I. It is recommended that a sweeper be utilized by the Construction Manager to keep both the sidewalks and streets clean of debris associated with the project.

1.11 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.12 SUPERINTENDENT

A. The Construction Manager shall provide and employ a full time licensed (with no restrictions) Mass. Dept. of Public Safety project superintendent who will be present on site when work is in progress.

1.13 PROJECT REPRESENTATIVE

A. The Owner has a Project Representative. The Construction Manager and subcontractors must fully cooperate with the OPM – Owner's Project Manager.

1.14 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.

B. Pre-construction Conference: Schedule a pre-construction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Construction Manager and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the

following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing.
d. Designation of responsible personnel.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Procedures for testing and inspecting.
h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.
j. Submittal procedures.
k. Preparation of Record Documents.
l. Use of the premises.
m. Work restrictions.
n. Owner's occupancy requirements.
o. Responsibility for temporary facilities and controls.
p. Construction waste management and recycling.
q. Parking availability.
r. Office, work, and storage areas.
s. Equipment deliveries and priorities.
t. First aid.
u. Security.
v. Progress cleaning.
w. Working hours.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. The Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.

o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct regularly scheduled progress meetings at weekly intervals of which the architect's representative will attend meetings bi-weekly. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner, Architect, Construction Manager, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Construction Manager's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Construction Manager's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Provide a separate three week work schedule updated for each construction meeting outlining the proposed work of each subcontractor for various areas of the project along with scheduled milestones.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.

4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) RFIs.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

    a. Schedule Updating: Revise Construction Manager's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Coordination Meetings: Conduct Project coordination meetings at biweekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Combined Construction Manager's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Construction Manager's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Schedule Updating: Revise Combined Construction Manager's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.15 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Construction Manager. RFIs submitted by entities other than Construction Manager will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Construction Manager's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Construction Manager.
4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Construction Manager's suggested solution(s). If Construction Manager's solution(s) impact the Contract Time or the Contract Sum, Construction Manager shall state impact in the RFI.
10. Construction Manager's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

a. Supplementary drawings prepared by Construction Manager shall include

dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs: CSI Form 13.2A

1. Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for coordination information already indicated in the Contract Documents.
d. Requests for adjustments in the Contract Time or the Contract Sum.
e. Requests for interpretation of Architect's actions on submittals.
f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Construction Manager to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

a. If Construction Manager believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Construction Manager disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log biweekly. Provide content with not less than the following:

1. Project name.
2. Name and address of Construction Manager.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Construction Manager's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Special reports.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

H. Major Area: A story of construction, a separate building, or a similar significant construction element.

I. Milestone: A key or critical point in time for reference or measurement.

J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article and in-house scheduling personnel to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

C. Preliminary Construction Schedule: Submit two printed copies; one a single sheet of reproducible media, and one a print along with an electronic version utilizing Microsoft Project of similar.

D. Construction Manager's Construction Schedule: Submit two printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire

schedule for entire construction period. Submit an electronic version utilizing Microsoft Project of similar.

E. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.

F. Daily Construction Reports: Submit two copies at monthly intervals.

G. Material Location Reports: Submit two copies as requested by Architect or Owner.

H. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

I. Special Reports: Submit two copies at time of unusual event.

1.5 QUALITY ASSURANCE

A. Photographer Qualifications: An individual of established reputation who has been regularly engaged as a professional photographer for not less than three years.

B. Pre-scheduling: Confer with Architect to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Construction Manager's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing work stages area separations interim milestones and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Construction Manager's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Construction Manager's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

a. Show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

3. Final Submittal: Submit concurrently with the first complete submittal of Construction Manager's Construction Schedule.

2.2 CONSTRUCTION MANAGER'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Construction Manager's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than seven (7) days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Partial occupancy before Substantial Completion.
    c. Use of premises restrictions.
    d. Provisions for future construction.
    e. Seasonal variations.
    f. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.

l. Startup and placement into final use and operation.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion of Press Hall for installation of Press, as well as for the Packaging Center equipment and other Owner contracted for items, and Final Completion.

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.
2. Construction Manager shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Architect's approval, be assigned to fabrication and delivery activities. Costs shall be under required principal subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
3. Each activity cost shall reflect an accurate value subject to approval by Architect.
4. Total cost assigned to activities shall equal the total Contract Sum.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

1. Microsoft Project, Latest Version for Windows based operating system.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONSTRUCTION MANAGER'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 21 days of date established for the Notice of Award. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Construction Manager's Construction Schedule using a computerized, cost-and resource-loaded**,** time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice of Award.

    a. Failure to include any work item required for performance of this Contract shall not excuse Construction Manager from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Construction Manager's activities.
    i. Testing and commissioning.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Construction Manager or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.

5. Material deliveries.
6. High and low temperatures and general weather conditions.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

B. Material Location Reports: At Architect/Owner requested intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Construction Manager's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONSTRUCTION MANAGER'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Construction Manager employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.

2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Construction Manager's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect, Owner, Owner's separate contractors, testing and inspecting agencies, and other parties identified by Construction Manager or Owner with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment.
2. Division 01 Section "Project Management and Coordination" for submitting Coordination Drawings.
3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule and construction photographs.
4. Division 01 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals and for erecting mockups.
5. Division 01 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will be provided if needed by Architect for Construction Manager's use in preparing submittals.

1. Architect will furnish Construction Manager one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.

a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

b. Construction Manager shall execute a data licensing agreement in the form of an Agreement form acceptable to the Architect.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal, other submittals, requirements and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.

1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Construction Manager when a submittal being processed must be delayed for coordination.
2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 days for initial review of each submittal.
3. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
4. Re-submittal Review: Allow 14 days for review of each re-submittal.
5. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 6 inches on label or beside title block to record Construction Manager's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Construction Manager.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals

shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

2) Include specification section page number and paragraph number on each hard copy submittal with separate transmittals for each trade.

i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Other necessary identification.

E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with transmittal, submittal number, specification number and including revision identifier and general topic as follows.

a. Example of Electronic File Name: 001-005-013300-01 Submittal Name.

3. Provide means for insertion to permanently record Construction Manager's review and approval markings and action taken by Architect.
4. Include the following information on an necessary inserted sheet:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Construction Manager.
e. Name and address of firm or entity that prepared submittal.
f. Name and address of subcontractor.
g. Name and address of supplier.
h. Name of manufacturer.
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Related physical samples submitted directly.
m. Other necessary identification.
n. Include specification section page number and paragraph number on each hard copy submittal with separate transmittals for each trade.

F. Options: Identify options requiring selection by the Architect.

G. Deviations: Identify deviations from the Contract Documents on submittals.

1. All substitutions must be accompanied by a filled out Substitution Request Form included in the Project Manual. NO REVIEW OF SUBSTITUTIONS WILL BE PROCESSED WITHOUT THIS FORM ATTACHED.

H. Unless additional copies are required.

1. Submit submittals via email as PDF electronic files to Architect. Submittal will be reviewed and scanned to an electronic file for Construction Manager to make as many copies as Construction Manager requires. A hard copy will be provided to OPM by the Architect. See Section 2.1.

I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form.

1. Transmittal Form: Use any.
2. On an attached separate sheet, prepared on Construction Manager's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

J. Resubmittals: Make resubmittals in same form as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

L. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

M. CPM Schedule:

1. Maintain CPM system using automated methods to involve following activities:

a. Long-lead purchases and deliveries of critical materials.
b. Fabrication, installation, and testing of critical equipment.
c. Submittal and approval of material samples and shop drawings, coordinated with Division 01 Section ‘Product Requirements” for product list submittal and schedule.
d. All activities that affect job progress, including on-site regulatory inspections.
e. Required dates of completion for all activities.

2. Submit summary diagram consisting of network of 50 to 150 activities, fully based on detailed diagrams of project tasks.

3. Include following information for each activity for mathematical analysis of CPM network diagram:

a. Preceding and following event numbers.
b. Activity description.

c. Estimated activity duration.
d. Earliest start date (calendar date).
e. Earliest finish date (calendar date).
f. Scheduled or actual start date.
g. Scheduled or actual finish date.
h. Latest start date (calendar date).
I. Latest finish date (calendar date).
j. Monetary value of activity.
k. Responsibility for activity (prime; subcontractors, suppliers, etc.).
l. Personnel required.
m. Percentage of activity completed as of each report.
n. Contractor's earnings based on portion of work completed.
o. Bid item of which activity is part.

4. In addition to activity tabulation, include identification of planned expedited activities using overtime or double shifts, including possible Saturday, Sunday, or Holiday work.
5. Provide on-site manpower loading schedule and description of major construction equipment planned for Project operations.
6. Generate computer printout sorting certain classes of frequently used data into groups as follows:

a. By preceding event number, from lowest to highest, and then in order of following event number.
b. By amount of slack, then in order to earliest allowable start date.
c. In order of latest allowable start date, then in order of preceding event numbers, then in order of succeeding event numbers.

7. Distribution:

a. Following response to initial submittal, print and distribute copies to Architect, Owner, subcontractors, and other parties required to comply with scheduled dates.
b. Post copies in Project Meeting Room and Temporary Field Office.
c. When revisions are made, distribute to same parties and post in same locations.
d. Delete parties from distribution when they have completed their assigned portion of work and are no longer involved in construction activities.

8. Schedule Updating:

a. Revise Schedule after each meeting or activity, where revisions have been recognized or made.
b. Issue updated Schedule concurrently with report of each meeting.

N. Updating and Reviewing Schedule:

1. Submit first Schedule minimum 15 days before first Request for Payment; payments will not be processed or approved without receipt and acceptance of Schedule.
2. At each Request for Progress Payment, submit updated Schedule, clearly identifying changes from previous Schedule; payments will not be processed or approved without receipt and acceptance of updated Schedule.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Submit electronic submittals via email as PDF electronic files.

    a. Architect, will return annotated file. Retain one copy of file as an electronic Project record document file.

2. Informational Submittals: Submit electronic copy of each submittal, unless otherwise indicated.
3. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

5. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
    i. Manufacturer's written recommendations.
    j. Manufacturer's installation instructions.
    k. Wiring diagrams showing factory-installed wiring.
    l. Printed performance curves.
    m. Operational range diagrams
    n. Mill reports.

o. Standard product operating and maintenance manuals.

4. Submit Product Data concurrent with Samples.
5. Submit Product Data in the following format:

a. PDF electronic file and physical sample.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon Architect's digital data drawing files is permitted by the Architect.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f. Shop work manufacturing instructions.
g. Templates and patterns.
h. Design calculations.
i. Schedules.
j. Compliance with specified standards.
k. Notation of coordination requirements.
l. Notation of dimensions established by field measurement.
m. Relationship and attachment to adjoining construction clearly indicated.
n. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
3. Submit Shop Drawings in the following format:

a. PDF electronic file.

4. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

D. Coordination Drawings: Comply with requirements in Division 01 Section "Project Management and Coordination."

E. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.

3. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
4. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.
5. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:

    a. Generic description of Sample.
    b. Product name or name of manufacturer.
    c. Sample source.

6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations
8. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
9. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.

10. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

F. Field Samples:

1. Specified in individual Sections are special types of samples.
2. Field samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish standard by which work will be judged.
3. Comply with submittal requirements to fullest extent possible.
4. Process Transmittal Forms to provide record of activity.

G. Delegated-Design Submittal: Comply with requirements in Division 01 Section "Quality Requirements."

H. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."

I. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

J. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

K. Subcontractor's List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Submit subcontractor's list in the following format:

    a. PDF electronic file.

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit four copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of Contractor, testing agency, or design professional responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of the company.
3. Test and Inspection Reports: Comply with requirements in Division 01 Section "Quality Requirements."

B. Contractor's Construction Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."

C. Informational Logs:

1. Shop Drawing Log.
2. Long Lead Item Log.
3. Pre-purchase Log.

D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

F. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

G. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

H. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

K. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.

L. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

M. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

N. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

O. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.

2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 01 Section "Closeout Procedures."

Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

R. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

T. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

U. Material Safety Data Sheets:

1. Submit three copies of MSDS for all products scheduled or planned for use on Project.

2. Notate in Submittal Schedule submission sequence for submission of MSDS.
3. Do not purchase any products until MSDS have been submitted to Architect and reviewed.
4. Label MSDS with Project Manual Section Number.

PART 3 - EXECUTION

3.1 CONSTRUCTION MANAGER'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Construction Manager's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Construction Manager's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action. On advice of counsel, select appropriate terms for action stamp and insert term and explanation of each action taken in subparagraph below. See Evaluations.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

CDR Maguire, Inc.

211 Congress Street, 11th Floor
Boston, MA 02110
Phone: 617-778-1440
Fax: 617-348-2143

SUBSTITUTION REQUEST FORM
(After the Bidding Phase)
Date: _____

Project Title: _____ Maguire Group Project No.: _____

To: _____ Product Description: _____

Submitted By: _____ Specification Section/Title: _____

Phone/Fax No.: _____ Specification Page/Paragraph: _____

Proposed Product: _____ Proposed Manufacturer: _____

Trade Name: _____ Manufacturer's Address: _____

Model Number: _____ Phone & Fax Number: _____

Where installed: _____ Proposed Installer: _____

Previous User(s) _____ Installer's Address: _____
User(s) Phone No: _____

How Long in Use: ( ) New Item ( ) 2-5 yrs ( ) 5-10 yrs ( ) 10+ yrs Phone & Fax Number: _____

Reasons for not providing specified item: _____

How substitution affects other parts of the Work: _____

Savings to Owner for accepting substitution: _____ ($_____

Proposed substitution changes to Contract Time: ( ) Add ( ) Delete ( ) None (_____) day

Supporting Data Attached: ( ) Drawings ( ) Product Data ( ) Samples ( ) Reports ( ) Tests ( ) Other

SUBMITTOR'S SIDE-BY-SIDE, LINE-BY-LINE COMPARATIVE DATA (REQUIRED FOR PROCESSING FORM)

Product Specification Section/Paragraph	List All Performance Criteria as noted in Specifications (Attach Additional Sheets if Needed)	List All Proposed Substitution Product Criteria (Attach Additional Sheets if Needed)

The Undersigned Certifies:

Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product. Same warranty will be furnished for proposed substitution as for specified product. Same maintenance service and source or replacement parts, as applicable, is available. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule. Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived. Proposed substitution does not affect dimensions and functional clearances. Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution. Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all aspects. (All forms required to be signed for processing).

Signed by: _____ Company: _____ Date: _____

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. Testing and Inspection services will be performed by an independent Testing Agency, engaged and paid for by the Owner. These services do not relieve the Construction Manager of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products. It is the Construction Manager’s responsibility to coordinate and schedule the testing and inspection required of each specification section with the Testing Agency.
2. Specified tests, inspections, and related actions do not limit Construction Manager's quality-control procedures that facilitate compliance with the Contract Document requirements. Re- testing and re-inspections required due to failure to meet quality requirements during Owner Testing Agency’s tests or inspection are the financial responsibility of the Construction Manager.
3. Requirements for Construction Manager to coordinate and schedule quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Coordinate and confirm Delegated Design as required of the individual specification sections.

D. Coordinate and schedule mock-ups as required of the individual specification sections.

E. Coordinate and schedule inspections and requirements of regulatory agencies.

F. Related Sections include the following:

1. Division 01 Section 017329 "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
2. See individual specification sections in Project Manual for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of the Construction Manager by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 REGULATORY REQUIREMENTS

A. Copies of Regulations: Obtain copies of regulations, by the authorities having jurisdiction, and retain at Project site to be available for reference by parties who have a reasonable need.

1.6 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article (for re-testing and re-inspections as required) to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Construction Manager to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections Required of Owner’s Testing Agency: The Construction Manager is to prepare a schedule in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Requirements for obtaining samples.
8. Unique characteristics of each quality-control service.

D. Reports: Reports Prepared by the Owner's Testing Agency: Reports will be certified and will include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on re-testing and re-inspection.

E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly or product, that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Pre-construction Testing: The Owner's Independent Testing Agency will perform pre-construction testing for compliance with specified requirements for performance and test methods.

1. Construction Manager responsibilities include the following:

a. Coordinate with Owner's testing agent all submissions of test specimens and assemblies representative of proposed materials and construction, including sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
b. Costs for re-testing and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents a Construction Manager, and the Contract Sum will be adjusted by Change Order.

2. Owner's Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Construction Manager. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

a. Provide test specimens and assemblies representative of proposed materials and construction, including sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
d. When testing is complete, Owner's testing agent remove assemblies; do not reuse materials on Project.
e. Payment for these services will be made directly by the Owner to the testing agencies.

H. Mock-ups: The Construction Manager is responsible for scheduling and coordinating mock-ups as required of the individual specification sections. Before installing portions of the Work requiring mock-ups, build mock-ups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mock-ups in location and of size indicated or, if not indicated, as directed by Architect.

    a. Provided two story construction of typical corner wall/bay of entire exterior wall assembly including a section of veneers, flashings, backup walls, sealants, control joints, drainage materials, curtain walls incorporating jamb and sill conditions, roofing and structural back-up systems.

2. Notify Architect fourteen (14) days in advance of dates and times when mock-ups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
5. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

1.8 QUALITY CONTROL

A. Construction Manager Responsibilities: Where quality-control services are indicated, Owner will engage an independent, qualified Testing Agency to perform these services.

1. Owner will furnish Construction Manager with names, addresses, and telephone numbers of testing agencies engaged.

B. Testing Agency:

1. Duties of Testing Agency:

    a. Independent testing agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Specification Sections shall cooperate with Architect, Owner and Construction Manager in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.
    b. Agency shall notify Architect, Owner and Construction Manager promptly of irregularities or deficiencies observed in work during performance of its services.
    c. Agency is not authorized to release, revoke, alter, or enlarge requirements of Contract Documents, or approve or accept any portion of work.
    d. The Testing Agency shall not perform any duties of Construction Manager.

2. Coordination:

    a. Construction Manager shall coordinate and schedule the testing and inspections required of the independent Testing Agency engaged to perform inspections, tests, and similar services for the Project. The CM shall coordinate sequence of their activities to accommodate required services with minimum of delay in the progress of work.
    b. In addition, Construction Manager and Testing Agency shall coordinate their work to avoid necessity of removing and replacing work to accommodate inspections and tests.

c. Construction Manager has full responsible for scheduling times for inspections, tests, taking of samples, and similar activities.

C. Special Tests and Inspections: Owner's Testing Agency will conduct special tests and inspections required by authorities having jurisdiction.

1. Testing Agency will notify Architect, Owner and Construction Manager promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Testing Agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Owner, Construction Manager and to authorities having jurisdiction.
3. Testing Agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Testing Agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Testing Agency will retest and re-inspect corrected work.

D. Manufacturer's Field Services: Where indicated, schedule a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

E. Re-testing/Re-inspecting: Provide quality-control services, including re-testing and re-inspecting, for revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.
2. The Construction Manager shall cooperate with agencies performing inspections or tests and provide auxiliary services as requested. Notify the agency in advance of operations to permit assignment of personnel.

G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as outlined in Section 1.6.C. Submit schedule within 30 days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, Architect, Testing Agencies and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are the Construction Manager's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": The term "approved," when used in conjunction with Architect's action on Construction Manager's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect, requested by Architect, and similar phrases.

D. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" means to supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is Construction Manager or another entity engaged by Construction Manager, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. All Installers provided by Filed Sub-Bidders shall meet the same criteria as above and per Massachusetts General Laws governing this project and as noted in the Project Manual.

J. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five (5) previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. "Project site" is the space available for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project. The extent of Project site is shown on the Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Compliance: Work shall conform to standards published by recognized professional and industry organizations when referenced in this Project Manual.

C. Edition Date of Reference Standards: Comply with standards in effect as of the date of the Contract Documents, unless otherwise indicated.

1. Code Listing: Any reference to standards of any society, institute, association, or governmental agency that is part of building code in effect for this Project shall comply with edition date published in referenced edition of Building Code.
2. Non-Code Listing: Any reference to standards of any society, institute, association, or governmental agency that is not part of Building Code for this Project shall be edition in effect at time of opening of Bids, except as otherwise specifically stated in this Project Manual.
3. Project Manual Listing: Edition dates listed with reference standards in each Section of this Project Manual are included for reference only.

D. If reference standards are revised before completion of any part of work to which such revision would pertain, Construction Manager may, if acceptable to Architect and if not violating Building Code, perform such work according to revised Specifications.

E. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, in writing to Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within

reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect for a decision before proceeding.

F. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from the publication source and make them available on request.

G. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

H. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. The following abbreviations and acronyms, as referenced in the Contract Documents, mean the associated names. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association 900 19th St., NW, Suite 300 Washington, DC 20006 www.aluminum.org	(202) 862-5100
AABC	Associated Air Balance Council 1518 K St., NW, Suite 503 Washington, DC 20005 www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association 1827 Walden Office Sq., Suite 104 Schaumburg, IL 60173-4268 www.aamanet.org	(847) 303-5664
AAN	American Association of Nurserymen (See ANLA)	
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol St., NW, Suite 249 Washington, DC 20001 www.aashto.org	(202) 624-5800

AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 One Davis Dr. Research Triangle Park, NC 27709-2215 www.aatcc.org	(919) 549-8141
ABMA	American Bearing Manufacturers Association (Formerly: Anti-Friction Bearing Manufacturers Association) 1200 19th St., NW, Suite 300 Washington, DC 20036-2401 www.abma-dc.org	(202) 429-5155
ABMA	American Boiler Manufacturers Association 950 North Glebe Rd., Suite 160 Arlington, VA 22203-1824 www.abma.com	(703) 522-7350
ACI	American Concrete Institute P.O. Box 9094 Farmington Hills, MI 48333-9094 www.aci-int.org	(248) 848-3700
ACIL	ACIL: The Association of Independent Scientific, Engineering, and Testing Firms 1629 K St., NW, Suite 400 Washington, DC 20006 www.acil.org	(202) 887-5872
ACPA	American Concrete Pipe Association 222 West Las Colinas Blvd., Suite 641 Irving, TX 75039-5423 www.concrete-pipe.org	(972) 506-7216
ADC	Air Diffusion Council 104 South Michigan Ave., Suite 1500 Chicago, IL 60603	(312) 201-0101
AEIC	Association of Edison Illuminating Companies 600 N. 18th St. P.O. Box 2641 Birmingham, AL 35291-0992 www.aeic.org	(205) 250-2530
AFBMA	Anti-Friction Bearing Manufacturers Association (See ABMA)	

AFPA	American Forest and Paper Association (Formerly: National Forest Products Association) 1111 19th St., NW, Suite 800 Washington, DC 20036 www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association 1515 Wilson Blvd. Arlington, VA 22209 www.aga.com	(703) 841-8400
AHA	American Hardboard Association 1210 W. Northwest Hwy Palatine, IL 60067-1897	(847) 934-8800
AHAM	Association of Home Appliance Manufacturers 20 N. Wacker Dr., Suite 1231 Chicago, IL 60606 www.aham.org	(312) 984-5800
AI	Asphalt Institute P.O. Box 14052 Lexington, KY 40512-4052 www.asphaltinstitute.org	(606) 288-4960
AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006-5292 www.aia.org	(202) 626-7300
AIA	American Insurance Association 1130 Connecticut Ave., NW, Suite 1000 Washington, DC 20036	(202) 828-7100
AIHA	American Industrial Hygiene Association 2700 Prosperity Ave., Suite 250 Fairfax, VA 22031 www.aiha.org	(703) 849-8888
AISC	American Institute of Steel Construction One East Wacker Dr., Suite 3100 Chicago, IL 60601-2001 www.aisc.web.com	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute 1101 17th St., NW, Suite 1300 Washington, DC 20036-4700 www.steel.org	(202) 452-7100

AITC	American Institute of Timber Construction 7012 S. Revere Pkwy, Suite 140 Englewood, CO 80112 www.aitc-glulam.org	(303) 792-9559
ALA	American Laminators Association (See LMA)	
ALCA	Associated Landscape Contractors of America 150 Elden St., Suite 270 Herndon, VA 20170-4831 www.alca.org	(800) 395-2522 (703) 736-9666
ALI	Associated Laboratories, Inc. P.O. Box 152837 Dallas, TX 75315 www.assoc-labs.com	(214) 565-0593
ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, MD 20875	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. 30 W. University Dr. Arlington Heights, IL 60004-1893 www.amca.org	(847) 394-0150
ANLA	American Nursery and Landscape Association (Formerly: American Association of Nurserymen) 1250 Eye St., NW, Suite 500 Washington, DC 20005 www.anla.org	(202) 789-2900
ANSI	American National Standards Institute 11 West 42nd St., 13th Floor New York, NY 10036-8002 www.ansi.org	(888) 267-4783 (212) 642-4900
AOAC	AOAC International 481 N. Frederick Ave., Suite 500 Gaithersburg, MD 20877 www.aoac.org	(301) 924-7077
AOSA	Association of Official Seed Analysts P.O. Box 81152 Lincoln, NE 68501-1152 www.zianet.com/AOSA	(402) 476-3852

APA	APA-The Engineered Wood Association (Formerly: American Plywood Association) P.O. Box 11700 Tacoma, WA 98411-0700 www.apawood.org	(253) 565-6600
APA	Architectural Precast Association P.O. Box 08669 Fort Myers, FL 33908-0669 www.archprecast.org	(941) 454-6989
API	American Petroleum Institute 1220 L St., NW, Suite 900 Washington, DC 20005-8029 www.api.org	(202) 682-8000
ARI	Air-Conditioning and Refrigeration Institute 4301 Fairfax Dr., Suite 425 Arlington, VA 22203 www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association Center Park 4041 Powder Mill Rd., Suite 404 Calverton, MD 20705 www.asphaltroofing.org	(301) 348-2002
ASA	Acoustical Society of America 500 Sunnyside Blvd. Woodbury, NY 11797 //asa.aip.org	(516) 576-2360
ASC	Adhesive and Sealant Council 1627 K St., NW, Suite 1000 Washington, DC 20006-1707 www.ascouncil.org	(202) 452-1500
ASCA	Architectural Spray Coaters Association 895 Doncaster Dr. West Deptford, NJ 08066	(609) 848-6120
ASCE	American Society of Civil Engineers World Headquarters 1801 Alexander Graham Bell Dr. Reston, VA 20191-4400 www.asce.org	(800) 548-2723 (703) 295-6000

ASHES	American Society for Healthcare Environmental Services Division of the American Hospital Association One North Franklin, Suite 2700 Chicago, IL 60606	(312) 422-3860
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305 www.ashrae.org	(800) 527-4723 (404) 636-8400
ASLA	American Society of Landscape Architects 636 Eye St., NW Washington, DC 20001-3736 www.asla.org	(202) 898-2444
ASME	American Society of Mechanical Engineers 345 East 47th St. New York, NY 10017-2392 www.asme.org	(800) 843-2763 (212) 705-7722
ASPA	American Sod Producers Association (See TPI)	
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake Village, CA 91362-3649	(805) 495-7120
ASQ	American Society for Quality 611 East Wisconsin Ave. Milwaukee, WI 53201-3005 www.asq.org	(800) 248-1946 (414) 272-8575
ASSE	American Society of Sanitary Engineering 28901 Clemens Rd. Westlake, OH 44145 www.asse-plumbing.org	(440) 835-3040
ASTM	American Society for Testing and Materials 100 Barr Harbor Dr. West Conshohocken, PA 19428-2959 www.astm.org	(610) 832-9500
ATIS	Alliance for Telecommunications Industry Solutions (Formerly: Exchange Carriers Standards Association) 1200 G St., NW, Suite 500 Washington, DC 20005 www.atis.org	(202) 628-6380

AWCI	Association of the Wall and Ceiling Industries--International 803 West Broad St., Suite 600 Falls Church, VA 22046 www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (See WCMA)	
AWI	Architectural Woodwork Institute 1952 Isaac Newton Sq. West Reston, VA 20190 www.awinet.org	(800) 449-8811 (703) 733-0600
AWPA	American Wood-Preservers' Association P.O. Box 5690 Granbury, TX 76049 www.awpa.com	(817) 326-6300
AWPB	American Wood Preservers' Bureau (This organization is now defunct.)	
AWS	American Welding Society 550 NW LeJeune Rd. Miami, FL 33126 www.amweld.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association 6666 W. Quincy Ave. Denver, CO 80235 www.awwa.org	(800) 926-7337 (303) 794-7711
BAC	Brick Association of the Carolinas (Formerly: Brick Association of North Carolina) P.O. Box 13290 Greensboro, NC 27415-3290 www.gobrick.com	(800) 622-7425 (336) 273-5566
BHMA	Builders Hardware Manufacturers Association 355 Lexington Ave., 17th Floor New York, NY 10017-6603	(212) 661-4261
BIA	Brick Industry Association 11490 Commerce Park Dr. Reston, VA 22091-1525 www.bia.org	(703) 620-0010

BIFMA	The Business and Institutional Furniture Manufacturer's Association International 2680 Horizon Dr., SE, Suite A1 Grand Rapids, MI 49546-7500 www.bifma.com	(616) 285-3963
CAGI	Compressed Air and Gas Institute c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/cagi	(216) 241-7333
CAUS	Color Association of the United States 409 W. 44th St. New York, NY 10036-4402	(212) 582-6884
CBMA	Certified Ballast Manufacturers Association 355 Lexington Ave., 17th Floor New York, NY 10017 www.certbal.org	(212) 661-4261
CCC	Carpet Cushion Council P.O. Box 546 Riverside, CT 06878-0546	(203) 637-1312
CDA	Copper Development Association Inc. 260 Madison Ave., 16th Floor New York, NY 10016-2401 www.copper.org	(800) 232-3282 (212) 251-7200
CFFA	Chemical Fabrics & Film Association, Inc. c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/cffa	(216) 241-7333
CGA	Compressed Gas Association 1725 Jefferson Davis Hwy, Suite 1004 Arlington, VA 22202-4102 www.cganet.com	(703) 412-0900
CGSB	Canadian General Standards Board Place du Portage Phase III, 6B1 11 Laurier St. Hull, Quebec K1A 0S5 CANADA www.pwgsc.gc.ca/cgsb	(819) 956-3500

	Mailing Address: Canadian General Standards Board Sales Centre Ottawa K1A 1G6 CANADA	(819) 956-0425
CISCA	Ceilings and Interior Systems Construction Association 1500 Lincoln Hwy, Suite 202 St. Charles, IL 60174 www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Rd., Suite 419 Chattanooga, TN 37421 www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute 9891 Broken Land Pkwy, Suite 300 Columbia, MD 21046 www.baileadership.com	(301) 596-2584
CPA	Composite Panel Association (Formerly: National Particleboard Association) 18928 Premiere Ct. Gaithersburg, MD 20879-1569 www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association 3621 Secor Rd., Suite 320 Toledo, OH 436046 www.cppa-info.org	(800) 510-2772 (419) 241-2221
CRI	Carpet and Rug Institute 310 S. Holiday Ave. Dalton, GA 30722-2048 www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Rd. Schaumburg, IL 60173-4758 www.crsi.org	(847) 517-1200
CSSB	Cedar Shake and Shingle Bureau 515 116th Ave., NE, Suite 275 Bellevue, WA 98004-5294 www.cedarbureau.org	(206) 453-1323

CTI	Ceramic Tile Institute of America 12061 West Jefferson Blvd. Culver City, CA 90230-6219	(310) 574-7800
CTI	Cooling Tower Institute P.O. Box 73383 Houston, TX 77273 www.cti.org	(281) 583-4087
DASMA	Door and Access Systems Manufacturers Association, International (Formerly: National Association of Garage Door Manufacturers) c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/dasma	(216) 241-7333
DHI	Door and Hardware Institute (Formerly: National Builders Hardware Association) 14170 Newbrook Dr. Chantilly, VA 20151-2223 www.dhi.org	(703) 222-2010
DIPRA	Ductile Iron Pipe Research Association 245 Riverchase Pkwy East, Suite O Birmingham, AL 35244 www.dipra.org	(205) 402-8702
DLPA	Decorative Laminate Products Association (Dissolved in 1995 - Now part of KCMA.)	
ECSA	Exchange Carriers Standards Association (See ATIS)	
EIA	Electronic Industries Association 2500 Wilson Blvd. Arlington, VA 22201 www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association 3000 Corporate Center Dr., Suite 270 Morrow, GA 30260-4116 www.eifsfacts.com	(800) 294-3462 (770) 968-7945

EJMA	Expansion Joint Manufacturers Association 25 N. Broadway Tarrytown, NY 10591-3201 www.ejma.org	(914) 332-0040
ETL	ETL Testing Laboratories, Inc. (Now part of ITS)	
FCI	Fluid Controls Institute c/o Thomas Associates, Inc 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/fci	(216) 241-7333
FCICA	Floor Covering Installation Contractors Association P.O. Box 948 Dalton, GA 30722-0948	(706) 226-5488
FGMA	Flat Glass Marketing Association (See GANA)	
FM	Factory Mutual System 1151 Boston-Providence Tnpk. P.O. Box 9102 Norwood, MA 02062-9102 www.factorymutual.com	(781) 762-4300
GA	Gypsum Association 810 First St., NE, Suite 510 Washington, DC 20002 www.usg.com	(202) 289-5440
GANA	Glass Association of North America (Formerly: Flat Glass Marketing Association) 2945 Southwest Wanamaker Dr., Suite A Topeka, KS 66614 www.glasswebsite.com/gana	(913) 266-7013
GRI	Geosynthetic Research Institute 475 Kedron Ave. Folsom, PA 19033 www.drexel.edu/gri	(610) 522-8440
HEI	Heat Exchange Institute c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/hei	(216) 241-7333

HI	Hydraulic Institute 9 Sylvan Way Parsippany, NJ 07054-3802	(888) 786-7744 (973) 267-9700
HI	Hydronics Institute Division of Gas Appliance Manufacturers Association P.O. Box 218 35 Russo Pl. Berkeley Heights, NJ 07922 www.gamanet.org	(908) 464-8200
HMA	Hardwood Manufacturers Association (Formerly: Southern Hardwood Lumber Manufacturers Association) 400 Penn Center Blvd., Suite 530 Pittsburgh, PA 15235-5605 www.hardwood.org	(412) 829-0770
HPVA	Hardwood Plywood and Veneer Association 1825 Michael Farraday Dr. P.O. Box 2789 Reston, VA 22195-0789 www.hpva.org	(703) 435-2900
IAS	International Approval Services Division of Canadian Standards Association 8501 East Pleasant Valley Rd. Cleveland, OH 44131 www.iasapprovals.org	(216) 524-4990
IBD	Institute of Business Designers (Now part of IIDA)	
ICC	International Code Council 5203 Leesburg Pike #708 Falls Church, VA 22041 www.intlcode.org	(703) 931-4533
ICEA	Insulated Cable Engineers Association P.O. Box 440 South Yarmouth, MA 02664 www.icea.net	(508) 394-4424
IEC	International Electrotechnical Commission (Available from ANSI) 11 West 42nd St., 13th Floor New York, NY 10036-8002 www.ansi.org	(888) 267-4783 (212) 642-4900

IEEE	Institute of Electrical and Electronics Engineers 345 E. 47th St. New York, NY 10017-2394 www.ieee.org	(800) 678-4333 (212) 705-7900
IESNA	Illuminating Engineering Society of North America 120 Wall St., 17th Floor New York, NY 10005-4001 www.iesna.org	(212) 248-5000
IGCC	Insulating Glass Certification Council P.O. Box 9 Henderson Harbor, NY 13651	(315) 938-7444
IIDA	International Interior Design Association 341 Merchandise Mart Chicago, IL 60654-1104 www.iida.com	(800) 888-4432 (312) 467-1950
ILI	Indiana Limestone Institute of America Stone City Bank Building, Suite 400 Bedford, IN 47421 www.iliai.com	(812) 275-4426
IMSA	International Municipal Signal Association P.O. Box 539 165 E. Union St. Newark, NY 14513 www.imsasafety.org	(800) 723-4672 (315) 331-2182
INCE	Institute of Noise Control Engineering P.O. Box 3206, Arlington Branch Poughkeepsie, NY 12603 www.ince.org	(914) 462-4006
IRI	HSB Industrial Risk Insurers P.O. Box 5010 85 Woodland St. Hartford, CT 06102-5010 www.industrialrisk.com	(800) 520-7300 (860) 520-7300
ISA	ISA - International Society for Measurement and Control P.O. Box 12277 67 Alexander Dr. Research Triangle Park, NC 27709 www.isa.org	(919) 549-8411

ISEA	Industrial Safety Equipment Association 1901 N. Moore St., Suite 808 Arlington, VA 22209 www.safetycentral.org/isea	(703) 525-1695
ISS	Iron and Steel Society 410 Commonwealth Dr. Warrendale, PA 15086-7512 www.issource.org	(412) 776-1535
ITS	Intertek Testing Services (Formerly: Inchcape Testing Services) P.O. Box 2040 3933 US Route 11 Cortland, NY 13045-7902 www.itsglobal.com	(800) 345-3851 (607) 753-6711
KCMA	Kitchen Cabinet Manufacturers Association (Formerly: National Kitchen Cabinet Association) 1899 Preston White Dr. Reston, VA 22191 www.kema.org	(703) 264-1690
LGSI	Light Gage Structural Institute P.O. Box 560746 The Colony, TX 75056	(972) 625-4560
LIA	Lead Industries Association, Inc. 295 Madison Ave., Suite 808 New York, NY 10017 www.leadinfo.com	(800) 422-5323 (212) 578-4750
LMA	Laminating Materials Association (Formerly: American Laminators Association) 116 Lawrence St. Hillsdale, NJ 07642-2730 www.lma.org	(201) 664-2700
LPI	Lightning Protection Institute 3335 N. Arlington Heights Rd., Suite E Arlington Heights, IL 60004-7700 www.lightning.org	(800) 488-6864 (847) 577-7200
MBMA	Metal Building Manufacturers Association c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/mbma	(216) 241-7333

MCAA	Mechanical Contractors Association of America 1385 Piccard Dr. Rockville, MD 20850-4329 www.mcaa.org	(301) 869-5800
MFMA	Maple Flooring Manufacturers Association (Formerly: Wood and Synthetic Flooring Institute) 60 Revere Dr., Suite 500 Northbrook, IL 60062 www.maplefloor.com	(847) 480-9138
MFMA	Metal Framing Manufacturers Association 401 N. Michigan Ave. Chicago, IL 60611	(312) 644-6610
MHIA	Material Handling Industry Association 8720 Red Oak Blvd., Suite 201 Charlotte, NC 28217-3957 www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America 30 Eden Alley, Suite 301 Columbus, OH 43215 www.marble-institute.com	(614) 228-6194
MIA	Masonry Institute of America 2550 Beverly Blvd. Los Angeles, CA 90057 www.masonryinstitute.org	(213) 388-0472
ML/SFA	Metal Lath/Steel Framing Association 8 South Michigan Ave., Suite 1000 Chicago, IL 60603	(312) 456-5590
MRCA	Midwest Roofing Contractors Association 4840 W. 15th St., Suite 1000 Lawrence, KS 66049 www.mrca.org	(913) 843-4888
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park St., NE Vienna, VA 22180-4602 www.mss-hq.com	(703) 281-6613

NAA	National Arborist Association P.O. Box 1094 Amherst, NH 03031-1094 www.natlarb.com	(800) 733-2622 (603) 673-3311
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Ave., Suite 1000 Chicago, IL 60603 www.gss.net/naamm	(312) 322-0405
NAAMM	North American Association of Mirror Manufacturers (See GANA) 2945 Southwest Wanamaker Dr., Suite A Topeka, KS 66614 www.glasswebsite.com/naamm	(913) 266-7013
NACE	NACE International (Formerly: National Association of Corrosion Engineers) P.O. Box 218340 Houston, TX 77218-8340	(281) 492-0535 (281) 492-8254
NAGDM	National Association of Garage Door Manufacturers (See DASMA)	
NAIMA	North American Insulation Manufacturers Association (Formerly: Thermal Insulation Manufacturers Association) 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314 www.naima.org	(703) 684-0084
NAMI	National Accreditation & Management Institute, Inc. P.O. Box 366 207 S. Washington St. Berkeley Springs, WV 25411	(304) 258-5100
NAPA	National Asphalt Pavement Association NAPA Building 5100 Forbes Blvd. Lanham, MD 20706-4413 www.hotmix.org	(888) 468-6499 (301) 731-4748
NBHA	National Builders Hardware Association (See DHI)	
NBGQA	National Building Granite Quarries Association, Inc. 1220 L. St., NW, Suite 100-167 Washington, DC 20005	(800) 557-2848

NCAC	National Council of Acoustical Consultants 66 Morris Ave., Suite 1A Springfield, NJ 07081 www.ncac.com	(973) 564-5859
NCCA	National Coil Coaters Association 401 N. Michigan Ave. Chicago, IL 60611 www.coilcoaters.org	(312) 321-6894
NCMA	National Concrete Masonry Association 2302 Horse Pen Rd. Herndon, VA 20171-3499 www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute P.O. Box 759 253-80 Center St. Lake Geneva, WI 53147 www.ncpi.org	(414) 248-9094
NCRPM	National Council on Radiation Protection and Measurements 7910 Woodmont Ave., Suite 800 Bethesda, MD 20814-3095 www.ncrp.com	(800) 229-2652 (301) 657-2652
NCSPA	National Corrugated Steel Pipe Association 1255 23rd St., NW, Suite 850 Washington, DC 20037 www.ncspa.org	(202) 452-1700
NEBB	Natural Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877-4121 www.mcaa.org/nebb.htm www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814-3299 www.necanet.org	(301) 657-3110
NEI	National Elevator Industry 185 Bridge Plaza North, Suite 310 Fort Lee, NJ 07024	(201) 944-3211

NELMA	Northeastern Lumber Manufacturers Association 272 Tuttle Rd. P.O. Box 87A Cumberland Center, ME 04021 www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association 1300 N 17th St., Suite 1847 Rosslyn, VA 22209 www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association P.O. Box 687 106 Stone St. Morrison, CO 80465-1526 www.electricnet.com/neta	(303) 697-8441
NFPA	National Fire Protection Association One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101 www.nfpa.org	(800) 344-3555 (617) 770-3000
NFPA	National Forest Products Association (See AFPA)	
NFRC	National Fenestration Rating Council Incorporated 1300 Spring St., Suite 500 Silver Spring, MD 20910 www.nfrc.org	(301) 589-6372
NGA	National Glass Association 8200 Greensboro Drive, 3rd Floor McLean, VA 22102-3881	(703) 442-4890
NHLA	National Hardwood Lumber Association P.O. Box 34518 Memphis, TN 38184-0518 www.natlhardwood.org	(901) 377-1818
NIA	National Insulation Association (Formerly: National Insulation and Abatement Contractors Association) 99 Canal Center Plaza, Suite 222 Alexandria, VA 22314 www.insulation.org	(703) 683-6422

NIAC	National Insulation and Abatement Contractors Association (See NIA)	
NKCA	National Kitchen Cabinet Association (See KCMA)	
NLGA	National Lumber Grades Authority #406-First Capital Pl. 960 Quayside Dr. New Westminster, BC V3M 6G2 CANADA	(604) 524-2393
NOFMA	National Oak Flooring Manufacturers Association P.O. Box 3009 Memphis, TN 38173-0009 www.nofma.org	(901) 526-5016
NPA	National Parking Association 1112 16th Street, NW, Suite 300 Washington, DC 20036	(202) 296-4336 (800) 647-7275
NPCA	National Paint and Coatings Association 1500 Rhode Island Ave., NW Washington, DC 20005-5597 www.paint.org	(202) 462-6272
NRCA	National Roofing Contractors Association O'Hare International Center 10255 W. Higgins Rd., Suite 600 Rosemont, IL 60018-5607 www.roofonline.org	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association 900 Spring St. Silver Spring, MD 20910 www.nrmca.org	(301) 587-1400
NSA	National Stone Association 1415 Elliot Pl., NW Washington, DC 20007 www.aggregates.org	(800) 342-1415 (202) 342-1100
NSF	NSF International (Formerly: National Sanitation Foundation) 3475 Plymouth Rd. Ann Arbor, MI 48105 www.nsf.org	(734) 769-8010

NSSEA	National School Supply and Equipment Association 8300 Colesville Rd., Suite 250 Silver Spring, MD 20910 www.nssea.org	(800) 395-5550 (301) 495-0240
NTMA	National Terrazzo and Mosaic Association 110 E. Market St., Suite 200-A Leesburg, VA 20176-3122 www.ntma.com	(800) 323-9736 (703) 779-1022
NUSIG	National Uniform Seismic Installation Guidelines P.O. Box 0933 Alamo, CA 94507	(925) 555-6331
NWMA	National Woodwork Manufacturers Association (See NWWDA)	
NWWDA	National Wood Window and Door Association (Formerly: National Woodwork Manufacturers Association) 1400 E. Touhy Ave. Des Plaines, IL 60018 www.nwwda.org	(800) 223-2301 (847) 299-5200
PATMI	Powder Actuated Tool Manufacturers' Institute 1603 Boonslick Rd. St. Charles, MO 63301-2244	(314) 947-6610
PCA	Portland Cement Association 5420 Old Orchard Rd. Skokie, IL 60077-1083 www.portcement.org	(847) 966-6200
PCI	Precast/Prestressed Concrete Institute 175 W. Jackson Blvd. Chicago, IL 60604 www.pci.org	(312) 786-0300
PDCA	Painting and Decorating Contractors of America 3913 Old Lee Hwy, Suite 33-B Fairfax, VA 22030 www.pdca.com	(800) 332-7322 (703) 359-0826
PDI	Plumbing and Drainage Institute 45 Bristol Dr., Suite 101 South Easton, MA 02375 //pdi-online.org	(800) 589-8956 (508) 230-3516

PEI	Porcelain Enamel Institute 4004 Hillsboro Pike, Suite 224-B Nashville, TN 37215 www.porcelainenamel.com	(615) 385-5357
PGI	PVC Geomembrane Institute/Technology Program University of Illinois-Urbana Champaign 205 N. Mathews Ave. 2215 Newmark Civil Engineering Lab Urbana, IL 61801 //pgi-tp.ce.vivc.edu	(217) 333-3929
PIMA	Photographic and Imaging Manufacturers Association 550 Mamaroneck Ave., Suite 307 Harrison, NY 10528 www.pima.net	(914) 698-7603
PPFA	Plastic Pipe and Fittings Association 800 Roosevelt Rd., Building C, Suite 20 Glen Ellyn, IL 60137-5833	(888) 314-6774 (630) 858-6540
PPI	Plastics Pipe Institute (The Society of the Plastics Industry, Inc.) 1801 K St., NW, Suite 600K Washington, DC 20006 www.plasticpipe.org	(202) 974-5306
RCMA	Roof Coatings Manufacturers Association Center Park 4041 Powder Mill Rd., Suite 404 Calverton, MD 20705 www.roofcoatings.org	(301) 348-2003
RCSC	Research Council on Structural Connections Sargent & Lundy 55 E. Monroe St. Chicago, IL 60603	(312) 269-2424
RFCI	Resilient Floor Covering Institute 966 Hungerford Dr., Suite 12-B Rockville, MD 20850-1714	(301) 340-8580
RMA	Rubber Manufacturers Association 1400 K St., NW, Suite 900 Washington, DC 20005 www.rma.org	(800) 220-7620 (202) 682-4800

SAE	SAE International 400 Commonwealth Dr. Warrendale, PA 15096-0001 For publications: Call (724) 776-4970 www.sae.org	(724) 776-4841
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60021 www.sdi.org	(847) 462-1930
SDI	Steel Door Institute 30200 Detroit Rd. Cleveland, OH 44145-1967 www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association 7 Wildbird Lane Hilton Head Island, SC 29926 www.sefalabfurn.com	(843) 689-6878
SEGD	Society for Environmental Graphic Design 401 F St., NW, Suite 333 Washington, DC 20001-2728	(202) 638-5555
SGCC	Safety Glazing Certification Council P.O. Box 9 Henderson Harbor, NY 13651	(315) 938-7444
SHLMA	Southern Hardwood Lumber Manufacturers Association (See HMA)	
SIGMA	Sealed Insulating Glass Manufacturers Association 401 N. Michigan Ave. Chicago, IL 60611-4267 www.sigmaonline.org/sigma	(312) 644-6610 x3279
SJI	Steel Joist Institute 3127 10th Ave., North Ext. Myrtle Beach, SC 29577-6760	(803) 626-1995
SMA	Screen Manufacturers Association 2850 S. Ocean Blvd., Suite 114 Palm Beach, FL 33480-5535	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Dr.	(703) 803-2980

	P.O. Box 221230 Chantilly, VA 20151-1209 www.smacna.org	
SPI	The Society of the Plastics Industry, Inc. Spray Polyurethane Division 1801 K St., NW, Suite 600K Washington, DC 20006 www.socplas.org	(800) 951-2001 (202) 974-5200
SPIB	Southern Pine Inspection Bureau 4709 Scenic Hwy Pensacola, FL 32504-9094 www.spib.org	(850) 434-2611
SPRI	SPRI (Formerly: Single Ply Roofing Institute) 200 Reservoir St., Suite 309A Needham, MA 02494-3034 www.spri.org	(781) 444-0242
SSINA	Specialty Steel Industry of North America c/o Collier, Shannon Rill & Scott 3050 K St., NW, Suite 400 Washington, DC 20007 www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings 40 24th St., 6th Floor Pittsburgh, PA 15222-4656 www.sspc.org	(800) 837-8303 (412) 281-2331
SSPMA	Sump and Sewage Pump Manufacturers Association P.O. Box 647 Northbrook, IL 60065-0647	(847) 559-9233
STI	Steel Tank Institute 570 Oakwood Rd. Lake Zurich, IL 60047-1559 www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/swi	(216) 241-7333

SWPA	Submersible Wastewater Pump Association 1806 Johns Dr. Glenview, IL 60025-1657	(847) 729-7972
SWRI	Sealant, Waterproofing and Restoration Institute 2841 Main St. Kansas City, MO 64108 www.swrionline.org	(816) 472-7974
TCA	Tile Council of America P.O. Box 1787 Clemson, SC 29633 www.tileusa.com	(864) 646-8453
TIMA	Thermal Insulation Manufacturers Association (See NAIMA)	
TPI	Truss Plate Institute 583 D'Onofrio Dr., Suite 200 Madison, WI 53719	(608) 833-5900
TPI	Turfgrass Producers International (Formerly: American Sod Producers Association) 1855-A Hicks Rd. Rolling Meadows, IL 60008 www.turfgrassod.org	(800) 405-8873 (847) 705-9898
UFAC	Upholstered Furniture Action Council P.O. Box 2436 High Point, NC 27261	(910) 885-6085
UL	Underwriters Laboratories Inc. 333 Pfingsten Rd. Northbrook, IL 60062 www.ul.com	(800) 704-4050 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association 2655 Villa Creek Dr., Suite 155 Dallas, TX 75234 members.aol.com/unibell	(972) 243-3902
USITT	USITT: The American Association of Design and Production Professionals in the Performing Arts 6443 Ridings Rd. Syracuse, NY 13206-1111 www.culturenet.ca/usitt	(800) 938-7488 (315) 463-6463

USP	U.S. Pharmacopeia (Formerly: U.S. Pharmacopoeial Convention) 12601 Twinbrook Pkwy Rockville, MD 20852-1790 www.usp.org	(800) 227-8772 (301) 881-0666
WA	Wallcoverings Association 401 N. Michigan Ave. Chicago, IL 60611-4267	(312) 644-6610
WASTEC	Waste Equipment Technology Association 4301 Connecticut Ave. NW, Suite 300 Washington, DC 20008	(202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281-3145	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association (Formerly: American Window Covering Manufacturers Association) 355 Lexington Ave., 17th Floor New York, NY 10017-6603	(212) 661-4261
WEF	Water Environment Federation (Formerly: Water Pollution Control Federation) 601 Wythe St. Alexandria, VA 22314-1994 www.wef.org	(800) 666-0206 (703) 684-2400
WIC	Woodwork Institute of California P.O. Box 980247 West Sacramento, CA 95798-0247 www.wicnet.org	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Association 507 First St. Woodland, CA 95695 www.wmmpa.com	(800) 550-7889 (530) 661-9591
WPCF	Water Pollution Control Federation (See WEF)	
WRI	Wire Reinforcement Institute 301 E. Sandusky St. Findlay, OH 45840 www.bright.net/~rreiter	(419) 425-9473

WSC	Water Systems Council Building C, Suite 20 800 Roosevelt Rd. Glen Ellyn, IL 60137	(630) 545-1762
WSFI	Wood and Synthetic Flooring Institute (See MFMA)	
WWPA	Western Wood Products Association Yeon Building 522 SW 5th Ave. Portland, OR 97204-2122 www.wwpa.org	(503) 224-3930

I. Federal Government Agencies: Names and titles of Federal Government standards- or specification-developing agencies are often abbreviated. The following abbreviations and acronyms referenced in the Contract Documents indicate names of standards- or specification-developing agencies of the Federal Government. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

CE	Corps of Engineers (U.S. Department of the Army) 20 Massachusetts Ave., NW Washington, DC 20314 www.usace.army.mil CRD standards are available from: U.S. Army Corps of Engineers Waterways Experiment Station Technical Report Distribution Section Services Branch, TIC 3909 Halls Ferry Rd. Vicksburg, MS 39180-6199	(202) 761-0660 (601) 634-2696
CFR	Code of Federal Regulations (Available from the Government Printing Office) Washington, DC 20401 (Material is usually published first in the "Federal Register.") www.access.gpo.gov	(202) 512-1800
CPSC	Consumer Product Safety Commission East West Towers 4330 East-West Hwy Bethesda, MD 20814 www.cpcs.gov	(800) 638-2772 (301) 504-0990

CS	Commercial Standard (U.S. Department of Commerce) Government Printing Office Washington, DC 20402 For commercial standards, contact: Ms. Brenda Umberger CS & PS Specialist c/o NIST Gaithersburg, MD 20899 www.nist.gov	(202) 512-1800 (301) 975-4036
DOC	Department of Commerce 14th St. and Constitution Ave., NW Washington, DC 20230 www.doc.gov	(202) 482-2000
DOT	Department of Transportation 400 Seventh St., SW Washington, DC 20590 www.dot.gov	(202) 366-4000
EPA	Environmental Protection Agency 401 M St., SW Washington, DC 20460 www.epa.gov	(202) 260-2090
FAA	Federal Aviation Administration (U.S. Department of Transportation) 800 Independence Ave., SW Washington, DC 20591 www.faa.gov	(202) 366-4000
FCC	Federal Communications Commission 1919 M St., NW Washington, DC 20554 www.fcc.gov	(202) 418-0126
FDA	Food and Drug Administration 5600 Fishers Lane Rockville, MD 20857 www.fda.gov	(301) 443-1544
FHA	Federal Housing Administration (U.S. Department of Housing and Urban Development) 451 Seventh St., SW Washington, DC 20410 www.hud.gov	(202) 401-0388

FS	Federal Specification Unit (Available from GSA) 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407 www.gsa.gov	(202) 619-8925
GSA	General Services Administration F St. and 18th St., NW Washington, DC 20405 www.gsa.gov	(202) 708-5082
MIL	Military Standardization Documents (U.S. Department of Defense) Defense Automated Printing Service 700 Robbins Ave., Building 4D Philadelphia, PA 19111 www.dodssp.daps.mil	(215) 697-2179
NIST	National Institute of Standards and Technology (U.S. Department of Commerce) Building 101, #A1134, Rte. I-270 and Quince Orchard Rd. Gaithersburg, MD 20899 www.nist.gov	(301) 975-2000
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor) 200 Constitution Ave., NW Washington, DC 20210 www.osha.gov	(202) 219-8148
PS	Product Standard of NBS (U.S. Department of Commerce) Government Printing Office Washington, DC 20402 For product standards, contact: Ms. Brenda Umberger CS & PS Specialist c/o NIST Gaithersburg, MD 20899 www.nist.gov	(202) 512-1800 (301) 975-4036
RUS	Rural Utilities Service (Formerly: Rural Electrification Administration) (U.S. Department of Agriculture) 14th St. and Independence Ave., SW Washington, DC 20250	(202) 692-0187

TRB	Transportation Research Board, National Research Council 2101 Constitution Ave., NW Washington, DC 20418 www.nas.edu/trb	(202) 334-2934
USDA	U.S. Department of Agriculture 14th St. and Independence Ave., SW Washington, DC 20250 www.usda.gov	(202) 720-8732
USPS	U.S. Postal Service 475 L'Enfant Plaza, SW Washington, DC 20260-0010 www.usps.gov	(202) 268-2000

J. State Government Agencies: The following state government agencies develop standards referenced in the Contract Documents:

California

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation Technical Information 3485 Orange Grove Ave. North Highland, CA 95660-5595	(916) 574-2041 (800) 952-5210

Texas

TFS	Texas Forest Service Forest Products Laboratory Highway 59 S. P.O. Box 310 Lufkin, TX 75902-0310	(409) 639-8180

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 Summary: This Section specifies temporary services. Remove when no longer needed or replaced by permanent facilities.

1.02 Regulations: Comply with applicable laws and regulations including standards set forth by the Massachusetts Department of Public Safety and the Occupational and Safety Health Act of 1970, latest revision.

1.03 Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition". Comply with Occupational and Safety Health Act of 1970, latest revision. Comply with all other applicable safety standards and regulations.

1.04 Conditions of Use: Keep facilities clean and neat. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload or permit facilities to interfere with progress. Do not allow hazardous, dangerous or unsanitary conditions or public nuisances to develop or persist on the site.

1.05 Materials and Equipment: Provide new materials and equipment or, if acceptable to the Architect, undamaged previously used materials and equipment in serviceable condition may be used. Provide materials and equipment suitable for the use intended.

A. Lumber and Plywood: Provide fire treated lumber and plywood for sheds and offices. Provide minimum 5/8 inch thick exterior plywood for other uses.

B. Tarpaulins: Waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

1.06 WEATHER PROTECTION

A. The Contractor shall provide a minimum temperature of 55 degrees Fahrenheit to all occupied areas of the project if the existing permanent heating system cannot be utilized or if the work requires a shutdown of the existing system.

B. "Weather Protection" shall mean the temporary protection of that Work adversely affected by moisture, wind, and cold by covering, enclosing, and/or heating. This protection shall provide adequate work areas during the months of November through March as determined by the Authority and consistent with the construction schedule to permit the continuous progress of all Work necessary to maintain an orderly and efficient sequence of construction operations. The Contractor shall furnish and install "Weather Protection" material and be responsible for all costs, including heating required to maintain a minimum of 40 degrees Fahrenheit at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials, or the applicable conditions set forth in the Contract Articles with added regard to performance obligations of the Contractor.

C. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices.

D. The Contractor shall provide thermometers at places designated by the Architect in order to determine if specified temperatures are being maintained.

E. Unit heaters, if used, shall be of the smokeless type and be installed and operated in such a way that they will not damage finished work or endanger the health and welfare of the occupants. Salamanders shall not be used.

F. The entire responsibility for weather protection during construction, until Substantial Completion, shall be assumed by the Contractor, who shall be liable for any damage to any Work caused by failure to supply proper weather protection and proper ventilation.

G. Work damaged by frost shall be removed and replaced at the expense of the Contractor and as directed by the Architect.

H. It is to be specifically understood that the Contractor shall do no work under any conditions deemed unsuitable by the Contractor to the perfect execution of the Work. This provision shall not constitute any waiver, release, or lessening of the Contractor's obligation to bringing the Work to Substantial Completion within the period of time set forth in the Contract Documents.

1.07 Temporary Construction and Support Facilities Installation: Locate for each access. Maintain facilities until Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

A. A temporary office will not be required for this project. The Contractor shall keep documents pertaining to the construction in a safe place at the construction site.

B. Telephone Service: Telephone service will not be required for this project. The Project Superintendent shall always be available however, by cell phone or pager.

C. Temporary Utilities:

1. The Contractor will be allowed to use existing electric power and city water through connection to a hydrant with a meter at the site. Existing power in the building is limited and the Contractor may need to provide his own power or make arrangements with the power company. The Contractor shall be responsible for providing supplementary fuses, breakers and any other control devices required to assure that the basic needs for the operations of the ongoing functions at the site are not interfered with. Comply with all applicable safety regulations. Secure municipal permits and perform work with licensed personnel when required by codes. At the close of each day’s work, temporary wiring of any type which may present a hazard shall be removed.

D. Toilets: Install self-contained single-occupant toilet units of the chemical aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material. Use of pit-type privies will not be permitted.

E. Wash Facilities: Arrange with owner to use existing wash facilities or install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up. Dispose of drainage properly. Supply cleaning compounds.

F. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units.

G. Temporary Shoring: Provide temporary shoring of existing construction. Engineer shoring to adequately support the existing loads.

H. Temporary Enclosures: Provide temporary enclosure for protection of construction from exposure, foul weather, other construction operations and similar activities. Where heat is needed, provide enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions.

1. Install tarpaulins securely, with incombustible framing. Close openings through floor or roof decks and horizontal surface with load-bearing construction.

I. Project Identification and Temporary Signs: A sign is not required for this project.

J. Collection and Disposal of Waste: Collect waste daily. Comply with NFPA 241 for removal of combustible waste. Enforce requirements strictly. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose in a lawful manner.

K. Staging and Hoisting: Provide temporary construction staging, planking and hoisting for all trades unless specifically noted otherwise under particular sections. All temporary staging shall conform to OSHA and all other applicable regulatory requirements.

1.08 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Fire Extinguishers: Provide hand-carried, portable UL rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand carried, portable, UL rated, class "ABC" dry chemical extinguishers. Locate fire extinguishers where effective for the intended purpose, but not less than one on each floor near each usable stairwell.

1. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

2. Store combustible materials in containers in fire-safe locations.

3. Provide supervision of welding operations, combustion type temporary heating units, and sources of fire ignition.

B. Barricades, Warning Signs and Lights: Comply with standard and code requirements for erection of barricades. Paint appropriate warning signs to inform personnel and the public of the hazard being protected against. Where needed provide lighting, including flashing lights.

C. Security Enclosure and Lockup: Install temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism and theft. Where materials and equipment must be stored, provide a secure lockup.

D. Environmental Protection: Operate temporary facilities and conduct construction by methods that comply with environmental regulations, and minimize the possibility that air, waterways and

subsoil might be contaminated or polluted. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints.

1.09 Operation: Enforce strict discipline in use of temporary facilities. Limit availability to intended use to minimize abuse. Maintain facilities in good operating condition until removal.

1.10 Termination and Removal: Remove each facility when the need has ended, or replaced by a permanent facility, or no later than Substantial Completion. Complete or restore construction delayed because of interference with the facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

END OF SECTION

SECTION 015001 – AIR QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division I General Requirements, apply to the work of this section.

B. This section applies to all work performed under the Contract.

C. The strictest interpretation of these specifications shall apply, particularly where there may be a conflict between sections.

1.2 SUMMARY

A. Section specifies requirements prior to, during and after each construction period.

1. Section Includes:

a. Testing indoor air quality before beginning demolition and construction operations of existing building areas.
b. Construction procedures to be implemented during demolition and construction operations to promote acceptable indoor air quality after construction completion.
c. Flush-out of building after construction completion and before occupancy in compliance with commissioning requirements.
d. Testing indoor air quality after construction completion in compliance with commissioning requirements.
e. Testing air change effectiveness after construction completion in compliance with commissioning requirements.

B. Definitions:

1. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and similar products.
2. Contaminants: Gases, vapors, governmental-regulated pollutants, airborne mold and mildew, and similar materials.
3. Particulates: Dust, dirt, and other airborne solid matter.
4. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds (VOCs) during installation, drying, or curing.

1.3 SUBMITTALS

A. Indoor Air Quality Management Plan:

1. Describe Plan in detail; take measures to promote acceptable indoor air quality at construction completion in compliance with SMACNA IAQ Guidelines for Occupied Buildings Under Construction and with commissioning requirements.

2. Submit Plan min. 60 days before beginning selective demolition or construction completion of building enclosure.
3. Identify potential sources of odor and dust.
4. Identify demolition operations and construction activities which produce unacceptable odors or dust.
5. In occupied buildings, identify areas which may have IAQ deficiencies due to demolition or construction operations.
6. Evaluate potential problems by severity and describe methods of IAQ control to be used.
7. Describe method of ventilation during demolition and construction operations, including type and duration of ventilation, use of permanent HVAC systems, types of filtration media, and schedules for periodic replacement of filtration media during demolition and construction operations.
8. Describe methods to be employed for cleaning and dust control procedures.

B. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to absorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

C. Duct and Terminal Unit Inspection Report: Submit Report min. 60 days after inspection.

D. Air Contaminant Test Plan: Submit Plan min. 60 days before beginning selective demolition or construction completion of building enclosure, identifying following as minimum:

1. Testing agency qualifications.
2. Locations and scheduling of air sampling.
3. Test procedures.
4. Test instruments and apparatus.
5. Sampling methods.

E. Air Contaminant Test Reports: Submit Reports min. 60 days after testing, identifying following as minimum:

1. Location and time for taking each sample.
2. Test values of each air sample and average values for each set of 3 tests.
3. HVAC operating conditions.
4. Certification of test equipment calibration.
5. Other conditions or discrepancies which influenced test results.

F. Ventilation Effectiveness Test Plan: Submit Plan min. 60 days before beginning selective demolition or construction completion of building enclosure, identifying following as minimum:

1. Testing agency qualifications.
2. Description of test spaces, including air sampling locations.
3. Test procedures, stating whether tracer gas decay or step-up testing methods will be used.
4. Test instruments and apparatus; identify tracer gas to be used in test.
5. Sampling methods.

G. Ventilation Effectiveness Test Reports: Submit Reports min. 60 days after testing, identifying following as minimum:

1. Include preliminary tests of instruments and apparatus and of test spaces.
2. Calculation of ventilation effectiveness.
3. Location and time of each sample.
4. Test values for each air sample.
5. HVAC operating conditions.
6. Other information required by ASHRAE 129.
7. Other conditions or discrepancies which might influence test results.

1.4 OWNER REQUIREMENTS

A. Intent: Execute the work with the least possible disturbance to the Owner's and building occupants' operations and without damage to or loss of the Owner's and building occupants' property.

B. Avoiding Nuisance: Take special care and make special efforts to avoid creating any nuisance, which could interfere with the Owner's ability to conduct business, and to avoid disturbing occupants who remain in the building during the work of this project.

C. Health and Comfort of Building Occupants: Throughout the work, use only materials, products and procedures which do not create or contribute to objectionable dust, odors, or other conditions, and which are specifically chosen to avoid adversely affecting the health and comfort of building occupants.

D. Vehicles and Engines, Noise and Exhaust Fumes: Do not operate any vehicle, machinery, or Engines Noise and Exhaust Fumes engine less than 50 feet from the nearest Owner occupied area, except where specific prior written permission has been obtained from the Owner or Architect. Ensure exhaust fumes do not migrate to Owner occupied areas.

E. When directed by the Owner or Architect, immediately cease offending operations and relocate Construction Manager's operations to another work area to maintain job progress.

1.4 USE CHARGES

A. Cost or use charges for these services are not chargeable to the Owner or Architect and will not be accepted as a basis of claims for a Change Order. Applicable costs shall be paid by the Construction Manager.

1.5 REGULATIONS

A. Comply with applicable laws and regulations including standards set forth by the Massachusetts Department of Public Safety and the Occupational and Safety Health Act of 1970, latest revision.

1.6 STANDARDS

A. Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition". Comply with Occupational and Safety Health Act of 1970, latest revision. Comply with EPA IAQ Tools for Schools program [http://www.epa.gov/iedweb00/schools/tools4s2.html]. Comply with ASHRAE

62 Indoor Air Quality Standards. Comply with all other applicable safety standards and regulations.

B. The following additional references shall be also be used in defining potential pollutant or irritant test levels to be achieved.

1. "Indoor Air Quality: Position Paper, (Approved by ASHRAE Board of Directors August 11, 1987; Reaffirmed by ASHRAE Board of Directors February 10, 2000)." [http://www.ashrae.org/ABOUT/iaq_papr.htm].
2. ACGIH (American Conference of Governmental Industrial Hygienists) TLV (Threshold Limit Values), TWA (Time Weighted Average) and STEL (Short Term Exposure Limits) and CEIL (Ceiling Limits), most current published limits.
3. NIOSH (National Institute for Occupational Safety and Health) REL (Recommended Exposure Limits), TWA and STEL/CEIL, most current published limits.

1.7 CONDITIONS OF USE

A. Keep facilities clean and neat. Operate in a safe and efficient manner. Take necessary preventative measures. Do not allow hazardous, dangerous or unsanitary conditions or public nuisances to develop or persist on the site.

1.8 INDEMNIFICATION

A. The Construction Manager shall be solely responsible for air quality problems and issues related to the Construction Manager's operations. To the fullest extent permitted by law, the Construction Manager and its subcontractors shall indemnify and hold harmless the Owner, the Architect, and their agents and employees from and against all claims, damages, losses and expenses including, but not limited to, attorneys' fees arising out of or relating to the performance of the Work, including air quality, caused in whole or in part by any negligent act or omission of the Construction Manager, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CONSTRUCTION PROCEDURES

A. Ventilation:

1. HVAC system has been designed to achieve minimum requirements for ventilation specified in ASHRAE 62 with air change effectiveness as required by Code.
2. Begin construction ventilation when building is substantially enclosed.
3. When working in portion of occupied building, prevent movement of air from construction area to occupied area.
4. Before using return air ductwork without intake filters, clean and remove dust and debris generated by demolition and construction activities from ductwork and perform following:

a. Inspect duct intakes, return air grilles, and terminal units for dust.

b. Clean plenum spaces, including upper surfaces of acoustical ceilings, exterior surfaces of ductwork, and upper surfaces of pipes and conduit.
c. Clean tops edges of doors and frames.
d. Clean mechanical and electrical rooms, including upper surfaces of pipes, ducts, and conduit, equipment, and supports.
e. Clean return plenums of air handling units.
f. Remove intake filters after completing cleaning operations.

5. Do not perform dusty or dirty work after starting use of return air ductwork if ductwork has no temporary or permanent intake filters.
6. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to demolition or construction operations.

B. Prevent absorption of moisture and humidity by absorptive materials by:

1. Sequencing delivery of materials to building after wet work is completed and dry.
2. Delivering and storing materials in fully sealed moisture-impermeable packaging.
3. Providing sufficient ventilation for drying within reasonable time frame.
4. Complying with requirements of Section 01100 related to biological contamination by harmful mold and mildew.
5. Not storing construction materials or waste in mechanical or electrical rooms.

3.2 BUILDING FLUSH-OUT

A. Contractor's Option:

1. Perform either full continuous flush-out or satisfactory air contaminant testing, not both.
2. Perform building flush-out before occupancy.
3. Do not start flush-out until:

a. All construction work is completed.
b. HVAC systems are tested, adjusted, and balanced for proper operation.
c. Inspection of interior of return air ducts and terminal units verifies that additional cleaning is not required.
d. New HVAC filtration media have been installed.

B. Building Flush-Out:

1. Operate all ventilation systems at normal flow rates with 100 percent outside air for min. 14 consecutive days.
2. Obtain Owner's approval that Substantial Completion has been achieved before beginning flush-out.
3. If additional construction work is required that involves materials which produce particulates or any contaminants being performed during flush-out, restart building flush-out procedure for additional 14 day period.
4. Install new HVAC filtration media after completion of building flush-out and before occupancy or further testing.

3.3 AIR CONTAMINANT TESTING

A. Contractor's Option:

1. Perform either full continuous flush-out or satisfactory air contaminant testing, not both.
2. Perform air contaminant testing before starting demolition or construction operations to establish baseline for evaluation of post-construction testing.
3. Perform air contaminant testing before occupancy.
4. Do not start air contaminant testing until:

    a. All construction work is completed.
    b. HVAC systems are tested, adjusted, and balanced for proper operation.
    c. Inspection of interior of return air ducts and terminal units verifies that additional cleaning is not required.
    d. New HVAC filtration media have been installed.

B. Indoor Air Samples:

1. Collect Air Samples:

    a. From spaces representative of occupied areas.
    b. While operable windows and exterior doors are closed, HVAC system is operating in normal mode, and building is unoccupied.
    c. From spaces in each air handler zone.
    d. At 48 in. to 84 in. height above floor.
    e. From same locations on 3 consecutive days during normal business hours and average results of each set of 3 samples.
    f. Exception: Do not test areas having normal or very high outside air ventilation rates, such as laboratories.

2. When retesting same building areas, take samples from same locations tested in previous test.
3. Outdoor Air Samples: Collect air samples at outside air intake of each air handler at same time as indoor samples are taken.
4. Analyze air samples and submit report.

C. Air Contaminant Concentration Determination and Limits:

1. Carbon Monoxide: Measure in parts per million (ppm), in relation to outdoor air, with results not exceeding outside air.
2. Airborne Mold and Mildew: Measure in relation to outside air, with results not exceeding outside air.
3. Formaldehyde: Measure in micrograms per cubic meter, in relation to outside air, with results not exceeding 20 micrograms per cubic meter higher than outside air.
4. Total Volatile Organic Compounds (TVOC): Measure in micrograms per cubic meter, in relation to outside air, with results not exceeding 200 micrograms per cubic meter higher than outside air.

5. Total Particulates (PM): Measure in micrograms per cubic meter, in relation to outside air, with results not exceeding 20 micrograms per cubic meter higher than outside air.

3.4 VENTILATION EFFECTIVENESS TESTING

A. Perform ventilation effectiveness testing before building occupancy and after acceptance of Substantial Completion.

B. Do Not Begin Ventilation Effectiveness Testing Until:

1. HVAC testing, adjusting, and balancing has been satisfactorily completed.
2. Building flush-out or air contaminant testing has been satisfactorily completed.
3. New HVAC filtration media have been installed.

C. Test each air handler zone in accordance with ASHRAE 129.

D. If calculated air change effectiveness for particular zone is less than 0.9 due to inadequate balancing of system, adjust system and retest at no additional cost to Owner.

END OF SECTION 015001

SECTION 015002 - RODENT CONTROL

PART 1 – GENERAL

1.1 SUMMARY

A. General Requirements: Before beginning demolition, retain a local exterminator or pest control company acceptable to the City to develop a plan and procedures for exterminating rats and other pests inhabiting the project site and preventing them from migrating from the project site to adjacent properties. Employ this company to implement extermination and control procedures before the start of the Work at the site and at regular intervals throughout the duration of the project until Substantial Completion, so that abutting properties are kept free of rodents and their residue. Minimizing pollution and damage from pests that may occur as result of construction operations and for protecting resources within Project boundaries and those outside limits of permanent work.

B. Assume responsibility for any delays resulting from failure to comply with pest control laws and regulations.

C. Related Sections:

1. Division 01 Section “Temporary Facilities”; for removal of temporary facilities and controls at completion of work.
2. Division 01 Section “Construction Waste Management and Disposal”; for Contractor-generated nonhazardous and hazardous waste.

D. Definitions:

1. Pests: Term "pests" means rodents that adversely affect wellbeing of personnel and animals; attack or damage real property, supplies, equipment, or vegetation; or are otherwise undesirable.

E. Perform control operations in a lawful manner using environmentally safe products.

F. Regulatory Requirements: Formulate and apply pest control chemicals; label with federal registration number to comply with EPA regulations and authorities having jurisdiction.

G. Pest Control Plan Compliance:

1. No requirement in this Section shall be construed as relieving Contractor of any applicable federal, state, and local environmental protection law and regulation.
2. During Construction, assume responsibility for identifying, implementing, and submitting for approval any additional requirements to be included in Pest Control Plan.

3. Contents:

    a. Name(s) of person(s) within Contractor's organization responsible for ensuring adherence to Pest Control Plan.
    b. Description of Contractor's Personnel Training Program to maintain compliance with Pest Control Plan.
    c. Include monitoring and reporting requirements to assure that control measures are in compliance with Pest Control Plan, federal, state, and local laws and regulations.

H. Extermination Program: As a minimum, require the pest control company to perform the following services:

1. At least 10 days prior to demolition bait the building for rodents.
2. Install a series of exterior rodent stations around the perimeter of the site.
3. Maintain these stations and service them weekly until the project is completed and all debris is removed.
4. Provide a monthly report indicating rodent activity and bait station status.

I. Final Inspection and Report: Prior to requesting inspection to certify substantial completion, require the licensed exterminator or pest control company which has been responsible for rodent control on the site to make a final inspection and prepare a report recording rodent-related activity (or absence thereof) at the site at the time of Substantial Completion, and recommending follow-up activities, if appropriate.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 015002

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:

1. Division 01 Section "Allowances" for products selected under an allowance.
2. Division 01 Section "Alternates" for products selected under an alternate.
3. Division 01 Section "References" for applicable industry standards for products specified.
4. Division 01 Section "Closeout Procedures" for submitting warranties for contract closeout.
5. Division 02 and all Sections beyond for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Construction Manager.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service

performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

F. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

G. “Materials" are products that are shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed or installed to form a part of the Work.

H. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.4 SOURCE LIMITATION

A. To the fullest extent possible, provide products of the same kind, from a single source.

1.5 MANUFACTURER PREFERENCE

A. Attention is directed to the provisions of General Laws of Massachusetts (Ter. Ed.) chapter 7, Section 23A, including provisions of Chapter 7, Section 22 Clause (17) which states as follows:

1. “A preference in the purchase of supplies and materials, other consideration being equal, in favor, first, of supplies and materials manufactured and sold within the Commonwealth; second, to supplies and materials manufactured and sold elsewhere within the United States."

1.6 NAMEPLATES

A. Except for required labels and operating data, do not attach manufacturer's nameplates or trademarks on surfaces exposed to view in occupied spaces or on the exterior.

B. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an inconspicuous accessible surface. The nameplate shall contain all information needed to identify the equipment and information to contact the manufacturer/installer as well as all essential operating data.

1.7 STANDARD PRODUCT

A. Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

1.8 NON-PROPRIETARY SPECIFICATIONS

A. When Specifications list products or manufacturers that are available and may be used but do not restrict the Construction Manager to use of these products only, the Construction Manager may propose any product that complies with Contract requirements unless specifically stated otherwise.

1.9 DESCRIPTIVE SPECIFICATION REQUIREMENTS

A. Where Specifications describe a product, listing characteristics required with or without use of a brand name, provide a product that provides the characteristics and otherwise complies with requirements.

1.10 REQUIREMENTS FOR UNSPECIFIED PRODUCTS

A. Where Specifications fail to describe a product or listing characteristics which are required for details, assemblies or finished products in the Contract Documents, the Construction Manager shall provide products that are of good quality, are fit for the intended use and are of even kind, quality and quantity to complete the required details, assembly or finished product to adhere to the quality of the surrounding Work and of the construction of the Project generally.

1.11 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Construction Manager's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:

a. Specification Section number and title.
b. Generic name used in the Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's name and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.
h. Identification of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.

a. At Construction Manager's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.

4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
5. Architect's Action: Architect will respond in writing to Construction Manager within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form provided by Owner. All substitutions must be accompanied by a filled out Substitution Request Form included in the Project Manual. NO REVIEW OF SUBSTITUTIONS WILL BE PROCESSED WITHOUT THIS FORM ATTACHED.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

    a. Statement indicating why specified material or product cannot be provided.
    b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
    i. Detailed comparison of Construction Manager's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
    j. Cost information, including a proposal of change, if any, in the Contract Sum.
    k. Construction Manager's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

l. Construction Manager's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.
b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.12 QUALITY ASSURANCE

A. Source Limitations:

1. To fullest extent possible, provide products of same kind, from single source.
2. When specified products are available only from sources that do not or cannot produce quantity adequate to complete Project requirements in timely manner, consult with Architect for determination of most important product qualities before proceeding.
3. Qualities may include attributes relating to visual appearance, strength, structural, durability, or compatibility.
4. When determination has been made, select products from sources that produce products possessing these qualities, to fullest extent possible.

B. Compatibility of Options: If Construction Manager is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.

2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.13 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products to allow for inspection and measurement of quantity or counting of units.
6. Store materials in a manner that will not endanger Project structure.
7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
9. Protect stored products from damage.

B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.14 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Construction Manager of obligations under requirements of the Contract Documents.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Refer to individual specification sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes,

profiles, dimensions, and other characteristics that are based on the product named. Retain one of first two options in subparagraph below for default requirement. Coordinate default with requirements in majority of Specification Sections. If retaining ", unless otherwise indicated" option, exceptions must be noted in individual Specification Sections.

a. Substitutions will not be considered.

6. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.

   a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
   b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

7. Visual Matching: Where Specifications require matching a sample, the Architect's decision on whether a proposed product matches in final. Where no product matches and complies with other requirements, comply with provisions for "substitutions" for selection of a matching product in another category.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products. Anchor each product securely in place, accurately located and aligned with other Work. Clean exposed surfaces and protect to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Installation of the Work.
3. Cutting and patching.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Sections:

1. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner

that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.4 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility lines, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Construction Manager, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings. If discrepancies are discovered, notify Architect promptly.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. See other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

C. Construction Manager to include cutting, coring, drilling, and patching of holes and openings for the work of all subtrades unless specifically noted otherwise.

1.2 QUALITY ASSURANCE

A. General Scope: The contract documents include replacement work and construction. Not all the existing conditions are shown nor the complete extent of patching nor interfacing construction to existing conditions. The Construction Manager and subcontractors shall examine and study the existing construction and conditions to fully understand the extent of cutting required. The work includes, but is not limited to, selective demolition and cutting required to perform demolition work, patching/repairing existing to remain construction is required if damaged during selective demolition.

B. Structural Work: Do not cut and patch structural elements in a manner that would reduce the load-carrying capacity or load deflection ratio. Obtain approval of the cutting and patching proposal before cutting and patching structural elements.

C. Operational and Safety Limitations: Do not cut and patch operating elements or safety components in a manner that would reduce their capacity to perform as intended, or would increase maintenance, or decrease operational life or safety. Obtain approval of the cutting and patching proposal before cutting and patching operating elements or safety related systems.

D. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would reduce the building's aesthetic qualities or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner if Work is to remain exposed.

PART 2 PRODUCTS

2.1 MATERIALS

A. Use materials identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible. Use materials whose performance will equal or surpass existing materials.

B. Comply with requirements in other Sections.

PART 3 EXECUTION

3.1 INSPECTION

A. Before cutting, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut. See structural requirements.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for the installation of other components or the performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible, review procedures with the original installer; comply with the original installer's recommendations.

1. Where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
2. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
3. By-pass utility services such as pipe or conduit before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe as noted. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that which are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

D. Cleaning: Thoroughly clean areas and spaces where cutting and patching is performed. Remove paint, mortar, oils, putty and similar items. Thoroughly clean piping, conduit and similar features before painting or finishing is applied.

END OF SECTION 017329

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. See Division 01 Section "Selective Structure Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

C. See Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 50 percent by weight of total waste generated by the Work and in compliance with requirements of Section 018113.23 and in compliance with 310 CMR 19.017: Massachusetts Waste Disposal Ban Regulation

1.4 SUBMITTALS

A. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for commencement of the Work.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include separate reports for demolition and construction waste. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Qualification Data: For Waste Management Coordinator and refrigerant recovery technician.

H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Waste Management Conference: Conduct conference at Project site.

1.6 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification and waste reduction work plan. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
2. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
3. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
4. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - EXECUTION

2.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

2.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in future Work:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner's Use:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

2.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by Owner and Construction Manager.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.

5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

2.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 4-inch size.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 4-inch size.
2. Clean and stack undamaged, whole masonry units on wood pallets.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

I. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

J. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

K. Plumbing Fixtures: Separate by type and size.

L. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

M. Lighting Fixtures: Separate lamps by type and protect from breakage.

N. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

O. Conduit: Reduce conduit to straight lengths and store by type and size.

2.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees at landfill facility.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

2.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for Project Closeout including, but not limited to:

1. Inspection procedures.
2. Submittal of Project Record Document submittal.
3. Submittal of Operating and Maintenance Manual submittal.
4. Submittal of Warranties.
5. Processing utility rebates.
6. Final cleaning.

B. Comply with submittals for project closeout requirements related to Massachusetts Energy Conservation Compliance (780CMR13), including:

1. Energy conservation compliance requirements.
2. Reports and analysis documents.
3. Project record documents.
4. Operation and maintenance data requirements.
5. Demonstration and training requirements.

C. Closeout requirements for specific construction activities are included in appropriate Sections in Divisions 2 through 33.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete following.

1. List exceptions in request.
2. In Application for Payment that coincides with, or first follows, date Substantial Completion is claimed, show 100 percent Completion for portion of work claimed as Substantially Complete.
3. Include supporting documentation for Completion as indicated in these Contract Documents and statement showing accounting of changes to Contract Sum.
4. If 100 percent Completion cannot be shown, include list of incomplete items, value of incomplete construction, and reasons work is not complete.
5. Advise Owner of pending insurance change-over requirements.

6. Submit specific warranties, workmanship bonds, release of liens from material suppliers or subcontractors as work progresses, maintenance agreements, final certifications, and similar documents.
7. Obtain and submit releases enabling Owner unrestricted use of work and access to services and utilities; include occupancy permits, operating certificates, and similar releases.
8. Submit Record Drawings, Maintenance Manuals, Damage or Settlement Survey, Property Survey, and similar final Record information.
9. Deliver tools, spare parts, extra stock, and similar items.
10. Make final change-over of permanent locks and transmit keys to Owner.
11. Advise Owner's personnel of change-over in security provisions.
12. Complete start-up testing of systems, and instruction of Owner's operating and maintenance personnel.
13. Discontinue or change-over and remove temporary facilities from site, along with construction tools, mockups, and similar elements.
14. Complete final clean up requirements, including touch-up painting.
15. Touch-up and otherwise repair and restore marred exposed finishes.
16. Perform a final inspection. Develop a “punch list” and deliver it to the Architect. The Architect will then perform the Architect’s “punch list” inspection.

B. Inspection Procedures:

1. On receipt of request for inspection, Architect will either proceed with inspection or advise Construction Manager of unfulfilled requirements.
2. The Architect will prepare Certificate of Substantial Completion following inspection, or advise Construction Manager of construction that must be completed or corrected before Certificate will be issued.
3. The Architect will repeat inspection when requested and assured that work has been Substantially Completed.
4. Results of completed inspection will form basis of requirements for Final Acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of Final Acceptance and Final Payment, complete following.

1. List exceptions in request.
2. Submit Final Payment Request with final releases, including all releases of liens from material suppliers and subcontractors for all placed work, and supporting documentation not previously submitted and accepted.
3. Include certificates of insurance for products and completed operations where required.
4. Submit updated final statement, accounting for final additional changes to Contract Sum.
5. Submit certified copy of Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for Acceptance and list has been endorsed and dated by Architect.
6. Submit final meter readings for utilities, measured record of stored fuel, and similar data as of date of Substantial Completion, or when Owner took possession of and responsibility for corresponding elements of work.
7. Submit consent of surety to Final Payment.
8. Submit final Liquidated Damages Settlement Statement.

9. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure:

1. The Architect will reinspect work on receipt of notice that work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to Architect.
2. On completion of reinspection, Architect will prepare Certificate of Final Acceptance, or advise Construction Manager of work that is incomplete or of obligations that have not been fulfilled but are required for Final Acceptance.
3. If necessary, reinspection will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS

A. General:

1. Do not use Record Documents for construction purposes; protect from deterioration and loss in secure, fire-resistive location.
2. Provide access to Record Documents for Architect's reference during normal working hours.

B. Record Drawings:

1. Maintain clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings.
2. Mark set to show actual installation where installation varies substantially from work as originally shown.
3. Mark whichever drawing is most capable of showing conditions fully and accurately.
4. Where shop drawings are used, record cross-reference at corresponding location on Contract Drawings.
5. Give particular attention to concealed elements that would be difficult to measure and record at later date.
6. Mark Record Sets with red erasable pencil; use other colors to distinguish between variations in separate categories of work.
7. Mark new information that is important to Owner, but was not shown on Contract Drawings or Shop Drawings.
8. Note related Change Order numbers where applicable.
9. Organize Record Drawing Sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on cover of each set.

C. Record Specifications:

1. Maintain one complete copy of Project Manual, including addenda, and one copy of other written Construction Documents such as Change Orders and modifications issued in printed form during construction.
2. Mark these documents to show substantial variations in actual work performed in comparison with text of Specifications and modifications.
3. Give particular attention to substitutions, selection of options, and similar information on

elements that are concealed or cannot otherwise be readily discerned later by direct observation.

4. Note related Record Drawing information and Product Data.
5. On completion of work, submit Record Specifications to Architect for Owner's records.

D. Record Product Data:

1. Maintain one copy of each product data submittal.
2. Mark these documents to show significant variations in actual work performed in comparison with information submitted.
3. Include variations in products delivered to site and from manufacturer's installation instructions and recommendations.
4. Give particular attention to concealed products and portions of work that cannot otherwise be readily discerned later by direct observation.
5. Note related Change Orders and mark-up of Record Drawings and Specifications.
6. On completion of mark-up, submit complete set of Record Product Data to Architect for Owner's records.

E. Record Sample Submittal:

1. Immediately before date or dates of Substantial Completion, Construction Manager will meet at site with Architect and Owner's personnel to determine which of submitted Samples that have been maintained during progress of work, are to be transmitted to Owner for record purposes.
2. Comply with delivery to Owner's sample storage area.

F. Miscellaneous Record Submittals:

1. Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of work.
2. Immediately before date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference.
3. Submit to Architect for Owner's records.

G. Maintenance Manuals:

1. Organize operating and maintenance data into suitable sets of manageable size.
2. Bind properly indexed data in individual heavy-duty 2 in., 3-ring vinyl-covered binders, with pocket folders for folded sheet information.
3. Mark appropriate identification on front and spine of each binder.
4. Include following type of information:

    a. Emergency instructions.
    b. Spare parts list.
    c. Copies of warranties.
    d. Wiring diagrams.
    e. Recommended turn-around cycles.
    f. Inspection procedures.

g. Shop drawings and product data.
h. Fixture lamping schedule.

1.6 UTILITY REBATES

A. Comply with Specification requirements for electric and gas utility company requirements for installing energy management programs.

B. Assist Architect to process utility rebates identified during design process.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operating and Maintenance Instructions:

1. Arrange for each installer of equipment that requires regular maintenance to meet with Owner's personnel to provide instruction in proper operation and maintenance.
2. If installers are not experienced in procedures, provide instruction by manufacturer's representatives; complete with step-by-step operating manuals written for each operating sequence or combination of sequences.
3. Include detailed review of following items:

a. Maintenance manuals, complete with step-by-step instructions for maintenance and troubleshooting.
b. Record documents.
c. Spare parts and materials.
d. Tools.
e. Lubricants.
f. Fuels.
g. Identification systems.
h. Control sequences.
i. Hazards.
j. Cleaning.
k. Warranties and bonds.
l. Maintenance agreements and similar continuing commitments.

4. As part of instruction for operating equipment, demonstrate following procedures:

a. Startup.
b. Shutdown.
c. Emergency operations.
d. Noise and vibration adjustments.
e. Safety procedures.

f. Economy and efficiency adjustments.
g. Effective energy utilization.

5. Prepare a Training Schedule no less than sixty (60) days prior to Substantial Completion with notification to all City Departments and personnel for required training.

3.2 FINAL CLEANING

A. General: General Cleaning during construction is required by General Conditions and is included in Division 01 Section “Temporary Facilities and Controls.”.

B. Cleaning:

1. Employ experienced workers or professional cleaners for final cleaning.
2. Clean each surface or unit to condition expected in normal, commercial building cleaning and maintenance program.
3. Comply with manufacturer's instructions.
4. Complete following cleaning operations before requesting inspection for Certificate of Substantial Completion.

a. Remove labels that are not permanent labels.
b. Clean transparent materials, including mirrors and glass in doors and windows.
c. Remove glazing compound and other substances that are noticeable vision-obscuring materials.
d. Replace chipped or broken glass and other damaged transparent materials.
e. Clean exposed exterior and interior hard-surfaced finishes to dust-free condition, free of stains, films, and similar foreign substances.
f. Restore reflective surfaces to their original reflective condition.
g. Leave concrete floors broom clean.
h. Wipe surfaces of mechanical and electrical equipment.
i. Clean plumbing fixtures to sanitary condition.
j. Clean light fixtures and lamps.
k. Clean site, including landscape development areas, of rubbish, litter, and other foreign substances.
l. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits.
m. Rake grounds that are neither paved nor planted, to smooth even-textured surface.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of work during construction.

D. Compliance:

1. Comply with regulations of authorities having jurisdiction and safety standards for cleaning.
2. Do not burn waste materials.
3. Do not bury debris or excess materials on Owner's property.
4. Do not discharge volatile, harmful, or dangerous materials into drainage systems.
5. Remove waste materials from site and dispose of in lawful manner.

6. Where extra materials of value remaining after completion of associated work have become Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Sections:

1. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Architect.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect, through Construction Manager, will return two copies.

B. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or modify each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Construction Manager.
6. Name and contact information for Architect.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based upon file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel upon opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear

plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.

2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Construction Manager is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a

tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections:

1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
2. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal: Submit one paper copy set of marked-up record prints and one set(s) of plots from corrected record digital data files. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
b. Final Submittal: Submit one paper copy set of marked-up record prints, one set(s) of record digital data files, and three set(s) of record digital data file plots. Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Record data as soon as possible after obtaining it.
c. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Construction Manager.

C. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Engineer. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:

1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Engineer for resolution.
4. Engineer will furnish Construction Manager one set of CAD Drawings of the Contract Drawings for use in recording information.

a. Architect makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as paper copy.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training media.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.
2. Divisions 02 and beyond for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

A. Instruction Program: Submit Six (6) copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. At completion of training, submit one complete training manual for Owner's use.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

E. Demonstration and Training Media, Video Tape and DVD: Submit two (2) copies of Video Tapes and DVDs within seven (7) days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of photographer.
c. Name of Architect and Construction Manager.

d. Name of Contractor.
e. Date videotape and DVD was recorded.
f. Description of vantage point, indicating location, direction by compass point, and elevation or story of construction.

2. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of media on each page.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or education maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Photographer Qualifications: A factory-authorized service representative who is experienced photographing construction projects.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

1. Prepare a Training Schedule no less than sixty (60) days prior to Substantial Completion with notification to all City Departments and personnel for required training.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Motorized doors, including overhead coiling doors.
2. Equipment, including stage equipment, projection screens, waste compactors, food-service equipment, residential appliances, and laboratory fume hoods.
3. Fire-protection systems, including [fire alarm, fire pumps and fire-extinguishing systems.
4. Intrusion detection systems.
5. Conveying systems, including elevators and wheelchair lifts.
6. Laboratory equipment, including laboratory air and vacuum equipment and piping.
7. Heat generation, including boilers, feedwater equipment, pumps, steam distribution piping, and water distribution piping.
8. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping.
9. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
10. HVAC instrumentation and controls.
11. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies and motor controls.
12. Packaged engine generators, including transfer switches.
13. Lighting equipment and controls.
14. Communication systems, including intercommunication, surveillance, clocks and programming, voice and data and television equipment.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project Record Documents.

e. Identification systems.
f. Warranties and bonds.
g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

    a. Diagnosis instructions.
    b. Repair instructions.
    c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    d. Instructions for identifying parts and components.
    e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. The Commissioning Agent will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Owner’s Project Manager, with at least fourteen (14) days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.

E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING MEDIA

A. General: Engage a qualified commercial photographer to record demonstration and training media. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Provide digital recordings for final preparation of DVDs and Videotapes as follows:

1. Videotape format: Provide six (6) copies of each demonstration and trainings in high-quality VHA color videotape in full-size cassettes for conversion to DVD format.
2. DVD Format: Provide six (6) copies of each demonstration and trainings in high-quality DVD.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

D. Narration: Describe scenes on electronic media by audio narration by microphone while dubbing audio narration off-site after it is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction by compass point, and elevation or story of construction.

E. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from media opposite the corresponding narration segment.

END OF SECTION 017900

SECTION 018130 - FIRE SUPPRESSION SYSTEMS COMMISSIONING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

A. This Section includes general requirements that apply to implementation of the commissioning process for fire suppression systems, assemblies, and components.

B. Related Sections include the following:

1. Division 01 Section “General Commissioning Requirements” for general commissioning process activities.
2. Division 21, Section “Fire Protection”
3. Division 26, Section “Electrical”

1.3 DEFINITIONS

A. Commissioning Plan: A document, prepared by CxA, that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority.

C. Quality Assurance: A program for the systematic monitoring and evaluation of the various aspects of a system, assembly, or component to ensure that standards of quality are being met. This is the responsibility of the CxA.

D. Quality Control: A system for ensuring the maintenance of proper standards in systems, assemblies, and components. This is the responsibility of the Contractor.

E. Official: State or Local official having jurisdiction over the conveying systems

F. Systems, Assemblies, Equipment, and Components: Where these terms are used together or separately, they shall mean “as-built” systems, assemblies, equipment, and components.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONSTRUCTION CHECKLISTS

A. The CxA shall provide Construction Checklists to the Contractors for execution that will indicate expected Quality Control features required for a highest-quality installation. The contractor shall complete the checklists as construction progresses and return them to the CxA as indicated in Division 01 Section “General Commissioning Requirements”.

B. Checklists for this section will include:

1. Wet sprinkler piping and equipment
2. Dry sprinkler piping and equipment
3. A sample installation checklist is included to show the typical scope and rigor of the process.

3.2 PREREQUISITES TO TESTING

A. Prior to the testing of these systems or assemblies, the Contractor shall certify that:

1. The system or assembly is completely installed, functional, and documented.
2. Work performed by other trades, but essential for this system or assembly’s operation, is complete (e.g., electrical components are wired and power is provided)
3. All contractor-performed start-up procedures and tests are complete and documented.
4. The system or assembly is ready for the Owner to take beneficial use.

3.3 SYSTEM OR ASSEMBLY TEST REQUIREMENTS

A. The CxA will provide Functional Performance Test procedures to the Contractor for execution for the following specific systems, assemblies, and components:

1. Wet sprinkler systems
2. Dry sprinkler system
3. Fire alarm system interactions

B. Acceptance criteria and test details will be in accordance with the related sections including the following:

1. Division 01 Section “General Commissioning Requirements” for general commissioning process activities.
2. Division 21, Section “Fire Protection “
3. Division 26, Section “16000 Electrical “

C. A sample functional performance test is included to show the typical scope and rigor of the process.

3.4 TEST REPORTS

A. Provide copies of all reports required in the listed reference sections (see Section 1.2 SUMMARY above for the sections) for review.

END OF SECTION 018130

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of the interior of the auditorium and kitchen areas.
2. Salvage of existing items to be reused or recycled.

B. Related Sections include the following:

1. Division 01 Section "Summary" for use of premises, and phasing requirements.
2. Division 01 Section "Photographic Documentation" for preconstruction photographs taken before selective demolition operations.
3. Division 01 Section "Temporary Facilities" for temporary construction and environmental-protection measures for selective demolition operations.
4. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
5. Division 23 Section "Mechanical Demolition" for demolition of selective areas.
6. Division 26 Section "Electrical Demolition" for demolition of selective areas.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

B. Unless otherwise indicated, demolition waste becomes property of the Contractor.

1.5 SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Locations of proposed dust- and noise-control temporary partitions and means of egress.
5. Means of protection for items to remain and items in path of waste removal from building.

C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

D. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.

E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1. Comply with submittal requirements in Division 01 Section "Construction Waste Management and Disposal."

F. Statement of Refrigerant Recover: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.,

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.7 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

1. Comply with requirements specified in Division 01 Section "Summary."
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Storage or sale of removed items or materials on-site is not permitted.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
2. Refer to Divisions 23 and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner Building manager will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

C. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.

D. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.

1. Electrical power panels dedicated to the area to be demolished are located in the janitor/electric room on first floor shown on Drawing A101. They are designated B(A), BB(B), HB(C), and HBB(D). Panels B, HB and HBB are fed underground from the main electric switchboard approximately 350 LF away as shown on Drawing A101.
2. To make safe the power within the area to be demolished, turn off the circuit breakers in the main switchboard labeled B, HB and HBB. Disconnect the feeder cables to each of

these circuit breakers. Insulate the cable conductors with tape and fittings, then label each conductor.

3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap or plug and seal remaining portion of pipe of conduit.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during and for at least four hours after flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

B. Dust Control:

1. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding and pollution.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

B. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.

1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

C. Existing Wood Flooring and Wood Wall Paneling: Remove existing wood flooring, wood wall paneling and associated substrate.

D. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 024120 – REMEDIATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Contractor shall furnish all labor, materials, and services for the mitigation work as defined in the project documents. Work shall be coordinated through the Owner's representative.

B. "IH" shall refer to the Industrial Hygiene (IH) firm that is designated as the "Owner's authorized representative for purposes of inspecting and monitoring the remediation Work.

C. Contractor" shall refer to the Contractor that is performing the Work of this specification.

1.2 EXTENT OF WORK

A. It is the intent of this specification to remove identified building contents and components which have been negatively impacted by flooding associated with Hurricane Sandy. In addition, the remaining building structure within the confines of the Work Area will be cleaned and HEP A vacuumed.

1. This work will take place while the school is occupied.
2. The work area will be segregated from the remainder of the school.
3. Doorways and openings into the work area will be sealed with polyethylene plastic sheeting.
4. A solid barrier in addition to the polyethylene sheet barrier will be required at the separation of the serving area in the kitchen and cafeteria to ensure the area cannot be inadvertently accessed.

B. At the discretion of the contractor, areas may be separated and removal and cleaning conducted in phases if this will expedite the process. Pre-approval of phasing must be granted by the owner's representative.

C. All access in and out of the work area by the contractor will be conducted through the loading dock in the kitchen.

D. Access to other areas of the school will not be allowed to the contractor.

E. Prior arrangements must be made with the school therefore a proposed schedule must be submitted with the pre-construction submittal package.

F. At the completion of the demolition phase and cleaning and HEP A vacuuming and prior to build back the contractor will meet the requirements of the post remediation verification.

1.3 TASKS

A. Removal and Cleaning Activities include removal, decontamination and disposal of impacted waste items and materials identified and cleaning of all surfaces within the work area demarcation.

B. Administrative Activities include record keeping and security.

C. Environmental Oversight Activities include work practice inspections and monitoring.

D. Cleaning and Decontaminating Activities include HEPA vacuuming and washing with a detergent contents and surfaces within the work area demarcation.

E. Post Remediation Verification Activities include final visual inspection, testing and certification of completion.

1.4 SPECIAL CONSIDERATIONS

A. The Contractor shall be responsible for performing all Work in the most time and cost efficient manner in accordance with industry standards.

B. The Contractor shall use industry "State of the Art" Work standards and practices, See Reference Guidance documents as necessary section 6.1.1.

1.5 DEFINITIONS

A. General: Definitions and explanations here are neither complete nor exclusive of all terms used in the contract documents, but are general for the work to the extent they are not stated more explicitly in another element of the contract documents. Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon.

B. Glossary:

1. Aerosol: Solid or liquid particles, suspended in air.
2. Air Monitoring: The process of collecting and analyzing air samples to determine the total concentration of airborne particulate using direct read instrumentation. The process of collecting air samples for analysis of total spore for comparative purposes. Or the collection of air samples for a gravimetric determination of ambient particulate. This overall monitoring procedure is also called Air Testing, or Testing.
3. Authorized Visitor: Any person approved by the Contracting Officer, the contractor or any government agency which has proven jurisdiction over the work.
4. Barrier: Any surface that seals the work area to inhibit the movement of dust or contaminants. The barrier responsible for isolation of the work area from adjacent spaces, typically constructed of polyethylene sheeting secured in place at penetrations such as doors, windows or any other opening into the work area. Secondary Barrier – Any additional sheeting to collect and provide protection from debris during abatement.
5. Breathing Zone: A hemisphere forward of the shoulders with a radius of approximately 6 to 9 inches.
6. Bulk Test: The collection and analysis of samples of suspected asbestos materials. A small amount, or bulk, of the material is physically removed from the structure and placed in a rigid airtight container for transportation to an accredited lab for analysis.
7. Cleaning: The process of using a HEPA vacuum and wet cleaning agents to remove contaminants; the process includes the removal of bulk debris from the Work area.

8. Competent person: As defined in the OSHA Construction Standard (29 CFR 1926), a person who is capable of identifying or predicting hazardous Working conditions and Work areas, and who has authorization to take prompt, corrective measures to eliminate the hazards. A competent person is not necessarily a risk assessor, inspector, or abatement project supervisor.
9. Engineering controls: Measures other than respiratory protection or administrative controls that are implemented at the Work site to contain, control, and/or otherwise reduce exposure to hazards usually in the occupational health setting. The measures include process and product substitution, isolation, and ventilation.
10. High-Efficiency Particulate Air (HEPA) Filter: A filter which removes from the air 99.97% or more of monodisperse dioctyl phthalate (DOP) particles having a mean diameter of 0.3 micrometer.
11. HEPA Filter Vacuum Cleaner: High efficiency particulate air vacuum collection equipment with a HEPA filter system capable of filtering exhausted air at 99.97% efficiency of particles having a mean diameter of 0.3 micrometers.
12. Negative Air Machine (NAM): Negative air machine equipped with HEP A filtration.
13. Negative Pressure: Air pressure lower than surrounding areas, created by exhausting air from a sealed space (work area).
14. Negative Pressure System: A local exhaust system, utilizing HEPA filtration capable of maintaining a negative pressure inside the work area and a constant air flow from adjacent areas into the work area and exhausting that air outdoors.
15. Polyethylene Sheeting: Strong plastic barrier material usually transparent, infers the use of 6 mil thickness.
16. Remediation: Work that involves corrective action including cleaning and removal of impacted materials.
17. Sealed Work Area: Refers to the work area after barriers have been erected and a negative pressure air system installed.
18. Visible Emissions: Any emission containing particulate asbestos material that are visually detectable without the aid of instruments.
19. Work Area: Area where work, cleaning or removal operations are performed which is defined and isolated to prevent the spread of dust or debris, and the entry of unauthorized personnel.

1.6 CODES AND REGULATIONS

A. Referenced Guidance Documents: Institute of Inspection, Cleaning and Restoration Certification (IICRC)

1. S500 Standard and Reference Guide for Professional Water Damage and Restoration, Vancouver, WA (1995).
2. S520 Standard Reference Guide for Professional Mold Remediation, Vancouver, WA (1995).

B. Preventing Indoor Air Quality Problems During Construction and Renovation, Bulletin 388. The Commonwealth of Massachusetts, Executive Office of Labor and Workforce Development, department of Labor Standards, Workplace Safety and Health Program.

C. Maintaining Indoor Environmental Quality (IEQ) During Construction and Renovation, National Institute for Occupational Safety and Health, Center for Disease Control and Prevention. 2007

D. IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition, Sheet Metal and Air Conditioning Contractor's National Association, 4201 Lafayette Center Drive, Chantilly, VA.

1.7 NOTIFICATIONS, PERMITS, AND LICENSES

A. Written notification is required by USEPA National Emission Standards for Hazardous Air Pollutants (NESHAPS) for Demolitions and Renovations. If Demolition and Renovation is part of this remediation, assure that this has been sent to and received by the regional NESHAPS Contact at least 10 Days prior to beginning any demolition or renovation Work.

B. State and Local Agencies: Send written notification as required by state and local regulations prior to beginning any demolition or renovation Work.

1. Commonwealth of Massachusetts - Department of Environmental Protection and written notification sent and received 10 Working days prior to beginning any demolition or renovation Work.
2. Local Board of Health. Send letter and copy of DEP notification 10 Working days prior to the start of Work.
3. Local Fire Department. Send written notification 10 Days prior to the start of Work.

C. Notify the local police department of the remediation project. Coordinate with the police for all security aspects of the project, as necessary.

1.8 PROJECT COORDINATION

A. Minimum administrative and supervisory requirements necessary for coordination of work on the project are personnel, contingency arrangements and security.

B. Personnel:

1. Supervisory Personnel: Shall consist of a qualified general superintendent, and appropriate number of qualified or competent foremen required to complete the remediation within contract time. Supervisory personnel will be capable and qualified to discuss the progress of the project and respond to issues that may arise as well as liaison with the owner's representative.
2. Non-Supervisory Personnel: Laborers employed for remediation shall be knowledgeable of the project requirements and be trained in company policies.

C. Contingency Plans and Arrangements: Prepare a contingency plan for emergencies including fire, accident, failure of power, failure of negative air system, failure of supplied air system or any other event that may require modification of standard operating procedures during abatement. Include specific procedures to ensure safe exiting and to provide medical attention in the event of an emergency. Post the telephone numbers and locations of emergency services including fire, ambulance, doctor, hospital, police, power company and telephone company in the clean room of personnel decontamination facilities. Provide assistance on developing contingency plans for responding safely and efficiently to any emergency during abatement. Provide and clearly indicate the location of approved fire extinguishers for every 10,000 sq. ft. and train the crew on the use of the equipment. Standards such as NFPA 241, "Safeguarding Construction, Alteration

and Demolition Operations, 1993", shall be followed to ensure a safe environment during construction.

D. Security: Provide a 24-hour security system, which consists solely of a guard and log book to ensure that every entry to the containment will be logged in and that only properly trained and outfitted workers will be allowed to enter. Entrance will be allowed also to any personnel authorized by the owner, such as their inspectors, engineers, etc., and inspectors from regulatory agencies. Security during non-working hours shall consist of securing all entrances to the work area by means of a lock. A copy of the keys or combinations to these locks shall be provided to the Owner. The contractor shall provide a 24-hour emergency response telephone number to the owner in the event of an engineering control failure within the work area.

1.9 WORKER PROTECTION

A. Respiratory Protection:

1. As appropriate under the contractors respiratory protection program the contractor will comply with respiratory protection requirements.
2. The Contractor shall provide all Workers, foremen, superintendents, authorized visitors, and inspectors personally-issued and marked respiratory protective equipment approved by NIOSH. When respirators with disposable filters are employed, the Contractor shall provide sufficient filters for replacement as necessary by the Worker or authorized visitor. Filters shall be disposed of as contaminated waste.

B. The Contractor shall provide personnel protection as required by all applicable guidance and regulations.

C. Respirators, disposable coveralls, head covers, safety glasses, rubber gloves/boots and footwear covers shall be provided by the Contractor for all Workers, the Consultant and other authorized visitors who may inspect the job site as appropriate in compliance with contractors' policies.

D. The Contractor shall require that Workers NOT eat, drink, smoke, chew gum or tobacco, or use toilet facilities (either existing or temporary) within the Work Area.

E. Contractor's personnel shall not enter into the occupied school area directly from the work area.

1.10 NEGATIVE PRESSURE FILTRATION SYSTEMS

A. Contractor shall provide enough HEPA filtered negative air units to completely exchange the work air 4 times/hour. Contractor shall demonstrate the number of units needed per work area for 4 room air changes by calculating the volume flow rate (cfin) delivered by each unit under 2 inches pressure drop across filters. Provide at least one standby unit in the event of a machine failure or emergency such as contamination in surrounding nonwork area. When the pressure differential system is operational provide enough HEPA filtration units to maintain a pressure differential in the work area of -0.02 inches of water or 5 Pascal's. As part of the negative pressure filtration system the contractor must have adequate manometric devices to illustrate the continued negative pressure.

B. Submittals: Before start of work submit design of negative air system. Submittal shall include number, location and size of HEPA units, points of exhaust, projected airflow within work area, anticipated pressure differential and supporting calculations for sizing. In all cases, submit the following:

1. Manufacturer's product data on the HEPA units.
2. Methods of supplying adequate power to the units and designation of panels supplying power.
3. Description of testing methods for correct airflow and pressure differential and manufacturer's product data on pressure differential monitor.

C. Pressure Differential: Provide a fully operational negative air system within the work area continuously maintaining a pressure differential across work area enclosures of -0.02 inches of water.

1. Demonstrate to the IH the pressure differential by use of a pressure differential meter or a manometer, before beginning the remediation project.

D. Monitoring: Continuously monitor and record the pressure differential between the work area and the building outside of the work area with either a monitoring device or pressure log incorporating a strip chart recorder or in written format on a log. Make the strip chart record part of the project log.

E. Testing the System: Test negative pressure system prior to any remediation and after the work area has been prepared, and the exhaust unit(s) installed, start the unit(s) (one at a time). Demonstrate operation and testing of negative pressure system to the IH.

F. Demonstration of Negative Air System Operation: Demonstrate the operation of the negative pressure system to the IH to include, but not be limited to the following:

1. Demonstrate pressure differential system will maintain -0.02" of water. Use a differential pressure meter or manometer to demonstrate a pressure difference across every barrier separating the Work Area from the balance of the building or outside. Modify the negative pressure system as necessary to successfully demonstrate the above.
2. Positive motion of air across all areas in which work is to be performed. Use smoke tubes to demonstrate air motion. Use a differential pressure meter or manometer to demonstrate a pressure difference of at least -0.02 inches of water across every barrier separating the Work Area from the balance of the building or outside. Modify the negative pressure system as necessary to successfully demonstrate the above.

G. Use of System During Demolition Operations:

1. Start exhaust units before beginning remediation work, after work has begun, run units continually to maintain a constant negative pressure until the work is complete. Do not turn off units at the end of the work shift or when remediation operations temporarily stop.
2. Once removal of identified items and building components has been conducted, begin the cleaning process. Start cleaning at a location farthest from the exhaust units and proceed toward them. If an electric power failure occurs, immediately stop all removal work and do not resume until power is restored and all exhaust units are operating again.

3. At completion of the remediation work, allow exhaust units to run as specified under this section, to remove airborne particulate that may have been generated during remediation work and cleanup and to purge the work area with clean make-up air.

H. Dismantling the System: When post remediation inspection and testing indicate that the area has met the standards, exhaust units may be removed from the work area. Before removal from the work area, properly remove and dispose of pre-filters, and seal intake while machine is running with 6 mil. polyethylene sheeting to prevent environmental contamination from the negative air machine.

1.11 CONTAINMENT BARRIERS AND COVERINGS OF WORK AREA

A. General: Seal off perimeter of work area to completely isolate remediation areas and to contain all airborne particulate created by remediation work. Cover all surfaces of the work area to protect them from cross contamination, to facilitate more efficient clean-up, and to protect the finishes from the work, as necessary. Should the area beyond the seal off limits become contaminated as a consequence of the work, clean those areas in accordance with procedures described in this section at no additional cost to the Owner.

B. The Work Area may be broken into smaller areas to ease project phasing and coordination at the discretion of the contractor. This segregation must be submitted and approved prior to the start of the work.

C. Preparation Prior to Sealing Off: Erect solid barriers consisting of new clean plywood in areas of openings from the work area larger than a standard doorway. Place all tools, scaffolding, staging, etc. necessary for the work in the area to be isolated prior to erection of temporary plastic sheeting enclosure. Disable ventilating systems or any other system bringing air into or out of the work area. Disable system utilizing positive means that will prevent accidental premature restarting of equipment, i.e., disconnecting wires, removing circuit breakers, lockable switch.

D. Critical Barriers:

1. Completely separate the work area from other portions of the building, and the outside by means of two layers of polyethylene sheeting barrier at least 6 mil. in thickness and duct tape. Individually seal all ventilation openings (supply and exhaust), lighting fixtures, clocks, doorways, windows, connectors and speakers, and other openings into the work area as appropriate with two layers polyethylene sheeting at least 6 mil. in thickness, taped securely in place with duct tape. Maintain seal until all work is completed. Take care in sealing off lighting fixtures to avoid melting or burning of sheeting. Seal the perimeter of all sheet plastic barriers with duct tape or spray cement.
2. All doors to the work area will be sealed with the critical barrier on both the inside and outside (building occupant side) to prevent from being used.
3. Critical barriers will be inspected daily for integrity and shall be repaired and/or replaced as necessary.

E. Control Access to Work Area: Permit access to the work area only through the controlled designated entry point. All other means of access shall be closed off and sealed and warning signs displayed on the clean side of the sealed access.

1. Where the area adjacent to the work area is accessible to the public, construct a solid barrier on the public side of the sheeting as required by this specification.
2. Construct barrier with nominal 2X4 wood stud's 16" on center, securely anchored to prevent movement, signs at each visual and physical barrier.
3. Post alternate emergency exits if applicable.

1.12 ENVIRONMENTAL OVERSIGHT

(MONITORING, INSPECTION AND TESTING)

A. Monitoring, Inspection and Testing by Contractor: The contractor is responsible for his/her employees and for providing safe conditions inside the work area for all authorized persons entering a work area. Keep a daily log of personnel, activities, and area conditions and make such log available to the IH. The log shall contain, but not be limited to, information on activities being performed, controls being utilized, failures to systems and the response to the failure.

B. Monitoring, Inspection and Testing by Owner's Representative: The Owner's representative will monitor the remediation project on a daily basis to document and verify the integrity of the controls used to contain the spread of contamination from the Work Area to the adjacent spaces.

1. Monitoring will consist of daily inspection of the activities and verification of the contractor's use of dust control measures.
2. Monitoring outside the Work Area will be conducted to verify the absence of elevated dust and debris outside the work area.

1.13 SUBMITTALS

A. The Contractor shall submit to the Owner's representative three (3) copies of the following listed documents. No remediation activities shall commence until these items are reviewed and approved by the Owner's representative. Submittal data shall be in sufficient detail to enable the Owner's representative to identify the particular process, product or equipment, and to form an opinion as to its conformity to the Specifications.

1. Completed copies of all applicable notifications, and permits.
2. Name and qualifications of Supervisor and Foremen.
3. Plan of Action & Standard Operating Procedures: Submit a detailed plan of the procedures and engineering controls proposed for use in complying with the requirements of this Specification. Include in the plan; drawings or sketches detailing isolation barriers. Work area limits or perimeter and HEP A exhaust unit locations.
4. Detailed work schedule.
5. Contingency Plan: Submit a contingency plan for emergencies including fire, accident, power failure, negative air system failure, or any other event that may require modifications or abridgment of Work practices. Include in plan specific procedures for Work Area isolation breach. It is understood that immediate danger to life and health (IDLH) hazard levels will take precedent to these specifications. Note that nothing in this Specification should impede safe exiting or providing of adequate medical attention in the event of an emergency.
6. Respiratory Protection Program: Submit level of respiratory protection intended for each operation required by the Project. Reference 29 CFR 1910.134 if applicable.

7. Manufacturer's documentation, including MSDS's, for all equipment, supplies or chemicals to be utilized during this project.

B. Submit the following items to the Owner's representative for approval within 30 days of project completion:

1. Project logs.
2. Recordings from Work Area pressure differential monitor, if utilized.

PART 2 - EXECUTION

2.1 GENERAL

A. Prior to the start of the work, the Contractor will verify the IH has conducted baseline sampling in and around the work area and facility. No work shall begin until these samples have been collected. These samples are vital to the determination of the efficacy of the remediation.

B. Remove identified building components and items impacted by the flooding associated with Hurricane Sandy. The Work Area and any remaining component or content shall be cleaned in accordance with this specification and the Reference Guidance Documents (see section# 1.6.1).

C. If it is determined that the HV AC system(s) need to be cleaned, the Contractor will follow the "NADCA General Specification for the Cleaning of Commercial Heating, Ventilating and Air Conditioning Systems," NADCA Copyright ©1997, Washington, D.C., as well as the applicable portions of this specification. Copies can be obtained from NADCA at 1518 K Street, N.W., Suite 503, Washington, D.C. 20005, 202-737-2926. E-mail: nadca@aol.com. Web site: www.nadca.com.

2.2 STOP REMEDIATION

A. If the owner's representative presents a stop work order, immediately stop all remediation and initiate dust reduction activities. Do not resume work until authorized in writing by the owner's representative. A stop work order will be issued at any time the owner's representative determines conditions are not within specification requirements. Stoppage will continue until conditions have been corrected. Standby time and cost required for corrective action is at the contractor's expense. The occurrence of the following events shall be reported in writing to the Owner's Representative and shall require the contractor to immediately stop work and initiate dust reduction activities. At a minimum improved construction area ventilation and barriers before work resumes.

1. Excessive airborne dust concentrations outside the work area (visible dust or concentrations or levels that are statistically greater than pre-work).
2. Visible dust observed in adjacent non-construction areas.
3. Break in the containment barriers.
4. Loss of negative air pressure (At or below -0.02 inches of water; 5 Pascal's).
5. Serious worker injury within the containment area which necessitates interruption of the normal activities.
6. Presence of a fire and safety emergency.
7. Power failure.

8. Excessive dust inside the work area (excessive accumulation on materials to be maintained).

2.3 REMOVAL OF WASTE ITEMS AND ITEMS TO BE CLEANED OFF SITE

A. All items to be discarded will be removed from the Work Area and discarded in waste containers and removed from the site.

B. Waste should be transferred from the Work Area directly outside into waste containers, waste should not enter into the occupied areas of the school. If waste must be transported through the occupied areas of the school prior approval must be requested from the owner's representative. All waste not transported directly outside into waste containers must be in clean, sealed waste receptacles.

C. For waste transported from within the Work area into a waste container via a chute, the chute must be a covered chute.

D. Contractor must use dust control means such as misting, as necessary to control ambient dust during the demolition and discarding processes.

2.4 CLEANING METHODS

A. There are two methods that have the potential for use in a water intrusion situation, depending on whether or not there is contamination that needs to be addressed.

B. Air Based Methods:

1. HEP A vacuuming or vacuuming with units that exhaust a safe distance outside the structure.
2. Air washing is a method that uses an air stream to blow contaminants or moisture off surfaces, which can result in aerosolizing, creating potential exposure for workers ad occupants. This method shall not be used except in outdoors or in laminate-airflow or high volume cleaning chambers, or in other situations where engineering controls are adequate to prevent excessive concentration of contaminants and minimize spreading of contaminants in Category 2 or 3 water.

C. Air washing has the potential to drive contaminants and fragments deeper into porous materials such as padding or upholstery.

D. Liquid based Methods: Liquid based methods rely on water combined with physical or mechanical cleaning process to dislodge contamination. The following are examples of acceptable liquid-based cleaning methods:

1. Immersion cleaning with an appropriate cleaning agent
2. Ultrasonic cleaning
3. Washing with an appropriate cleaning agent
4. Steam cleaning with live steam systems

2.5 REMEDIATION INSPECTION AND PREPARATIONS

A. Perform all preparatory work for the work area in accordance with the approved detailed work schedule. Execute the preparatory work in accordance with the specification.

B. Upon completion of all preparatory work, the IH will inspect the work and systems and will notify the contractor and owner when such work is in accordance with these specifications.

C. IH shall document the remediation inspection described above.

D. Upon satisfactory inspection of the installation and systems and satisfactory demonstration of operations the IH will notify the contractor to proceed.

2.6 CLEANING

A. Usually cleaning can be accomplished by using one or more of the following cleaning methods:

1. Detergent washing and rinsing.
2. Damp wiping with cleaning agent.

B. After thorough cleaning restorers should remove cleaning residue and follow up with rapid drying and appearance enhancement as appropriate.

C. If heavy odors exist, multiple cleanings and deodorizing attempts may be needed.

D. First Cleaning: Carry out a first cleaning of all surfaces of the work area including items of remaining sheeting, tools, scaffolding and/or staging by use of damp-cleaning and mopping, and HEP A filtered vacuuming. Do not perform dry dusting or dry sweeping. Use each surface of a cleaning cloth one time only and then dispose of as contaminated waste.

E. Recyclable cleaning cloths shall be disposed in appropriately marked containers. Continue this cleaning until there is no visible debris from removed materials or residue on plastic sheeting or other surfaces. Maintain negative pressure system in operation for the entire 24-hour period.

F. First Cleaning Verification: The IH will perform a thorough and detailed visual inspection at the end of the first cleaning to determine whether there are any signs of visible dust or debris in the work area. If the visual inspection is satisfactory, the IH will notify the contractor's supervisor to complete the cleaning process by following the steps for a "second cleaning".

G. Second Cleaning: Following the first visual inspection, perform a thorough cleaning of all surfaces of the work area in the same manner as the first cleaning. Leave only the following barrier and facilities.

1. Critical barrier which forms the sole barrier between the work area and other portions of the building or the outside.
2. Critical barrier sheeting over lighting fixtures and clocks, ventilation openings, doorways, connectors, speakers and other openings as appropriate.
3. Negative pressure system in continuous operation.

H. Second Cleaning Verification: The inspection will include the entire work area with all critical barriers in place. If any debris, residue on surfaces, dust or other matter is detected the area will be re-cleaned.

2.7 POST-REMEDIATION AND VERIFICATION

A. General: Notify the IH when the removal of identified materials and the second cleaning has been completed.

B. Air Scrubbing and Equalization: Once the area is deemed visually clean, the negative pressure air filtration system will be set to scrub mode. The NAM's will be allowed to operate in scrub mode for a minimum of a 24-hour period. At the competition of the scrub period, the NAM's will be shut down in order for the area to reach equilibrium with the remainder of the building for a period of 24 hours.

C. The HEPA-exhaust systems must remain running until the intake is sealed. Only, after the intake is adequately sealed with 6-mil polyethylene and duct tape will the system be shut down. After the equalization period, air samples will be collected.

D. Verification Testing: The Post Remediation Verification testing may take place using aggressive air sampling technique by operating circulating fans and leaf blowers during the verification sampling to ensure effective air circulation. The final verification will consist of a visual inspection and collecting air samples.

E. Samples collected for Post Remediation Verification will be analyzed using Spore Trap methodology.

F. Samples will be deemed acceptable when the concentrations and identification of particulate detected on the samples collected from inside the work area are equal to or less than the concentration of particulate detected on the samples collected from outside the work area and outside the building. In addition the identification of the particulate from samples collected inside the work area will be similar to the identification of particulate from the samples collected outside the work area and outside the building with no spikes or anomalies.

G. Completion of Remediation Work: After achieving the level of cleanliness and decontamination, as specified herein and as confirmed by the post remediation inspections and testing, the Contractor will be notified.

H. After successful completion of the post remediation air testing, the Contractor shall carefully remove any temporary barrier walls or tunnels that will not remain during the build back phase.

I. A sufficient number of HEP A-vacuum shall be kept on-site during this final disassembly Work to cleanup any dust or debris.

J. Remove NAM and all equipment not necessary for the build back phase of the project from the work area.

K. Submit copies of the daily log and pressure log to the IH.

END OF SECTION 024120
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SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A. Section Includes:

1. Clay face brick.
2. Building (common) brick.
3. Mortar and grout.
4. Embedded flashing.
5. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.

C. Related Sections:

1. Section 055000 "Metal Fabrications" for furnishing steel lintels for Unit Masonry.

1.3 ACTION SUBMITTALS

A. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

B. Samples for Initial Selection:

1. Brick.

C. Samples for Verification: For each type and color of the following:

1. Brick.
2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.4 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For testing agency.

C. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence according to ASTM C 67.
d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include name of manufacturer, brand name, and type.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Joint reinforcement.
6. Anchors, ties, and metal accessories.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 BRICK

A. Regional Materials: Brick shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Clay Face Brick: Facing brick complying with ASTM C 216.

1. Products: Subject to compliance with requirements, provide the following:

   a. Reuse salvaged and cleaned brick.

2. Grade: SW.
3. Type: FBS.
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
7. Application: Use where brick is exposed unless otherwise indicated.
8. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.

D. Building (Common) Brick: ASTM C 62, Grade MW or SW.

1. Size: Match size of face brick.
2. Application: Use where brick is indicated for concealed locations. Face brick complying with requirements for grade, compressive strength, and size indicated for building brick may be substituted for building brick.

2.5 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Aggregate for Grout: ASTM C 404.

G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

H. Water: Potable.

2.6 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.

2.7 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Copper: ASTM B 370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. weight or 0.0216 inch thick or ASTM B 370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. weight or 0.0162 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.

3. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
4. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
5. Fabricate through-wall flashing with sealant stop where unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
6. Fabricate metal expansion-joint strips from copper to shapes indicated.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, useType S.
3. For mortar parge coats, use Type S or Type N.
4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior nonload-bearing partitions, Type O may be used instead of Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.
3. Match color of existing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than 1/2 inch 1 inch 2 inches wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.7 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.8 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, extend flashing through outer wythe, turned up a minimum of 4 inches 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
3. At multiwythe masonry walls extend flashing through outer wythe, turned up a minimum of 4 inches 8 inches, and 1-1/2 inches into the inner wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.
4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
5. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
6. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
7. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
8. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.

3.9 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B C in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.10 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.11 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 050001 - MISCELLANEOUS AND ORNAMENTAL IRON (FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 GENERAL PROVISIONS - FILED SUB-BID REQUIRED

A. Time, Manner, and Requirements for Submitting Sub-Bid: The work of this Section is stipulated as a Filed Sub-Bid under the General Bid Form. Sub-Bids for the work of this Section shall be for the complete work and filed in a sealed envelope in strict compliance with and before the date and time stated in the Invitation for Bid and Instructions to Bidders. The following information shall appear in the upper left hand of the envelope:

Name of Bidder:

Name of Project: Repairs to Somerville High School Auditorium, Kitchen & Cafeteria

Section Number and Name of Sub-trade: 050001, MISCELLANEOUS AND ORNAMENTAL IRON

B. Form of Sub-Bid: The Sub-Bid for the work of this Section shall be made on the Form of Sub-Bid, a copy for the use of Sub-Bidders in submitting Sub-Bids is included in the Bid Package.

C. Bid Deposit: A Bid Deposit equal to five percent of the value of the Bid must be submitted with the Sub-Bid. The value of the Bid includes Add Alternates. The Bid Deposit may be in the form of a bid bond, cash, or a certified check on, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to The City of Somerville, Massachusetts.

D. Sub-Sub-Bid Requirements:

1. Sub-bidders attention is directed to Mass. GL Chapter 149, Section 44F as amended which provides in part as follows:

a. Each sub-bidder shall list in Paragraph E of the "Form for Sub-Bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which (the section of the Specifications for that sub-trade) required such listing; provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name in said Paragraph E for any such class of work or part thereof and perform that work with persons on his own payroll, if such sub-bidder, after sub-bid

openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work or part thereof with persons on his own payroll and is qualified to do so. This Section requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

Classes of Work	Section Number
Not Applicable	

E. Reference to Drawings: Work to be performed is shown on Drawings numbered:

1. AD101,AD102,AD103,AD104,AD105,AD106,AD107,AD108,A001,A010,A101,A102, A103,A121,A122,A123,A401,A511,A512,A602,A630,A631,A632,A701,HD201,HD202 ,HD203,HD204,H000,H201,H202,H203,H204,H500,H501,H700,H701,H702,H800,ED2 01,ED202,ED203,E000,E100,E201,E202,E203,E301,E302,E303,E401,E402,E403,E500, AVD201,AVD202,AVD203,AV000,AV201,AV202,AV203

1.3 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. All Work of Division 05 Section "Miscellaneous Fabrications."
2. All Work of Division 05 Section "Pipe and Tube Railings."

B. Alternates: Not Applicable.

1.4 TEMPORARY FACILITIES

A. Weather Protection:

1. Submit requirements to Construction Manager for temporary enclosures to permit work to be carried on during November through March in compliance with MGL Chapter 149, Section 44D(G), within 30 calendar days after Award of Contract.
2. Weather protection is defined as temporary protection of work which might be adversely affected by moisture, wind, and cold, and which requires covering and enclosing work areas to retain heat.

B. Heating: Submit requirements to Construction Manager for heating to permit work to be carried on during November through March in compliance with MGL Chapter 149, Section 44D(G), within 30 calendar days after Award of Contract.

C. Lifts and Hoists: All lifting and hoisting for this work shall be performed as work of this Section.

D. Waste Materials:

1. Removal of crating, packaging, and wrapping of material to be performed as work of Section 050001.

2. Waste materials related to crating, packaging, and wrapping of materials to be delivered to Construction Manager for removal from Project site.

E. Scaffolding and Staging: All scaffolding and staging for this work shall be performed as work of this Section.

END OF SECTION 050001

SECTION 055000 - METAL FABRICATIONS (FILED SUB-BID REQUIRED)

(Part of Work of Section 050001 – MISCELLANEOUS AND ORNAMENTAL IRON, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A. This Section includes the following metal fabrications:

1. Miscellaneous brackets, wall anchors, clip angles, supports and pipe sleeves.

    a. Framing for manufactured wall and roof panels.

2. Loose steel lintels.
3. HVAC unit support.
4. Perforated Architectural Metal Panels

B. Related Sections: The following Sections describe Work to be included in the Miscellaneous and Ornamental Iron Sub-Bid, but specified elsewhere:

1. Division 05 Section "Metal Fabrications" for miscellaneous metal fabrications.
2. Division 05 Section "Pipe and Tube Railings."
3. Division 08 Section "Fixed Louvers."

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 03 Section "Cast-in-Place Concrete" for installation of concrete fill and reinforcing materials.
2. Division 04 Section "Unit Masonry" for installation of loose lintels in masonry work.
3. Division 09 Section "Painting."

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product data for steel floor plate, paint products, and grout.

C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

D. Samples representative of materials and finished products as may be requested by Architect.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Rolled Steel Floor Plates: ASTM A 786/A 786M.

D. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500.

a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.

E. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

F. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

G. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

2.3 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Nonshrink, Nonmetallic Grouts:

a. Similar to Five Star Grout; Five Star Products.
b. Similar to Masterflow 928 and 713; Master Builders Technologies, Inc.
c. Similar to Sealtight 588 Grout; W. R. Meadows, Inc.
d. Similar to Sonogrout 14; Sonneborn Building Products-ChemRex, Inc.
e. Or equal.

C. Erosion-Resistant Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from

water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

D. Products: Subject to compliance with requirements, provide the following:

1. Erosion-Resistant Anchoring Cement:

a. Similar to "Super Por-Rok"; Minwax Construction Products Division.
b. Or equal.

2.4 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Build in straps, plates, and brackets as required for supporting and anchoring fabricated items to adjoining construction. Reinforce sheet metal units as required to attach and support other construction.

C. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

D. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

E. Shear and punch metals cleanly and accurately. Remove burrs.

F. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

G. Remove sharp or rough areas on exposed traffic surfaces.

H. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

I. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

J. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Include brackets, clips, miscellaneous fittings and anchors for interconnection and attachment of metal fabrications to other work.
2. Furnish inserts, sleeves and other devices for connecting metal fabrications to concrete or masonry work.

K. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

L. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

M. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.5 LOOSE STEEL LINTELS

A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels as indicated.

D. Galvanize loose steel lintels located in exterior walls and at exterior louvers.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors building into masonry.

a. Except as otherwise indicated, space anchors 24 inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.

C. Galvanize miscellaneous framing and supports at the following locations:

Kitchen.

2.7 PERFORATED ARCHITECTURAL METALS

A. Manufacturer
1. Hendrick Manufacturing Co., 1 Seventh Ave., Carbondale, PA 18407; Telephone: (877) 840-0881, (570) 282-1010; Fax: (570) 282-1506;
E-mail: sales@hendrickarchproducts.com; website: www.hendrickarchproducts.com.
2. Or Equal.

B. Material:
1. Steel: To ASTM A653
a. Thickness: 18 gauge (0.048 inch) (1.2 mm)
b. Sheet Size: As indicated in architectural drawings.
c. Shape: Flat
d. Finish: Painted
e. Color: Match adjacent walls. Submit range of colors to architect for selection.

C. Perforations:
1. Round: 0.191 inch diameter holes, 52.937% open area, .250 holes/in^2 (holes/mm^2), Staggered.
2. Pattern: HEND97A

D. End Pattern: Finished

E. Panel Edges: Edge margins 1 in, Side margins 1 in

F. Accessories:
1. Equip Panels With: Wood boarder trim to match adjacent existing walls.
2. Fixing Device: as detailed and indicated on shop drawings.

2.8 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.

B. Finish metal fabrications after assembly.

2.9 STAINLESS-STEEL FINISHES

A. Satin, Directional Polish: AISI No. 6 finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Locate and place sheet metal fabrications plumb, level, and in alignment with adjacent construction.

C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

F. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 09 Section "Painting."

B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055213 - PIPE AND TUBE RAILINGS (FILED SUB-BID REQUIRED)

(Part of Work of Section 050001 – MISCELLANEOUS AND ORNAMENTAL IRON, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A. This Section includes the following:

1. Steel pipe and tube railings and handrails for stairs, and landings.

B. Related Sections include the following:
1. Division 05 Section “Metal Fabrications” for steel pipe handrails and railings included with exterior stairs, interior and exterior ramps and railings.

C. Related Sections: The following Sections describe Work to be included in the Miscellaneous and Ornamental Iron Sub-Bid, but specified elsewhere:

1. Division 05 Section "Metal Fabrications" for miscellaneous metal fabrications.
2. Division 05 Section "Pipe and Tube Railings.”

1.3 PERFORMANCE REQUIREMENTS

A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:

1. Structural Steel: AISC S335, "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary."
2. Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."

B. Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements of ASTM E 985 for structural performance, based on testing performed according to ASTM E 894 and ASTM E 935.

C. Thermal Movements: Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and

other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Grout, anchoring cement, and paint products.

B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other Work.

1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this Project in material, design, and extent.

B. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 “Structural Welding Code-Steel” and AWS D1.3 “Structural Welding Code-Sheet Steel.”

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.6 STORAGE

A. Store handrails and railings in a dry, well-ventilated, weathertight place.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate installation of anchorages for handrails and railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.9 SCHEDULING

A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that does not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Stainless-Steel Pipe and Tube Railings:

a. Blum, Julius & Co., Inc.
b. Paragon Aquatics; Division of Pentair, Inc.
c. Pisor Industries, Inc.
d. Stainless Fabricators, Inc.
e. Sterling Dula Architectural Products, Inc.; Div. of Kane Manufacturing.
f. Tri Tech, Inc.
g. Tubular Specialties Manufacturing, Inc.
h. Tuttle Railing Systems; Div. of Tuttle Aluminum & Bronze, Inc.
i. Wagner, R & B, Inc.; a division of the Wagner Companies.
j. Or equal.

2.2 STAINLESS STEEL

A. Recycled Content of Steel Products: Provide products with average recycled content of stainless steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Tubing: ASTM A 554, Grade MT 304

C. Pipe: ASTM A 312/A 312M, Grade TP 304

D. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20

E. Plate and Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304

2.3 STEEL AND IRON

A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

B. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

C. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:

1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

    a. Galvanized finish for exterior installations and where indicated.
    b. Type F, or Type S, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.

2. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless another grade is required by structural loads.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
4. Iron Castings: Malleable iron complying with ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

D. Brackets, Flanges, and Anchors:

1. Where railings call for aluminum railings, provide self-leveling wall and post brackets to match aluminum rail finishes.
2. Where railings call for wood railing, provide self-leveling wall and post brackets to match metal guard rail finishes.
3. Where railings call for painted steel tailings, provide cast or formed metal of same type of material and finish matching the supported rails, unless otherwise indicated.

2.4 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

C. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.

1. For steel handrails, railings, and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

D. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

1. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, unless otherwise indicated.
2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

2.5 PAINT

A. Shop Primers: Provide primers to comply with applicable requirements in Division 09 Section "High Performance Coatings."

2.6 FABRICATION

A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Form changes in direction of railing members as follows:

1. As detailed.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

E. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

F. Nonwelded Connections: Fabricate handrails and railings by connecting members with concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

G. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

H. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

I. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

J. Close exposed ends of handrail and railing members with prefabricated end fittings.

K. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.

L. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.7 FINISHES, GENERAL

A. Comply with requirements of Division 05 Section “Shop-Applied Metal Finishes” for shop-applied finish to fabricated metal work.

2.8 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines, or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Directional Satin Finish: No. 4.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean

1. Stripe paint edges, corners, crevices, bolts, and welds.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

A. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

B. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with post-installed anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.

1. Weld flanges to railing ends.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

1. For steel-framed gypsum board assemblies, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.

3.7 CLEANING

A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 Section "Painting."

3.8 PROTECTION

A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213

SECTION 057313 - GLAZED DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Post-supported railings with glass infill.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring railings.

1.3 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.4 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Somerville High School.

1.6 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of railings assembled from standard components.

2. Anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, and attachment details.

C. Samples for Initial Selection: For products involving selection of color, texture, or design.

D. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Each type of glass required.
3. Fittings and brackets.
4. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.

E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and testing agency.

B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

D. Preconstruction test reports.

E. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.8 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups as shown on Drawings.
2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches (600 mm) in length.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide one of the following:
   1. The Wagner Companies.
   2. Morse Industries.
   3. Or equal.

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

C. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods, including structural analysis, preconstruction testing, field testing, and in-service performance.

   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. See Section 016000 "Product Requirements."

   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
   1. Stainless Steel: 60 percent of minimum yield strength.
   2. Glass: 25 percent of mean modulus of rupture (50 percent probability of breakage), as listed in "Mechanical Properties" in AAMA's Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."

C. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   1. Handrails and Top Rails of Guards:

      a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.4 STAINLESS STEEL

A. Tubing: ASTM A 554, Grade MT 304.

B. Pipe: ASTM A 312/A 312M, Grade TP 304.

C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.

D. Sheet, Strip, Plate, and Flat Bar: ASTM A 666 or ASTM A 240/A 240M, Type 304.

E. Bars and Shapes: ASTM A 276, Type 304.

2.5 GLASS AND GLAZING MATERIALS

A. Safety Glazing: Glazing shall comply with 16 CFR 1201, Category II.

B. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent flat glass), Quality-Q3. Provide products that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16 CFR 1201 for Category II materials.

1. Glass Color: Clear
2. Thickness for Glass Infill Panels: 1/2”.

C. Laminated Glass: ASTM C 1172, Condition A (uncoated), Type I (transparent flat glass), Quality-Q3 with two plies of glass and polyvinyl butyral interlayer not less than 0.060 inch (1.52 mm) thick.

1. Kind: LT (laminated tempered).

2. Glass Color: Clear.
3. Interlayer Color: Clear.

D. Safety Glazing Labeling: Permanently mark glass with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

2.6 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide the following:

1. Stainless-Steel Components: Type 304 stainless-steel fasteners.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.

1. Provide hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 **or** ICC-ES AC308.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage**,** but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

H. Form changes in direction as follows:
1. By flush bends or by inserting prefabricated flush-elbow fittings.
2. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
3. By bending to smallest radius that will not result in distortion of railing member.

I. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

J. Close exposed ends of hollow railing members with prefabricated end fittings.

K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work where indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

2.8 GLAZING PANEL FABRICATION

A. General: Fabricate to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.

1. Clean-cut or flat-grind edges at butt-glazed sealant joints to produce square edges with slight chamfers at junctions of edges and faces.
2. Grind smooth exposed edges, including those at open joints, to produce square edges with slight chamfers at junctions of edges and faces.

B. Infill Panels: Provide laminated, tempered glass panels for both straight and curved sections.

2.9 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.10 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.

C. Directional Satin Finish: No. 4.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.3 ANCHORING POSTS

A. Cover anchorage joint with flange of same metal as post, attached to post with set screws.

3.4 INSTALLING GLASS PANELS

A. Post-Supported Glass Railings: Install assembly to comply with railing manufacturer's written instructions and with requirements in other Part 3 articles. Erect posts and other metal railing components, then set factory-cut glass panels. Do not cut, drill, or alter glass panels in field. Protect edges from damage.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made.

B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings according to ASTM E 894 and ASTM E 935 for compliance with performance requirements.

C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.

D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.6 CLEANING

A. Clean stainless steel by washing thoroughly with water and soap, rinsing with clean water, and wiping dry.

B. Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.

C. Clean wood rails by wiping with a damp cloth and then wiping dry.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057313

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A. This Section includes the following:

1. Rough carpentry work not specified elsewhere and generally intended for support of other work.
2. Wood furring.
3. Miscellaneous blocking, grounds, nailers and panels.
4. Installation of door hardware.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 06 Section "Interior Architectural Woodwork" for interior trim and woodwork specially fabricated for this Project.
2. Division 08 Section "Door Hardware" for hardware furnished for installation under this Section.
3. Division 09 Section "Gypsum Board Assemblies" for metal-stud formed partitions, and gypsum sheathing.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 01 Specification Sections.

B. Product data for the following products:

1. Construction adhesives.

C. Wood treatment data from chemical treatment manufacturer. Include chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated material.

1. Preservative Treatment: Include certification by treatment plant stating type of solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.

2. Waterborne Preservative Treatment: Include certification that moisture content of treated wood was reduced to levels specified prior to shipment to Project site.
3. Warranty: Include warranty of chemical treatment manufacturer for each type of treatment.

D. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction evidencing compliance of the following wood products with specified requirements and building code in effect for Project.

1.4 QUALITY ASSURANCE

A. Forest Certification: For wood products, provide materials produced from wood obtained from forests certified by FSC-accredited certification body to comply with FSC STD-01-001, FSC Principles and Criteria for Forest Stewardship.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack material above ground level on uniformly spaced supports to prevent deformation.

1. For material pressure treated with waterborne chemicals, place spacers between each bundle for air circulation.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Grade Stamps: Furnish lumber with each piece factory-marked with grade stamp of inspection agency that indicates grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, furnish pieces marked on ends or back of each piece.

C. Sizes: Provide nominal sizes indicated, complying with PS 20 except where actual sizes are specifically noted as being required.

D. Surfacing: Dressed lumber, S4S, unless otherwise indicated.

E. Fire Retardant Treated Lumber: All lumber used in interior concealed locations is to be fire retardant treated.

2.2 DIMENSION LUMBER FOR CONCEALED CONDITIONS

A. Species: Same species as designated for exposed conditions.

B. Moisture Content: Same moisture content as designated for exposed conditions.

C. Grade: Same grade as designated for exposed conditions.

2.3 DIMENSION LUMBER FOR EXPOSED CONDITIONS

A. Species: Any one of the following:

1. Southern yellow pine.
2. Douglas fir.
3. Hem-fir.

B. Moisture Content: Kiln-dry, KD 15 or MC 15 (15 percent maximum moisture content).

C. Grade: No. 1 or construction grade.

2.4 BOARDS FOR CONCEALED CONDITIONS

A. Species: Same species as listed for exposed boards.

B. Moisture Content: Same moisture content as designated for exposed boards.

C. Grade: Same grade as listed for exposed boards.

2.5 BOARDS FOR EXPOSED CONDITIONS

A. Species: Any one of the following:

1. Douglas fir.
2. Southern pine.
3. Poplar.

B. Moisture Content: Kiln-dry, KD 15 or MC 15 (15 percent maximum moisture content).

C. Grade: No. 1, 1 Common.

2.6 CONSTRUCTION PANELS

A. Standards: Comply with requirements of PS 1 Voluntary Product Standard "Construction and Industrial Plywood" for veneer plywood and APA PRP-108 "Performance Standards and Policies for Structural-Use Panels" for performance-rated panels.

1. Trademark: Furnish construction panels that are each factory-marked with APA trademark for grade specified.

B. Miscellaneous Concealed Plywood: C-C Plugged Exterior, thickness as indicated but not less than ½ inch nominal.

C. Roof and Wall APA Rated Sheathing:

1. Exposure Durability Classification: Exterior.
2. Span Rating: 24/16, or to suit support spacing indicated.

D. Miscellaneous Exposed Plywood: A-D Interior, thickness as indicated but not less than ½ inch nominal.

E. Electrical/Telephone Backing Panels: APA-RATED SHEATHING, Exposure 1, fire-retardant treated, thickness as indicated but not less than 23/32 inch.

2.7 FASTENERS

A. General: Where miscellaneous carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel.

B. Nails, Wire, Brads and Staples: FS FF-N-105.

C. Bolts: ASTM A 307, Grade A; with ASTM A 563 hex nuts and flat washers.

2.8 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

A. General: Obtain preservative-treated lumber complying with AWPA Standard C2. Mark each treated item with AWPB or SPIB Quality Mark Requirements. Coat surfaces cut after treatment to comply with AWPA M4.

B. Above-Ground Wood Treatment: Pressure treat with waterborne preservatives to a minimum retention of 0.25 pcf.

1. Kiln-dry interior dimension lumber after treatment to 15 percent maximum moisture content.
2. Kiln-dry interior construction panels after treatment to 15 percent maximum moisture content.
3. Treat wood items indicated and in the following circumstances:

a. In contact with built-up asphalt roofing, flashing, or waterproofing.

1) Do not treat items in contact with asphalt shingles.

b. In contact with masonry or concrete.
c. Within 18 inches of grade.

C. Ground-Contact Wood Treatment: Pressure treat with waterborne preservatives to a minimum retention of 0.40 pcf.

2.9 FIRE-RETARDANT TREATMENT BY PRESSURE PROCESS

A. General: Identify treated wood with appropriate classification marking of Underwriters Laboratories Inc. or other testing and inspection agency acceptable to authorities having jurisdiction.

B. Dimension Lumber: Comply with AWPA C20.

1. Treatment Types: Interior Type A for protected wood and Exterior Type for wood exposed to weather.

C. Plywood: Comply with AWPA C27.

1. Treatment Types: Interior Type A for protected wood and Exterior Type for wood exposed to weather.

D. Inspect each piece after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of miscellaneous carpentry and in sizes that would require an excessive number or poor arrangement of joints.

B. Cut and fit miscellaneous carpentry accurately. Install members plumb and true to line and level.

C. Coat cut edges of preservative-treated wood to comply with AWPA M4.

D. Securely fasten miscellaneous carpentry as indicated and according to applicable codes and recognized standards.

E. Countersink nail heads on exposed carpentry work and fill holes.

F. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install where shown and where required for screeding or attachment of other work. Cut and shape to required size. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 CONSTRUCTION PANELS

A. Comply with applicable installation recommendations in APA Form E30 "Design/Construction Guide Residential & Commercial."

3.4 DOOR HARDWARE INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.

1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
2. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 07 Section "Joint Sealers."

F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

END OF SECTION 061053

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Subflooring.
2. Underlayment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:

1. Fire-retardant-treated plywood.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory.

2.2 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Plywood.
2. Oriented strand board.

3. Particleboard underlayment.
4. Hardboard underlayment.

C. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat all plywood unless otherwise indicated.

2.4 SUBFLOORING AND UNDERLAYMENT

A. Plywood Subflooring: Exterior, Structural I single-floor panels or sheathing.

B. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exterior A-C with fully sanded face.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

2.6 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."

END OF SECTION 061600

SECTION 064600 - WOOD TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Interior standing and running trim.
2. Wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

B. Related Sections:

1. Division 09 – Section “Wood Veneer Wall Panels.”
2. Division 09 – Section “Painting.”

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product and material.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

1. Lumber for transparent finish, for each species and cut, finished on one side and one edge.

1.3 INFORMATIONAL SUBMITTALS

A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products and Certified participant in AWI's Quality Certification Program.

1.5 FIELD CONDITIONS

A. Environmental Limitations for Interior Work: Do not deliver or install interior wood trim until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 WOOD TRIM, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of wood trim indicated for construction, finishes, installation, and other requirements.

1. Provide labels from AWI certification program indicating that woodwork including installation complies with requirements of grades specified.

2.2 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Grade: Custom.

B. Regional Materials: Interior trim for transparent finish shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

C. Regional Materials: Interior trim for transparent finish shall be manufactured within 500 miles of Project site.

D. Certified Wood: Interior trim for transparent finish shall be certified as "FSC Pure" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

E. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.

1. Species: Maple.
2. Cut: Plain sliced/plain sawn.

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of wood trim and quality grade specified unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Interior Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.
3. Structural Wood Member Adhesive: 140 g/L.
4. Architectural Sealants: 250 g/L.

2.5 FABRICATION

A. Fabricate wood trim to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.

B. Backout or groove backs of flat trim members and kerf backs of other wide, flat members except for members with ends exposed in finished work.

C. Assemble casings in shop except where shipping limitations require field assembly.

2.6 SHOP PRIMING

A. Interior Wood Trim for Transparent Finish: Shop seal with stain (if required), other required pretreatments, and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing." Color and finish to match wood panel color. Refer to specification section 097714 “Wood Veneer Wall Panels.”

B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing wood trim, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of wood trim. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition wood trim to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

A. Grade: Install wood trim to comply with same grade as item to be installed.

B. Install wood trim level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

C. Scribe and cut wood trim to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Anchor wood trim to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.

E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches long except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

1. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

END OF SECTION 064600

SECTION 070001 - WATERPROOFING, DAMPPROOFING AND CAULKING (FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 GENERAL PROVISIONS - FILED SUB-BID REQUIRED

A. Time, Manner, and Requirements for Submitting Sub-Bid: The work of this Section is stipulated as a Filed Sub-Bid under the General Bid Form. Sub-Bids for the work of this Section shall be for the complete work and filed in a sealed envelope in strict compliance with and before the date and time stated in the Invitation for Bid and Instructions to Bidders. The following information shall appear in the upper left hand of the envelope:

Name of Bidder:

Name of Project: East Somerville Community School Additions and Renovations

Section Number and Name of Sub-trade: 070001, WATERPROOFING, DAMP-PROOFING AND CAULKING

B. Form of Sub-Bid: The Sub-Bid for the work of this Section shall be made on the Form of Sub-Bid, a copy for the use of Sub-Bidders in submitting Sub-Bids is included in the Bid Package.

C. Bid Deposit: A Bid Deposit equal to five percent of the value of the Bid must be submitted with the Sub-Bid. The value of the Bid includes Add Alternates. The Bid Deposit may be in the form of a bid bond, cash, or a certified check on, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to The City of Somerville, Massachusetts.

D. Sub-Sub-Bid Requirements:

1. Sub-bidders attention is directed to Mass. GL Chapter 149, Section 44F as amended which provides in part as follows:

a. Each sub-bidder shall list in Paragraph E of the "Form for Sub-Bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which (the section of the Specifications for that sub-trade) required such listing; provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name in said Paragraph E for any such class of work or part thereof and perform

that work with persons on his own payroll, if such sub-bidder, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work or part thereof with persons on his own payroll and is qualified to do so. This Section requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

Classes of Work	Section Number
Not Applicable	

E. Reference to Drawings: Work to be performed is shown on Drawings numbered:

1. AD101,AD102,AD103,AD104,AD105,AD106,AD107,AD108,A001,A010,A101,A102, A103,A121,A122,A123,A401,A511,A512,A602,A630,A631,A632,A701,HD201,HD202 ,HD203,HD204,H000,H201,H202,H203,H204,H500,H501,H700,H701,H702,H800,ED2 01,ED202,ED203,E000,E100,E201,E202,E203,E301,E302,E303,E401,E402,E403,E500, AVD201,AVD202,AVD203,AV000,AV201,AV202,AV203

1.3 DESCRIPTION OF WORK - Revised 8/17/2011

A. Related Sections: The following Sections describe Work to be included in the Waterproofing, Dampproofing and Caulking Sub-Bid, but specified elsewhere:

1. All Work of Division 07, Section “Joint Sealants” as specified and indicated.

1.4 TEMPORARY FACILITIES

A. Weather Protection:

1. Submit requirements to General Contractor for temporary enclosures to permit work to be carried on during November through March in compliance with MGL Chapter 149, Section 44D(G), within 30 calendar days after Award of Contract.
2. Weather protection is defined as temporary protection of work which might be adversely affected by moisture, wind, and cold, and which requires covering and enclosing work areas to retain heat.

B. Heating: Submit requirements to General Contractor for heating to permit work to be carried on during November through March in compliance with MGL Chapter 149, Section 44D(G), within 30 calendar days after Award of Contract.

C. Lifts and Hoists: All lifting and hoisting for this work shall be performed as work of this Section.

D. Waste Materials:

1. Removal of crating, packaging, and wrapping of material to be performed as work of Section 070001.
2. Waste materials related to crating, packaging, and wrapping of materials to be delivered to General Contractor for removal from Project site.

E. Scaffolding and Staging: All scaffolding and staging for this work shall be performed as work of this Section.

END OF SECTION 070001

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A. This Section includes the following:

1. Safing insulation.
2. Building insulation in batt form.
3. Building insulation in rigid form.
4. Acoustical insulation (provide at all interior walls separating rooms).

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 07 Section "Penetration Firestopping" for insulation installed as part of fire and smoke resistance assemblies.
2. Division 09 Section "Gypsum Board Assemblies" for sound attenuation insulation installed as part of metal-framed wall and partition assemblies.

1.3 DEFINITIONS

A. Thermal Resistivity: Where the thermal resistivity of insulation products are designated by "R-values," they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of insulation products with requirements including R-values (aged values for plastic foam insulations), fire performance characteristics, perm ratings, water absorption ratings, and other properties, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristic: ASTM E 84.
2. Fire Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

B. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

C. Fire Precaution: Do not store rigid insulation or similar combustible materials inside the building or within 15 feet of any structure on the site. Observe proper fire precautions during installation of insulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide insulation products of one of the following:

1. Extruded Polystyrene Board Insulation:

a. Amoco Foam Products Co.
b. Dow: The Dow Chemical Company.
c. UC Industries, Inc.
d. Owens/Corning Corp.
e. Or equal.

2. Manufacturers of Glass Fiber Insulation:

   a. CertainTeed Corp.
   b. Manville: Building Insulations Div., Manville Sales Corp.
   c. Owens/Corning Corp.
   d. Or equal.

3. Manufacturers of Acoustic Mineral Wool Insulation:

   a. ThermaFiber LLC, Wabash, IN, telephone 888-834-2371; 75% recycled content.
   b. Rock Wool Manufacturing Company, Leeds, AL; 75% recycled content.
   c. Roxul Inc., Milton, Ontario, Canada, telephone 800-265-6878; 75% recycled content.
   d. Or equal.

4. Manufacturers of Semi-Refractory Fiber Insulation:

   a. Cafco Industries Ltd.
   b. Fibrex Inc.
   c. USG: Thermafiber Div., USG Interiors, Inc.
   d. Or equal.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

   1. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for type indicated; with 5-year aged R-values of 5.4 and 5 at 40 and 75 deg F (4.4 and 23.9 deg C), respectively; and as follows:

   1. Type VII, 2.2 pcf min. density.
   2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 75 and 450, respectively.
   3. Compressive strength: 25 psi.
   4. Sustainability: HCFC-FREE, min. 5 percent recycled content.

C. Unfaced Semi-Refractory Fiber Board Insulation: Thermal insulation produced by combining semi-refractory mineral fibers manufactured from slag with thermosetting resin binders to comply with ASTM C 612 for class indicated; passing ASTM E 136 for combustion characteristics; and as follows:

   1. Low Density Semi-Rigid Board: Class 1 and 2, nominal density of 4.0 pcf, R-value of 4.0 at 75 deg F (23.9 deg C).
   2. Rigid Board: Class 4, nominal density of 8.0 pcf, R-value of 4.35 at 75 deg F (23.9 deg C).

3. Fiber Color: Regular color, unless otherwise indicated.
4. Sustainability: Formaldehyde-free, min. 5 percent recycled content.

D. Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type III, Class A (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less); foil-scrim-kraft vapor-retarder membrane on one face, and as follows:

1. Mineral Fiber Type: Fibers manufactured from glass or slag.
2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.
3. Sustainability: GreenGuard Certified for IAQ, formaldehyde-free, min. 5 percent recycled content.

E. Premium High-Performance Acoustic/Thermal Insulation: Sound Attenuation Blankets: ASTM C 665, Type 1 produced by combining thermosetting resins with mineral fibers manufactured from slag wool, or rock wool. For fire-rated assembly assemblies, comply with mineral-fiber requirements of assembly. Acoustical/Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type 1, Class A and as follows:

1. Mineral Fiber Type: Fibers manufactured from slag or rock wool.
2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.
3. Sustainability: GreenGuard Certified for IAQ, formaldehyde-free, min. 75 percent recycled content.

2.3 SAFING INSULATION AND ACCESSORIES

A. Semi-Refractory Fiber Board Safing Insulation: Semi-rigid boards designed for use as a fire stop at openings between edge of slab and exterior wall panels, produced by combining semi-refractory mineral fiber manufactured from slag with thermosetting resin binders to comply with ASTM C 612, Class 1 and 2; nominal density of 4.0 pcf; passing ASTM E 136 for combustion characteristics; R-value of 4.0 at 75 deg F (23.9 deg C).

B. Caulking Compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.

C. Safing Clips: Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.

2.4 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation or mechanical anchors securely to substrates indicated without damaging or corroding either insulation, anchors, or substrates.

B. Adhesively Attached Pin Anchors: Perforated plate, 2 inches square, welded to projecting pin, with self-locking washer, complying with the following requirements:

1. Plate: Zinc-plated steel, 0.106 inch thick.
2. Pin: Copper-coated low carbon steel, fully annealed, 0.106 inches in diameter, length to suit depth of insulation indicated and, with washer in place, to hold insulation tightly to substrate behind insulation.
3. Self-Locking Washer: Mild steel, 0.016 inch thick, size as required to hold insulation securely.

a. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers.

C. Joint Closure Strips - Clip Strip Type: rigid PVC construction, J-channel shape, [1 inch (25 mm)] [1-1/2 inch (38 mm)] [2 inch (50 mm)] [2-1/2 inch (62 mm)] nominal size; Manufacturer: The Dow Chemical Company - PVC Clip Strip Joint Closures

D. Joint Closure Strips - Interlocking Type: rigid PVC construction, two piece male-to-female connection, [1 inch (25 mm)] [1-1/2 inch (38 mm)] [2 inch (50 mm)] [2-1/2 inch (62 mm)] nominal size; female profile complete with pre-drilled holes spaced at 12 inches (300 mm) on center, both sides of attachment flange; Manufacturer: The Dow Chemical Company - PVC Clip Strip Joint Closures

E. Joint Tape: 2.0 mil (0.051 mm) thick aluminum tape, 3 inches (75 mm) wide[, white coated finish]. Board joints must be clean prior to applying tapes.

F. Mechanical Fasteners - Screw Type: ITW Buildex Multi-Diameter Insulation Teks with Dow Quik-Caps or similar fastener with a 1-1/4 inch plastic washer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections that might puncture vapor retarders.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult

manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.

B. Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

D. Apply premium high-performance acoustic/thermal insulation of required thickness as noted on drawings between all interior metal stud partitions and furring elements to meet the STC ratings as noted on the wall types.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

C. Set reflective, foil-faced units accurately with not less than 0.75-inch air space in front of foil as indicated.

3.5 INSTALLATION OF SAFING INSULATION

A. Install safing insulation to fill gap between edge of concrete floor slab and back of exterior spandrel glass on safing clips spaced as needed to support insulation but not further apart then 24 inches o.c. Cut safing insulation wider than gap to be filled to ensure compression fit and seal joint between insulation and edge of slab with caulking approved by safing insulation manufacturer for this purpose. Leave no voids in completed installation.

3.7 PROTECTION

A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A. This Section includes through-penetration firestopping systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:

1. Floors.
2. Walls and partitions.
3. Smoke barriers.
4. Construction enclosing compartmentalized areas.
5. For penetrations 4 in. and smaller requiring firestopping and core-drilled penetration requiring firestopping, trade responsible for work to be installed in penetration is responsible for firestopping in compliance with requirements of this Section; for all penetrations larger than 4 in. and not core-drilled, this Section is responsible for all firestopping in compliance with requirement of this Section.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 04, Section "Unit Masonry" for joint fillers for non-fire-resistive-rated masonry construction.
3. Division 03, Section "Thermal Insulation" for safing insulation and non-fire-resistive-rated insulation and accessories.
4. Division 07, Section "Joint Sealants" for non-fire-resistive-rated joint sealants.
5 Division 09, Section “Gypsum Board Assemblies” construction of openings in walls to accommodate penetrating items.
6. Division 23 Section “Heating. Ventilating and Air-Conditioning (HVAC)” Sections specifying ducts and piping penetrations.
7. Division 26 Section “Electrical” specifying cable and conduit penetrations.
8. Division 27 Section “Communications” specifying cable and conduit penetrations.

B. Responsibility of the Construction Manager and Filed Subcontractors to provide penetration firestopping systems:

1. Through- and membrane penetrations of all fire rated barriers, floors, and roof deck for fire protection piping relating to fire protection systems shall be the responsibility of the Fire Protection Subcontractor.

2. Through- and membrane penetrations of all fire rated barriers, floors, and roof deck for plumbing and vent piping relating to plumbing systems shall be the responsibility of the Plumbing Subcontractor.
3. Through- and membrane penetrations of all fire rated barriers, floors, and roof deck for piping relating to the HVAC systems shall be the responsibility of the HVAC Subcontractor.
4. Through- and membrane penetrations of all fire rated barriers, floors, and roof deck for ductwork relating to the HVAC systems shall be the responsibility of the HVAC Subcontractor.
5. Through- and membrane penetrations of all fire rated barriers, floors, and roof deck for electrical conduit, cables, cable trays relating to electrical, security, and technology systems shall be the responsibility of the Electrical Subcontractor.
6. Through- and membrane penetrations of all fire rated barriers, floors, and roof deck for all other Work shall be the responsibility of the Construction Manager.

1.3 DEFINITIONS

A. The following definitions shall apply to all references within the entire specification:

1. Firestopping: The use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating on that wall or floor.
2. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s) constitutes a "System".
3. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.
4. Through-Penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.
5. Membrane-Penetration: Any penetration in a fire-rated wall that breaches only one side of the barrier
6. Construction Gaps: Any gap, joint, or opening, whether static or dynamic, where the top of a wall may met a floor; wall to wall applications, edge to edge floor configurations; floor to exterior wall; or any linear breach in a rated barrier. Where movement is required, the firestopping system must comply with UL 2079 for dynamic joints.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide through-penetration firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.

1. Joints along the top of fire-resistance-rated wall construction and the underside of roof or floor deck above.
2. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
3. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

4. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings, openings containing penetrating items, and openings due to flute decks.
5. Sealant joints in fire-resistance-rated construction.

B. F-Rated Through-Penetration Firestopping Systems: Provide through-penetration firestopping systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.

C. T-Rated Systems: For the following conditions, provide through-penetration firestopping systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas.

1. Where firestopping systems protect penetrations located outside of wall cavities.
2. Where firestopping systems protect penetrations located outside fire-resistive shaft enclosures.
3. Where firestopping systems protect penetrations located in construction containing fire-protection-rated openings.
4. Where firestopping systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

E. For through-penetration firestopping systems exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestopping systems.
2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestopping systems capable of supporting floor loads involved either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestopping systems not requiring removal of insulation.

F. For through-penetration firestopping systems exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

1. Certification by through-penetration firestopping systems manufacturer that products supplied comply with Local and state authorities controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

C. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestopping system, and each kind of construction condition penetrated and kind of penetrating item. Include firestopping design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestopping configuration for construction and penetrating items.
2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestopping condition, submit illustration, with modifications marked, approved by through-penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

a. Engineer judgment drawings submitted in accordance with the requirements set forth by the International Firestop Council.

B. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:

1. Types of penetrating items.
2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
4. Qualification Data: For Installer.

C. Product Certificates: Signed by manufacturers of through-penetration firestopping system products certifying that their products comply with specified requirements.

D. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of through-penetration firestopping system with requirements based on comprehensive testing of current products.

E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide through-penetration firestopping systems that complies with the following requirements and those specified under the "System Performance Requirements" article:

1. Through-penetration firestopping systems tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or Warnock Hersey.
2. Through-penetration firestopping systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:

    a. Through-penetration firestopping system products bear classification marking of qualified testing and inspecting agency.
    b. Through-penetration firestopping systems correspond to those indicated by reference to through-penetration firestopping system designations listed by UL in their "Fire Resistance Directory," or by Warnock Hersey.

3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:

    a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
    b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.

B. Information on drawings referring to specific design designations of through-penetration firestopping systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.

C. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

1. Installer shall assign a Designated Responsible Individual (DRI) who has successfully studied the FCIA Manual of Practice and passed the FM 4491 competency-based testing. This DRI shall be present on site and supervise the installation of all systems outlined in this section.

C. Source Limitations: Obtain through-penetration firestopping systems for each kind of penetration and construction condition indicated from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.

a. Provide products tested in accordance with requirements of ASTM-E119.

2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:

a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:

1) UL in its "Fire Resistance Directory."

E. Provide through-penetration firestopping systems products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

F. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestopping systems are installed per specified requirements.

G. Field-Constructed Mockup: Prior to installing through-penetration firestopping systems, erect mockups for each different through-penetration firestopping system indicated to verify selections made and to demonstrate qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final installations.

1. Locate mockups on site in locations indicated or, if not indicated, as directed by Architect.
2. Obtain Architect's acceptance of mockups before start of final unit of Work.
3. Accepted mockups in an undisturbed condition at time of Substantial Completion may become part of completed unit of Work.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestopping system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle through-penetration firestopping systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not install through-penetration firestopping systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilation: Ventilate through-penetration firestopping systems per manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestopping systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestopping systems.

C. Do not cover up those through-penetration firestopping systems installations that will become concealed behind other construction until the Architect and authorities having jurisdiction, if required, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A/D Fire Protection Systems Inc.
2. Firestopping Systems Inc.
3. Hilti Construction Chemicals, Inc.
4. Isolatek International.
5. Specified Technologies Inc.
6. 3M Fire Protection Product.
7. United States Gypsum Company.
8. Tremco; Fire Protection Systems.
9. Or equal.

2.2 THROUGH-PENETRATION FIRESTOPPING SYSTEMS, GENERAL

A. Compatibility: Provide through-penetration firestopping systems composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the through-penetration firestopping systems under conditions of service and

application, as demonstrated by through-penetration firestopping systems manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the through-penetration firestopping systems manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:

    a. Ceramic fiber.
    b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for joint sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

C. Applications: Provide through-penetration firestopping systems systems composed of materials specified in this Section that comply with system performance and other requirements.

2.3 FILL MATERIALS

A. Cast-in-Place Firestopping Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

C. Firestopping Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

F. Ceramic-Fiber Forming/Backing/Damming Material: Formulation of continuous filament ceramic fibers and inorganic binders.

H. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

I. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, nonshrinking foam.

J. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade: Pourable (self-leveling) or nonsag spray formulation for openings in floors and other horizontal surfaces and nonsag spray formulation for openings in vertical and other surfaces requiring a nonslumping/ spray able sealant, unless indicated firestopping system limits use to nonsag gunnable grade for both opening conditions.

2.4 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

B. Sealant Colors: Provide color of exposed joint sealants to comply with the following:

1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:

a. 50 percent movement in both extension and compression for a total of 100 percent movement.

D. Multicomponent, Nonsag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

1. 50 percent movement in both extension and compression for a total of 100 percent movement.

2.4 MIXING

A. For those products requiring mixing prior to application, comply with through-penetration firestopping systems manufacturer's directions for accurate proportioning of materials, water

(if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce through-penetration firestopping systems products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of through-penetration firestopping systems.

B. Notify Owner’s Representative and do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing through-penetration firestopping systems to comply with recommendations of through-penetration firestopping system manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of through-penetration firestopping systems.
2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestopping systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended by through-penetration firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration on to exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestopping systems from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from through-penetration firestopping systems materials. Remove tape as soon as it is possible to do so without disturbing through-penetration firestopping systems's seal with substrates.

3.3 INSTALLING THROUGH-PENETRATION FIRESTOPPING SYSTEMS

A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration through-penetration firestopping system manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional

shapes and depths required to achieve fire ratings of designated through-penetration firestopping systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestopping systems.

C. Install fill materials for through-penetration firestopping systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Through-penetration firestop system designation of applicable testing and inspecting agency.

3. Date of installation.
4. Through-penetration firestop system manufacturer's name.
5. Installer's name.

B. Labeling of firestopping exposed to view in finished spaces shall be located above the ceiling, directly above the penetration with a description of location. Where no ceiling is installed, locate below penetration.

3.5 FIELD QUALITY CONTROL

A. The Owner's Representative will examine completed through-penetration firestopping systems to determine, in general, if it is being installed in compliance with requirements.

B. The Owner's Representative will report observations promptly and in writing to Contractor and Architect.

C. Do not proceed to enclose through-penetration firestopping systems with other construction until installations are approved.

D. Where deficiencies are found, repair or replace through-penetration firestopping systems so that it complies with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of through-penetration firestopping systems products and of products in which opening and joints occur.

B. Protect through-penetration firestopping systems during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestopping systems immediately and install new materials to produce through-penetration firestopping systems complying with specified requirements.

3.7 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

A. Firestop Systems with no Penetrating Items (e.g., top of partition to underside of deck and similar conditions): UL Classified System C-AJ-0001-0999, using either intumescent putty or silicone sealant.

B. Firestop Systems for Metallic Pipes, Conduit, or Tubing: UL Classified System C-AJ-1001-1999 and W-L-1001-1999, using either intumescent putty or silicone sealant.

C. Firestop Systems for Nonmetallic Pipes, Conduit, or Tubing: UL Classified System C-AJ-2001-2999 and W-L-2001-2999, using intumescent wrap strips and intumescent putty.

D. Firestop Systems for Electrical and Data (Telephone) Cables: UL Classified System C-AJ-3001-3999 and W-L-3001-3999, using pillows/bags.

E. Firestop Systems for Cable Trays: UL Classified System C-AJ-4001-4999 and W-L-3001-3999, using pillows/bags.

F. Firestop Systems for Insulated Pipes: UL Classified System C-AJ-5001-5999 and W-L-5001-5999, using intumescent wrap strips and putty.

G. Firestop Systems for Miscellaneous Electrical Penetrants: UL Classified System C-AJ-6001-6999 and W-L-6001-6999, using intumescent putty or mortar.

H. Firestop Systems for Miscellaneous Mechanical Penetrants: UL Classified System C-AJ-7001-7999 and W-L-7001-7999, using mortar.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS (FILED SUB-BID REQUIRED)

(Part of Work of Section 070001 – WATERPROOFING, DAMP-PROOFING AND CAULKING, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A . This Section includes joint sealants for the following locations:

1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as indicated below:

    a. Control and expansion joints in cast-in-place concrete.
    b. Control and expansion joints in unit masonry.
    c. Joints between different materials listed above.
    d. Perimeter joints between materials listed above and frames of doors and windows.
    e. Control and expansion joints in ceiling and overhead surfaces.
    f. Isolation joints.
    g. Other joints as indicated.

2. Exterior joints in horizontal traffic surfaces as indicated below:

    a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
    b. Other joints as indicated.

3. Interior joints in vertical surfaces and horizontal non-traffic surfaces as indicated below:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Control and expansion joints in ceilings and overhead surfaces.
    c. Perimeter joints of exterior openings where indicated.
    d. Joints between tops of non-fire-resistance-rated non-load-bearing unit masonry walls and underside of floor or roof deck.
    e. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
    f. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    g. Penetrations in smoke proof partitions due to flute decks, pipes, conduits, ducts, wiring, etc.

h. All exposed joints between steel columns, masonry, drywall, or other dissimilar materials as indicated.
i. Other joints as indicated.

4. Interior joints in horizontal traffic surfaces as indicated below:

a. Control and expansion joints in cast-in-place concrete slabs.
b. Other joints as indicated.

5. Work of this Section does not include sealant work required for installation of other materials where sealant work is part of system or warranty requirements.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 04 Section “Unit Masonry” for sealing joints in masonry interior and exterior walls.
2. Division 07 Section "Penetration Firestopping" for through-penetration firestopping systems.
3. Division 09 Section "Gypsum Board Assemblies" for sealing concealed perimeter joints of gypsum board partitions to reduce sound transmission.

C. Related Sections for product specifications, furnished and installed by the Waterproofing, Damp-proofing and Caulking Filed Sub-Bid, include the following:

1. Division 07 Section “Joint Sealants

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Product data from manufacturers for each joint sealant product required.

1. Certification, by joint sealant manufacturer, that sealants, and the primers and cleaners required for sealant installation, comply with local regulations controlling use of volatile organic compounds.

C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.

D. Samples for verification purposes of each type and color of joint sealant required. Install joint sealant samples in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

E. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

F. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names addresses, names of Architects and Owners, plus other information specified.

G. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

H. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

I. Preconstruction field test reports indicating which products and joint preparation methods demonstrate acceptable adhesion to joint substrates.

J. State Submittal requirements: Provide submittals that meet the State of Florida Approval requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

B. Testing Laboratory Qualifications: To qualify for acceptance, an independent testing laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying progress of the Work.

C. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

D. Preconstruction Field Testing: Prior to installation of joint sealants, field-test their adhesion to joint substrates as follows:

1. Locate test joints where indicated or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:

    a. Each type of elastomeric sealant and joint substrate indicated.
    b. Each type of non-elastomeric sealant and joint substrate indicated.

3. Notify Architect one week in advance of the dates and times when mock-ups will be erected.
4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
5. Test Method: Test joint sealants by hand pull method described below:

    a. Install joint sealants in 60 inches joint lengths using same materials and methods for joint preparation and joint sealant installation required for completed Work. Allow sealants to cure fully before testing.
    b. Make knife cuts horizontally from one side of joint to the other followed by 2 vertical cuts approximately 2 inches long at side of joint and meeting horizontal cut at top of 2-inch cuts. Place a mark 1 inch from top of 2-inch piece.
    c. Use fingers to grasp 2-inch piece of sealant just above 1-inch mark; pull firmly down at a 90-degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.

6. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
7. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F.
3. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 SEQUENCING AND SCHEDULING

A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:

1. Match existing colors where indicated.
2. Provide selections made by Architect from manufacturer's full range of colors for products of type indicated.

C. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside weatherproofing system that comply with following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Omniseal 50.
b. Dow Corning Corporation; 795.
c. GE Advanced Materials - Silicones; SilGlaze II SCS2800.
d. May National Associates, Inc.; Bondaflex Sil 295.
e. Pecora Corporation; 898.
f. Polymeric Systems, Inc.; PSI-641.
g. Sika Corporation, Construction Products Division; SikaSil-C995.
h. Tremco Incorporated; Spectrem 3.
i. Or equal.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.

B. Available Products: Subject to compliance with requirements, elastomeric sealants that may be incorporated in the Work include, but are not limited to, the products specified in each Elastomeric Sealant Data Sheet.

C. Products: Subject to compliance with requirements, provide one of the products specified in each Elastomeric Joint Sealant Data Sheet.

D. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

2.4 SOLVENT-RELEASE-CURING JOINT SEALANTS

A. Acrylic Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing acrylic terpolymer sealant complying with AAMA 808.3 or FS TT-S-00230 or both, with capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage change in joint width existing at time of application and remain adhered to joint substrates indicated for Project without failing cohesively:

1. 7-1/2 percent movement in both extension and compression for a total of 15 percent.
2. 12-1/2 percent movement in both extension and compression for a total of 25 percent.

B. Multi-Part, Non-Sag Urethane: Manufacturer's standard multi-part, nonsag, urethane sealant complying with ASTM C 719, chemically curing, nonstaining, paintable, and have a tack-free time of 24 hours or less.

C. Butyl Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids to be nonstaining, paintable, and have a tack-free time of 24 hours or less.

D. Pigmented Narrow Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented synthetic rubber sealant complying with AAMA 803.3 and formulated for sealing joints 3/16 inch or smaller in width.

E. Products: Subject to compliance with requirements, provide one of the following:

1. Acrylic Sealant:

a. Similar to "Acryl-R Acrylic Sealant," Schnee-Moorehead, Inc.
b. Similar to "Mono 555," Tremco, Inc.
c. Or equal.

2. Single-Component Mildew-Resistant Silicone Sealant:

a. Similar to "Sanitary SCS1700," GE Silicones
b. Similar to "786 Mildew Resistant," Dow Corning Corporation.
d. Similar to "Tremsil 200," Tremco, Inc.
e. Or equal.

2. Multi-Part, Non-Sag Urethane Sealants:

a. Similar to "Chem-Calk 500", Bostik Findley.
b. Similar to "Elasto-Thane 227 R Type II", Pacific Polymers, Inc.
c. Similar to "PSI-270," Polymeric Systems Inc.
d. Similar to "Dynatrol II", Pecora Corp.
e. Similar to "Sonolastic NP2", Sonneborn Building Products Division
f. Similar to "Dymeric 240/240FC", Tremco.
g. Or equal.

2. Multi-Part, Pourable Urethane Sealants:

a. Similar to "Chem-Calk 550", Bostik Findley.
b. Similar to "Pourthane," W.R.Meadows Inc.
c. Similar to "Elasto-Thane 227 High Shore Type I (Self Leveling)", Pacific Polymers, Inc.
f. Similar to "Elasto-Thane 227 Type I (Self Leveling)", Pacific Polymers, Inc.
g. Similar to "Urexpan NR-200", Pecora Corp.
h. Similar to "Urexpan NR-300," Pecora Corp.
i. Similar to "THC-900/901", Tremco.
j. Or equal.

3. Butyl Sealant:

a. Similar to "Chem-Calk 300", Bostik Findley.
b. Similar to "BC-158," Pecora Corp.
c. Similar to "Sonneborn Multi-Purpose Sealant," Sonneborn Building Products Div., ChemRex, Inc.
d. Similar to "Tremco Butyl Sealant," Tremco, Inc.
e. Or equal.

4. Pigmented Narrow Joint Sealant:

   a. Similar to "Acryl-R SM5504," Schnee-Morehead, Inc.
   b. Or equal.

2.5 LATEX JOINT SEALANTS

A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.

C. Silicone Emulsion Sealant: Provide product complying with ASTM C 834 and, except for weight loss measured per ASTM C 792, with ASTM C 920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.

D. Products: Subject to compliance with requirements, provide one of the following:

1. Acrylic-Emulsion Sealant:

   a. Similar to "AC-20+," Pecora Corp.
   b. Similar to "Acryl-R SM8200," Schnee-Morehead, Inc.
   c. Similar to "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
   d. Similar to "Tremco Acrylic Latex 834," Tremco, Inc.
   e. Or equal.

2. Silicone-Emulsion Sealant:

   a. Similar to "Trade Mate Paintable Glazing Sealant," Dow Corning Corp.
   b. Or equal.

2.6 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
2. Product has flame spread and smoke developed ratings of less than 25 per ASTM E 84.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

C. Products: Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant:

a. Similar to "SHEETROCK Acoustical Sealant," United States Gypsum Co.
b. Similar to "AC-20 FTR Acoustical and Insulation Sealant," Pecora Corp.
c. Or equal.

2. Acoustical Sealant for Concealed Joints:

a. Similar to "Tremco Acoustical Sealant," Tremco, Inc.
b. Or equal.

2.7 TAPE SEALANTS

A. Tape Sealant: Manufacturer's standard, solvent-free, butyl-based tape sealant with a solids content of 100 percent formulated to be nonstaining, paintable, and nonmigrating in contact with nonporous surfaces with or without reinforcement thread to prevent stretch and packaged on rolls with a release paper on one side.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Similar to "Extru-Seal Tape," Pecora Corp.
2. Similar to "Shim-Seal Tape," Pecora Corp.
3. Similar to "Tremco 440 Tape," Tremco, Inc.
4. Similar to "MBT-35," Tremco, Inc.
5. Or equal.

2.8 PREFORMED FOAM SEALANTS

A. Preformed Foam Sealants: Manufacturer's standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:

1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.
2. Impregnating Agent: Manufacturer's standard.
3. Density: Manufacturer's standard.
4. Backing: Pressure-sensitive adhesive factory applied to one side with protective wrapping.
5. Products: Subject to compliance with requirements, provide one of the following:

a. Similar to "Emseal Colorseal," Emseal Corp.
b. Similar to "Emseal Seismic Colorseal," Emseal Corp.
c. Similar to "Emseal Greyflex," Emseal Corp.
d. Similar to "Wil-Seal 150," Wil-Seal Construction Foams Div., Illbruck.
e. Similar to "Wil-Seal 250," Wil-Seal Construction Foams Div., Illbruck.
f. Or equal.

2.9 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 g/cc per ASTM C 1083.

C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.10 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    a. Do not leave gaps between ends of joint fillers.
    b. Do not stretch, twist, puncture, or tear joint fillers.

c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
2. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.

a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.6 GUARANTEE AND CERTIFICATION

A. This Contractor shall and hereby does guarantee that all sealant work will be free from defects of materials and workmanship for a period of five (5) years. The following types of failure will be adjusted.

1. Leakage, cracking, crumbling, melting, shrinking or running of caulking, or staining of adjacent work by caulking.

B. This Contractor shall repair and replace work which becomes defective during guarantee term without cost to the Owner.

C. This Contractor shall furnish a certificate to the Owner from the sealant manufacturer(s) stating that the materials furnished to the job site and installed are as specified and approved by the Architect.

3.7 SCHEDULE

A. Exterior Joints (including interior face of exterior wall):

1. Steel frame and louver perimeters: Multi-Part, Non-Sag Urethane Sealant.
2. All exposed joints between dissimilar materials: Multi-Part, Non-Sag Urethane Sealant joints between masonry and structural steel when exposed to view: Multi-Part, Non-Sag Urethane Sealant.

B. Interior Joints:

1. Masonry to door frames: Acrylic-Emulsion Sealant.
2. Masonry to drywall: Acrylic-Emulsion Sealant.
4. Steel frame and louver perimeters: Acrylic-Emulsion Sealant.
5. Drywall to door frames: Urethane Sealant.
8. All exposed joints between masonry: Urethane Sealant.

END OF SECTION 079200

SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.
2. Fixed, wood louvers.

B. Related Requirements: Section 081416 "Flush Wood Doors" for louvers in flush wood doors.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

B. Windborne-debris-impact-resistance test reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
2. Wind Loads: Determine loads based on a uniform pressure of 20 lbf/sq. ft. (957 Pa) 30 lbf/sq. ft. (1436 Pa), acting inward or outward.
3. Wind Loads: Determine loads based on pressures indicated below:

a. Corner Zone: Within of building corners, uniform pressure of, acting inward, and, acting outward.
b. Other Than Corner Zone: Uniform pressure of, acting inward, and acting outward.

C. Windborne-Debris-Impact Resistance: Louvers located within 30 feet (9.1 m) of grade shall pass basic enhanced-protection, large-missile testing requirements in ASTM E 1996 for Wind Zone 1 Wind Zone 2 Wind Zone 3 Wind Zone 4 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than louvers indicated for use on Project.

D. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Design earthquake spectral response acceleration, short period (Sds) for Project is
2. Component Importance Factor: 1.5 1.0.

E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

G. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Nondrainable-Blade Louver :

1. Manufacturers:

a. Greenheck
b. Grainger
c. Airolite
d. or equal

2. Louver Depth: 1 1/2 inches.

B. Horizontal, Wind-Driven-Rain-Resistant Louver:

1. Manufacturers:

a. Greenheck
b. Grainger
c. Airolite
d. or equal

2. Louver Depth: 4 inches (200 mm).
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and 0.080 inch (2.03 mm) for frames.
4. Louver Performance Ratings:

a. Free Area:
1) UV-H Intake – 2.97 sqft

2) SF-2 Intake – 12.96 sqft
3) EF-32 Exhaust – 0.6 sqft
4) HV-22&23 Intakes – 17 sqft each

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver louvers indicated.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Insect screening.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

B. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
4. For fastening stainless steel, use 300 series stainless-steel fasteners.
5. For color-finished louvers, use fasteners with heads that match color of louvers.

C. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern.
2. Horizontal Mullions: Provide horizontal mullions at joints.

C. Maintain equal louver blade spacing**,** including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.

G. Provide subsills made of same material as louvers for recessed louvers.

H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.8 WOOD LOUVERS

A. Custom maple wood grille as part of door (see architectural drawings).

B. Stain to match door and adjacent wood panels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

G. ADJUSTING AND CLEANING

H. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

I. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

J. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

SECTION 090003 - ACOUSTICAL TILE (FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 GENERAL PROVISIONS - FILED SUB-BID REQUIRED

A. Time, Manner, and Requirements for Submitting Sub-Bid: The work of this Section is stipulated as a Filed Sub-Bid under the General Bid Form. Sub-Bids for the work of this Section shall be for the complete work and filed in a sealed envelope in strict compliance with and before the date and time stated in the Invitation for Bid and Instructions to Bidders. The following information shall appear in the upper left hand of the envelope:

Name of Bidder:

Name of Project: Repairs to Somerville High School Auditorium Kitchen, and Cafeteria.

Section Number and Name of Sub-trade: 090003, ACOUSTICAL TILE

B. Form of Sub-Bid: The Sub-Bid for the work of this Section shall be made on the Form of Sub-Bid, a copy for the use of Sub-Bidders in submitting Sub-Bids is included in the Bid Package.

C. Bid Deposit: A Bid Deposit equal to five percent of the value of the Bid must be submitted with the Sub-Bid. The value of the Bid includes Add Alternates. The Bid Deposit may be in the form of a bid bond, cash, or a certified check on, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to The City of Somerville, Massachusetts.

D. Sub-Sub-Bid Requirements:

1. Sub-bidders attention is directed to Mass. GL Chapter 149, Section 44F as amended which provides in part as follows:

a. Each sub-bidder shall list in Paragraph E of the "Form for Sub-Bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which (the section of the Specifications for that sub-trade) required such listing; provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name in said Paragraph E for any such class of work or part thereof and perform that work with persons on his own payroll, if such sub-bidder, after sub-bid

openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work or part thereof with persons on his own payroll and is qualified to do so. This Section requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

Classes of Work	Section Number
Not Applicable	

E. Reference to Drawings: Work to be performed is shown on Drawings numbered:

1. AD101,AD102,AD103,AD104,AD105,AD106,AD107,AD108,A001,A010,A101,A102, A103,A121,A122,A123,A401,A511,A512,A602,A630,A631,A632,A701,HD201,HD202 ,HD203,HD204,H000,H201,H202,H203,H204,H500,H501,H700,H701,H702,H800,ED2 01,ED202,ED203,E000,E100,E201,E202,E203,E301,E302,E303,E401,E402,E403,E500, AVD201,AVD202,AVD203,AV000,AV201,AV202,AV203

F. Related Sections: The following Sections describe Work to be included in the Tile Sub-Bid, but specified elsewhere:

1. All Work of Division 09 Section "Acoustical Panel Ceilings"
2. All Work of Division 09 Section " Acoustical Room Components "

G. Alternates: Not Applicable.

1.3 TEMPORARY FACILITIES

A. Weather Protection:

1. Submit requirements to General Contractor for temporary enclosures to permit work to be carried on during November through March in compliance with MGL Chapter 149, Section 44D(G), within 30 calendar days after Award of Contract.
2. Weather protection is defined as temporary protection of work which might be adversely affected by moisture, wind, and cold, and which requires covering and enclosing work areas to retain heat.

B. Heating: Submit requirements to General Contractor for heating to permit work to be carried on during November through March in compliance with MGL Chapter 149, Section 44D(G), within 30 calendar days after Award of Contract.

C. Lifts and Hoists: All lifting and hoisting for this work shall be performed as work of this Section.

D. Waste Materials:

1. Removal of crating, packaging, and wrapping of material to be performed as work of Section 090003.
2. Waste materials related to crating, packaging, and wrapping of materials to be delivered to General Contractor for removal from Project site.

E. Scaffolding and Staging: All scaffolding and staging for this work shall be performed as work of this Section.

END OF SECTION 090003

SECTION 090007 – PAINTING (FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 GENERAL PROVISIONS - FILED SUB-BID REQUIRED

A. Time, Manner, and Requirements for Submitting Sub-Bid: The work of this Section is stipulated as a Filed Sub-Bid under the General Bid Form. Sub-Bids for the work of this Section shall be for the complete work and filed in a sealed envelope in strict compliance with and before the date and time stated in the Invitation for Bid and Instructions to Bidders. The following information shall appear in the upper left hand of the envelope:

Name of Bidder:

Name of Project: Repairs to Somerville High School Auditorium, Kitchen & Cafeteria

Section Number and Name of Sub-trade: 090007, PAINTING

B. Form of Sub-Bid: The Sub-Bid for the work of this Section shall be made on the Form of Sub-Bid, a copy for the use of Sub-Bidders in submitting Sub-Bids is included in the Bid Package.

C. Bid Deposit: A Bid Deposit equal to five percent of the value of the Bid must be submitted with the Sub-Bid. The value of the Bid includes Add Alternates. The Bid Deposit may be in the form of a bid bond, cash, or a certified check on, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to The City of Somerville, Massachusetts.

D. Sub-Sub-Bid Requirements:

1. Sub-bidders attention is directed to Mass. GL Chapter 149, Section 44F as amended which provides in part as follows:

a. Each sub-bidder shall list in Paragraph E of the "Form for Sub-Bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which (the section of the Specifications for that sub-trade) required such listing; provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name in said Paragraph E for any such class of work or part thereof and perform that work with persons on his own payroll, if such sub-bidder, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does

customarily perform such class of work or part thereof with persons on his own payroll and is qualified to do so. This Section requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

Classes of Work	Section Number
Not Applicable	

E. Reference to Drawings: Work to be performed is shown on Drawings numbered:

1. AD101,AD102,AD103,AD104,AD105,AD106,AD107,AD108,A001,A010,A101,A102, A103,A121,A122,A123,A401,A511,A512,A602,A630,A631,A632,A701,HD201,HD202 ,HD203,HD204,H000,H201,H202,H203,H204,H500,H501,H700,H701,H702,H800,ED2 01,ED202,ED203,E000,E100,E201,E202,E203,E301,E302,E303,E401,E402,E403,E500, AVD201,AVD202,AVD203,AV000,AV201,AV202,AV203

F. Related Sections: The following Sections describe Work to be included in the Painting Sub-Bid, but specified elsewhere:

1. All Work of Division 09 Section "Painting."

G. Alternates: Not Applicable.

1.3 TEMPORARY FACILITIES

A. Heating: Submit requirements to General Contractor for heating to permit work to be carried on during November through March in compliance with MGL Chapter 149, Section 44D(G), within 30 calendar days after Award of Contract.

B. Lifts and Hoists: All lifting and hoisting for this work shall be performed as work of this Section.

C. Waste Materials:

1. Removal of crating, packaging, and wrapping of material to be performed as work of Section 090007.
2. Waste materials related to crating, packaging, and wrapping of materials to be delivered to General Contractor for removal from Project site.

D. Scaffolding and Staging: All scaffolding and staging for this work shall be performed as work of this Section.

END OF SECTION 090007

SECTION 092116 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A. This Section includes the following:

1. Gypsum board steel framing assemblies for furred walls and ceilings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 06 Section "Miscellaneous Rough Carpentry" for the following:

a. Wood blocking built into metal stud and gypsum board walls and partitions.

2. Division 07 Section "Penetration Firestopping" for firestopping systems and fire-resistive-rated joint sealants.

1.3 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms related to gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

A. Sound Transmission Characteristics: For gypsum board assemblies indicated to have STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined per ASTM E 90 and classified per ASTM E 413 by a qualified independent testing agency.

1.5 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 01 Specification Sections.

B. Product data for each type of product specified.

C. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

D. Data signed by professional engineer indicating stud gauges to be utilized for all locations in the project based upon given wind loads and stud sizes indicated.

1.6 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Where fire-rated gypsum board assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire Resistance Ratings: As indicated by reference to GA File Numbers in GA-600 "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory".

B. Engineer Qualifications: Professional engineer licensed to practice in the Commonwealth of Massachusetts and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of systems similar in material, design, and extent to those indicated for this Project.

C. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer.

D. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

E. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

F. Field Samples: On actual gypsum board assemblies, prepare field samples of at least 100 sq. ft. in surface area for the following applications. Simulate finished lighting conditions for review of in-place unit of Work.

1. Wall surfaces indicated to receive nontextured paint finishes.
2. Soffit and False work surfaces indicated to receive nontextured paint finishes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.8 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.

B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F (10 deg C) for 48 hours prior to application and continuously after until dry. Do not exceed 95 deg F (35 deg C) when using temporary heat sources.

C. Ventilation: Ventilate building spaces, as required, for drying joint treatment materials. Avoid drafts during hot dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Framing and Furring:

a. Clark Dietrich Building Systems.
b. James Industries Inc.
c. Marino Industries Corp.
d. The Steel Network Corp.
e. Or equal.

2. Gypsum Board and Related Products:

a. LaFarge North America.
b. National Gypsum Co.
c. United States Gypsum Co.
d. Certainteed Saint-Gobain
e. Georgia – Pacific Corp.
f. Or equal.

2.2 SUSTAINABILITY

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

C. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site.

2.3 STEEL FRAMING COMPONENTS FOR FURRED CEILINGS

A. General: Provide components of sizes indicated but not less than that required to comply with ASTM C 754 for conditions indicated.

B. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

C. Angle-Type Hangers: Angles with legs not less than 7/8 inch wide, formed from 0.0635-inch-thick galvanized steel sheet complying with ASTM A 653 Coating Designation G90, with bolted connections and 5/16-inch-diameter bolts.

D. Channels: Cold-rolled steel, 0.05980-inch-minimum thickness of base (uncoated) metal and 7/16-inch-wide flanges, and as follows:

1. Furring Channels: 3/4 inch deep, 300 lb per 1000 feet, unless otherwise indicated.
2. Finish: Rust-inhibitive paint, unless otherwise indicated.

E. Steel Studs for Furring Channels: ASTM C 645, with flange edges bent back 90 deg and doubled over to form 3/16-inch minimum lip (return), minimum thickness of base (uncoated) metal and minimum depth as follows:

1. Thickness: 0.0329 inch, unless otherwise indicated.
2. Protective Coating: Manufacturer's standard corrosion-resistant coating.

2.4 STEEL FRAMING FOR WALLS AND PARTITIONS

A. General: Provide steel framing members complying with the following requirements:

1. Component Sizes and Spacings: As indicated but not less than that required to comply with ASTM C 754 under the following maximum deflection and lateral loading conditions:

   a. Maximum Deflection: L/240 at 5 lbf per sq. ft.
   b. Maximum Deflection at veneer plaster L/360 @ 15 lbs./sq. ft.

2. Protective Coating: Manufacturers standard corrosion-resistant coating.
3. Protective Coating: G40 hot-dip galvanized coating per ASTM A 653 for framing members attached to and within 10 feet of exterior walls.

B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 deg and doubled over to form 3/16-inch-wide minimum lip (return) and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: 2-1/2":

a. Minimum 25 gauge:

1)	Up to 9.8'	Marino 2-1/2 DW
2)	Up to 10.1'	Detrich STN-25

b. Minimum 20 gauge:

1)	Over 9.8'	Marino 2-1/2 SW20
2)	Over 10.1'	Detrich STN-25

2. Thickness 3-5/8":

a. Minimum 25 gauge:

1)	Up to 13' - 0"	Marino 3-5/8 DW
2)	Up to 13.4'	Detrich STN-25

b. Minimum 20 gauge:

1)	Over 13' - 0"	Marino 3-5/8 SW20
2)	Over 13.4'	Detrich STN-20

3. Thickness 6" and greater depth:

a. Minimum 20 gauge, 0.346 inch.

C. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Similar to Clark Dietrich Building Systems; SLP-TRK Slotted Deflection Track.
b. Similar to The Steel Network Inc. VertiTrack VTD Series.
e. Or equal.

D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Similar to Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi

Klip.
b. Similar to Clark Dietrich Building Systems; Blaze Frame.
c. Similar to Metal-Lite, Inc.; The System.
d. Or equal.

E. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.5 GYPSUM BOARD PRODUCTS

A. Mold and Moisture-Resistant Gypsum Board:

1. Basis of Design: Gold Bond® BRAND XP Gypsum Board.
2. Panel Physical Characteristics:

a. Core: Mold and moisture-resistant gypsum core.
b. Surface paper: 100% recycled content moisture/mold/mildew-resistant paper on front, back, and long edges.
c. Long Edges: tapered.
d. Overall thickness: 5/8 inch.
e. Panel complies with requirements of ASTM C 1396 Standard Specification for Gypsum Board.
f. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
g. Environmental Requirements: Provide products that comply with testing and product requirements for low emitting materials.

B. Fire-Resistance Rated Gypsum Board with Enhanced Mold and Mildew Resistance:

1. Basis of Design: Gold Bond® BRAND XP® Fire-Shield® Gypsum Board
2. Type X, Panel Physical Characteristics:

a. Core: Mold and moisture resistant, fire-resistance rated gypsum core.
b. Surface paper: 100% recycled content moisture/mold/mildew resistant paper on front, back and long edges.
c. Long Edges: Tapered.
d. Overall thickness: 5/8 inch.
e. Panel complies with Type X requirements of ASTM C 1396 Standard Specification for Gypsum Board.
f. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

2.6 TRIM ACCESSORIES

A. Accessories for Interior Installation: Corner beads, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal, plastic, or metal combined with paper, with metal complying with the following requirement:

a. Sheet steel zinc-coated by hot-dip process.

2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:

a. Cornerbead on all outside corners where indicated on drawings. Cornerbeads on outside corners where radius wall trim is not indicated.
b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim unless otherwise indicated.
c. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
d. One-piece control joint formed with V-shaped slot, with removable strip covering slot opening.

3. Wall Trim: Extruded aluminum, 6063-T5 alloy formed with continuous tapered 7/8" fin, punched to receive fasteners and joint compound. Finish with manufacturer's standard clear anodized finish.

a. Location: See architectural details.
b. Products: Subject to compliance with requirements, provide the following:

1. Similar to "Model RCT-625", Fry Reglet (order for 5/8” gypsum wall board).
2. Similar to "Model DRMB-625-600", Fry Reglet.
3. Similar to "Model WRM-75-75", Fry Reglet.
4. Similar to "Model DRMZ-625-200", Fry Reglet.
5. Similar to "Model DRMCOS-100", Fry Reglet
6. Similar to "Model DRMF-625-50", Fry Reglet

c. Manufacturers: Provide products from Basis-of-Design Manufacturer Fry Reglet Corporation, 625 South Palm Avenue, Alhambra, CA 91803, Phone (800) 237-9773, Fax (800) 200-4397, www.fryreglet.com or equivalent products matching size, quality, characteristics and performance from the following manufacturers:

1. Pittcon Industries, 6409 Rhode Island Avenue 3330 W. Flower Street, Riverdale, Maryland 20737 Phoenix, Arizona 85043, Phone (800) 637-7638, (301) 927-1000 (800) 637-7638, (602) 233-9100, Fax: (301) 699-8690 Fax: (602) 233-9400, www.pittconindustries.com.
2. Flannery Inc, 300 Parkside Drive | San Fernando, California 91340 | Phone (818) 837-7585 | Fax. (818) 837-1155 | Email. info@flannerytrim.com
3. Gordon, Inc., 5023 Hazel Jones Ro ad, Bossier City, LA 71111, Phone (800) 747-8954, Fax (800) 877-8746.
4. Or equal.

2.7 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.

C. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mixed Formulation: Factory-mixed product.
2. All-purpose compound formulated for both taping and topping compounds.

2.8 ACOUSTICAL SEALANT

A. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant for Concealed Joints:

a. Similar to BA-98, Pecora Corp.
b. Similar to Tremco Acoustical Sealant, Tremco, Inc.

2.9 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum panels.

C. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot grouting hollow metal door frames.

D. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.

E. Steel drill screws complying with ASTM C 1002 for the following applications:

1. Fastening gypsum board to steel members less than 0.03 inch thick.
2. Fastening gypsum board to gypsum board.

F. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.

G. Sound Attenuation Blankets: Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing):

1. Mineral-Fiber Type: Fibers manufactured from glass.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

1. Furnish concrete inserts and other devices indicated to other trades for installation well in advance of time needed for coordination with other construction.

B. Before sprayed-on fireproofing is applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required, provide continuous units fastened to building structure not more than 24 inches o.c.

C. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of gypsum board assemblies without reducing thickness of fireproofing below that required to obtain fire-resistive rating indicated. Protect remaining fireproofing from damage.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.

1. Where building structure abuts ceiling perimeter or penetrates ceiling.
2. Where partition framing and wall furring abut structure except at floor.

    a. Provide slip- or cushioned-type joints as detailed to attain lateral support and avoid axial loading.

D. Do not bridge building expansion and control joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.4 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.

1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Cut studs ½ inch short of full height. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. For STC-rated and fire-resistive-rated partitions requiring partitions to extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

D. Install steel studs and furring in sizes and at spacings indicated but not less than that required by the referenced steel framing installation standard to comply with maximum deflection and minimum loading requirements specified:

1. Single- and Double-Layer Construction: Space studs at 16 inches o.c.

E. Install steel studs so that flanges point in the same direction and so that leading edges or ends of each gypsum board can be attached to open (unsupported) edges of stud flanges first.

F. Frame door openings to comply with details indicated, with GA-219, and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

G. Frame openings other than door openings to comply with details indicated or, if none indicated, in same manner as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.5 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install sound attenuation blankets where indicated prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install wall/partition board panels to minimize the number of abutting end joints or avoid them entirely. Stagger abutting end joints not less than one framing member in alternate courses of board. At stairwells and other high walls, install panels horizontally with end abutting joints over studs and staggered.

E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position adjoining panels so that tapered edges abut tapered edges, and field-cut edges abut field-cut edges and ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Avoid joints at corners of framed openings where possible.

F. Attach gypsum panels to steel studs so that the leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chase walls that are braced internally.

1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.

I. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4-inch-to-1/2-inch-wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

J. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.6 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:

1. At horizontal draft stop, apply gypsum panels at right angles to framing, unless otherwise indicated.
2. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
3. On partitions/walls 10' or less in height, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
4. On partitions/walls greater than 10' in height, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistive-rated assemblies. Use maximum-length panels to minimize end joints.

B. Double-Layer Application: Install gypsum backing board for base layers and gypsum wallboard for face layers.

1. On ceilings, apply base layer prior to applying base layer on walls/partitions; apply face layers in same sequence. Offset face-layer joints at least 10 inches from parallel base-layer joints. Apply base layers at right angles to framing members unless otherwise indicated.
2. On partitions/walls, apply base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face layer joints offset at least one stud or furring member with base layer joints. Stagger joints on opposite sides of partitions.

C. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:

1. Fasten with screws.

D. Double-Layer Fastening Methods: Apply base layer of gypsum panels and face layer to base layer as follows:

1. Fasten base layers with screws and face layer with adhesive and supplementary fasteners.

3.7 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install corner beads at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed or semiexposed. Provide edge trim type with face flange formed to receive joint compound except where other types are indicated.

1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install U-bead where indicated.
3. Install reveal channels where indicated.

D. Install control joints at locations indicated, and where not indicated according to ASTM C 840, and in locations approved by Architect for visual effect.

3.8 INSTALLATION OF GYPSUM SHEATHING

A. General: Fasten gypsum sheathing to exterior face of exterior stud wall framing.

B. Install 4-foot by 8-foot or longer sheathing horizontally with long edges at right angles to studs. Abut ends of boards over centers of studs and stagger end joints of adjacent boards not less than one stud spacing, two where possible.

C. Fasten sheathing to studs with 1" long type S12, corrosion resistant fasteners, spaced 3/8" from ends and 8" o.c.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration and levels of gypsum board finish indicated.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints except those with trim accessories having concealed face flanges not requiring taping to prevent cracks from developing in joint treatment at flange edges.

D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.

1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistive-rated assemblies and sound-rated assemblies.
2. Level 4 for gypsum board surfaces unless otherwise indicated.
3. Level 5 for gypsum board surfaces at soffits and false work.

E. For level 4 gypsum board finish, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration. Use the following joint compound combination:

1. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound.
2. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
3. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.

F. Where level 5 gypsum board finish is indicated, apply joint compound combination specified for level 4 plus a thin, uniform skim coat of joint compound over entire surface. Use joint compound specified for the finish (third coat) or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Produce surfaces free of tool marks and ridges ready for decoration of type indicated.

G. Where level 1 gypsum board finish is indicated, apply joint compound specified for embedding coat.

H. Finish water-resistant gypsum backing board forming base for ceramic tile to comply with ASTM C 840 and board manufacturer's directions for treatment of joints behind tile.

I. Ridging and Beading:

1. If ridging or beading at joints is visible with strong low-angle lighting (side lighting), lightly sand ridge down, taking care not to damage embedded joint reinforcing tape.
2. Fill surface over joint with taping compound as wide as necessary to create essentially plane surface.
3. After 24 hours of drying, lightly sand, as required, to feather edges and remove trowel marks.
4. If examination of joint with strong low-angle lighting reveals ridge is not concealed, apply additional feathering coats of joint compound until joint is acceptable to Architect.
5. If ridging or beading is still visible after feathering, apply skim coat of joint compound over entire surface to eliminate effect of ridging or beading.

3.10 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner suitable to Installer that ensures gypsum board assemblies remain without damage or deterioration at time of Substantial Completion.

C. Protect gypsum sheathing that will be left exposed to weather for more than one month as follows:

1. Protect cutouts, corners, and joints in the sheathing by filling with a flexible sealant or by applying sheathing tape recommended by sheathing manufacturer at the time sheathing is applied.

END OF SECTION 092216

SECTION 095113 - ACOUSTICAL PANEL CEILINGS (FILED SUB-BID REQUIRED)
(Part of Work of Section 090003 – ACOUSTICAL TILE, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A. This Section includes:

1. Acoustical panel ceilings units.
2. Exposed grid suspension systems.
3. Wire hangars, fasteners, main runners, cross tees, wall angle moldings, hold down clips and accessories.
4. Ceiling expansion joint cover assemblies.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 21 for sprinkler heads in acoustical ceilings.
2. Division 23 grilles, registers, and diffusers in acoustical ceilings.
3. Division 26 for lighting fixtures in acoustical ceilings, some of which may require additional or larger size wire for proper support.
4. Division 09 Section “Gypsum Board Assemblies” for gypsum board soffits.
5. Division 05 Section “Expansion Joint Cover Assemblies” for Ceiling expansion joint cover assemblies.

C. Related Sections for product specifications, furnished and installed by the Acoustical Tile Filed Sub-Bid, include the following:

1. Division 09 Section "Acoustical Panel Ceilings."
2. Division 09 Section "Acoustical Room Components."

1.3 REFERENCES

A. ASTM A 366 “Standard Specification for Steel, Carbon Cold-Rolled Sheet, Commercial Quality.”

B. ASTM A 641 “Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.”

C. ASTM C 423 “Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.”

D. ASTM C 635 “Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.”

E. ASTM C 636 “Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.”

F. ASTM E 84 “Standard Test Method for Surface Burning Characteristics of Building Materials.”

G. ASTM E 1414 “Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.”

H. ASTM E1111 “Standard Test Method for Measuring the Interzone Attenuation of Ceiling Systems.”

I. ASTM E 1264 “Classification for Acoustical Ceiling Products.”

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Product data for each type of product specified.
2. Samples for verification purposes of each type of exposed finish required, prepared on samples of size indicated below and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

a. 6-inch-square samples of each acoustical panel type, pattern, and color.
b. Set of 12-inch-long samples of exposed suspension system members, including moldings, for each color and system type required.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has successfully completed acoustical ceilings similar in material, design, and extent to those indicated for Project.

B. Fire-Performance Characteristics: Provide acoustical ceilings that are identical to those tested for the following fire-performance characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.

a. Flame Spread: 25 or less.

b. Smoke Developed: 50 or less.

C. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling unit from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

D. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1. Obtain suspension system from same manufacturer that produces acoustical ceiling units.

E. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way. Replace any damaged units.

1.7 PROJECT CONDITIONS

A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.8 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
2. Exposed Suspension System Components: Furnish quantity of each exposed component equal to 2.0 percent of amount installed.

1.9 WARRANTY

A. Acoustical Panel System: Submit a written warranty executed by the manufacturer, agreeing to repair or replacement of acoustical panels and/or grids that fails within the warranty period. Failures include, but are not limited to:

1. Acoustical Panels: Sagging or warping.
2. Grid System: Rusting and manufacturing defects.

B. Warranty period for acoustical panels is ten (10) years from the date of substantial completion.

C. Warranty period for acoustical grid system is ten (10) years from the date of substantial completion.

D. Warranty period for acoustical panels and grid systems supplied by one source manufacturer is fifteen (15) years from the date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panel Products: Subject to compliance with the requirements, provide products by one of the following:

1. Armstrong World Industries, Inc.
2. United States Gypsum Co.
3. CertainTeed.
4. Or equal.

B. Ceiling Grid Products: Subject to compliance with the requirements, provide products by one of the following:

1. Armstrong World Industries, Inc.
2. United States Gypsum Co.
3. Certainteed.
4. Or equal.

2.2 GENERAL AND SUSTAINABILITY

A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Recycled Content:

1. Panels: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

2. Suspension System: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

D. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.

E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 MATERIALS

A. Ceiling Panel Products: Subject to compliance with requirements, provide one of the following:

1. Ceiling Type ACT-1: 24” x 24” x 3/4” for 9/16” grid, Fine Beveled/Tegular Edge, Armstrong Ultima HumiGuard Plus with BioBlock +#1912, USG Mars ClimaPlus Superior #86985, or CertainTeed Symphony M BioShield Standard #1222F-OVT-1, UL Classified min. NRC .70 and min, CAC 35, LR 89%. Or equal.

B. Ceiling Grid Products: Subject to compliance with requirements, provide products by one of the following:

1. Suspension System:

a. Armstrong Prelude XL 15/16” Exposed Tee System,
b. Certainteed Classic Stab System
c. USG Donn DXLA
d. Or equal.

C. Special Ceiling Grid Products: Subject to compliance with requirements, provide products by one of the following:

1. Freeform extruded aluminum suspension trim, edges, splice plates, and all related hardware, colors to be selected by the Architect. See drawings for size of edge trim.

a. Similar to Axiom Custom Perimeter Trim, Armstrong World Industries, Inc.
b. Similar to Compasso Metal Edge System, USG Interiors, Inc.
c. Or equal.

D. Ceiling Grid colors: All ceiling grids shall be white unless otherwise indicated:

2.4 ACOUSTICAL CEILING UNITS, GENERAL

A. Standard for Acoustical Ceiling Units: Provide manufacturers' standard units of configuration indicated that comply with ASTM E 1264 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400 (plenum mounting in which face of test specimen is 15-3/4 inches [400 mm] away from the test surface) per ASTM E 795.
2. Colors and Patterns: Provide products to match appearance characteristics indicated under each product type.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

A. Standard for Metal Suspension Systems: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Components: All main beams and cross tees shall be commercial-quality hot dipped galvanized steel coating as per ASTM A 635. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main Beams and Cross Tees are double-web steel construction with 15/16” type exposed flange design. Light gauge steel Cross Tees shall have rotary stitching to improve column strength and staked-on end detail allowing easy cross tee removal and remounting.

1. Structural Classification: Intermediate duty.
2. Exposed bottom flange shall be continuous with unbroken roll-formed cap, made from steel, running the length of the member.

a. Main Beam: Web height shall be 1-1/2”.
b. 4’ Cross Tee: Web height shall be 1-3/8”.
c. 2’ Cross Tee: Web height shall be 1-3/8”.
d. End condition of Cross Runners: Override.

C. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated.

D. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

E. Wire for Hangers and Ties: Galvanized carbon steel per ASTM A 641, Class 1, soft temper, prestretched.

1. Gage: Provide wire sized so that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct-Hung), will be less than yield stress of wire, but provide not less than 0.106-inch diameter (12 gage).
2. For ACT-10 and other types where hanger wire will be exposed, use 1/16-inch stainless steel rope wire attached per manufacturer’s installation guide: Exposed Hanger Solutions (IC453/rev 3-08).

F. Edge Moldings and Trim: Metal of manufacturer's standard moldings for edges and penetrations that fit type of edge detail and suspension system indicated.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

G. Hold-Down Clips for Non-Fire-Resistance-Rated Ceilings: For interior ceilings composed of lay-in panels weighing less than 1 lb per sq. ft., and ceiling designated as Type C-2, and C-6, provide hold-down clips spaced 2'-0" o.c. on all cross-tees.

H. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

2.6 NON-FIRE-RESISTANCE-RATED DIRECT-HUNG SUSPENSION SYSTEMS

A. Wide-Face Capped Double-Web Steel Suspension System: Main and cross-runners roll-formed from prepainted or electrolytic zinc-coated cold-rolled steel sheet, with prefinished 15/16-inch-wide metal caps on flanges; other characteristics as follows:

1. Structural Classification: Intermediate-Duty system.
2. End Condition of Cross-Runners: Override or Butt-edge type, as stated with Manufacturer.
3. Cap Material and Finish: Galvanized steel sheet painted white.

B. Wide-Face, Aluminum-Capped, Double-Web, Hot Dip Galvanized-Steel Suspension System: Main and cross runners roll formed from hot-dip galvanized, cold-rolled steel sheet, with prefinished 15/16" wide aluminum caps on flanges, other characteristics as follows:

1. Structural Classification: Intermediate-Duty system.
2. Zinc-Coating: ASTM A525, G60.
3. Finish: Painted White.

2.7 MISCELLANEOUS MATERIALS

A. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant complying with requirement specified in Division 07 Section "Joint Sealers." Acoustical sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation

and anchorage of ceiling system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half-width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical ceiling systems to comply with installation standard referenced below, per manufacturer's instructions and CISCA "Ceiling Systems Handbook."

1. Standards for Installation of Ceiling Suspension Systems: Comply with ASTM C 636 and ASTM E 580 for areas requiring seismic restraint.

B. Arrange acoustical units and orient directionally patterned units in a manner shown by reflected ceiling plans.

C. Suspend ceiling hangers from building structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling space that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling space produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
4. Do not attach hangers to steel roof deck. Attach hangers to structural members.
5. Space hangers not more than 4'-0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.

D. Install edge moldings of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical units. Set edge in a bead of acoustical seal before anchoring. Clean excess caulk.

1. Miter corners where intersect or install corner caps.
2. Provide radiused edge moldings at curved surfaces. Do not kerf angles exposing panel or voids.

E. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.

1. Install hold-down clips in areas indicated and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.
2. For tegular or reveal edge panels: Cut and reveal or rabbet edges of ceiling tiles at all border areas and exposed surfaces.

F. Install ceiling expansion joint cover assemblies at all seismic joint locations and in locations indicated.

3.4 FIELD QUALITY CONTROL

A. Deflection of and grid components shall not exceed 1/540 of the span.

3.5 CLEANING

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096400 - WOOD FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Field-finished wood flooring.

B. Related Sections:

1. Section 096466 "Wood Athletic Flooring" for resilient systems used in sports-activity areas.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor assembly and accessory. Include plans, elevations, sections, details, and attachments to other work. Include expansion provisions and trim details.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and finishes available for wood flooring.

D. Samples for Verification: For each type of wood flooring and accessory, with stain color and finish required, approximately 12 inches (300 mm) long and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wood Flooring: Equal to 1 percent of amount installed for each type of wood flooring indicated.

1.5 QUALITY ASSURANCE

A. Hardwood Flooring: Comply with NOFMA's "Official Flooring Grading Rules" for species, grade, and cut.

1. Certification: Provide flooring that carries NOFMA grade stamp on each bundle or piece.

B. Maple Flooring: Comply with applicable MFMA grading rules for species, grade, and cut.

1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.

C. Build mockup of typical flooring area as shown on Drawings.

1. To set quality standards for sanding and application of field finishes, prepare finish mockup of floor area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver wood flooring materials in unopened cartons or bundles.

B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.

C. Store wood flooring materials in a dry, warm, ventilated, weathertight location.

1.7 PROJECT CONDITIONS

A. Conditioning period begins not less than seven days before wood flooring installation, is continuous through installation, and continues not less than seven days after wood flooring installation.

1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F (18 and 24 deg C) and relative humidity planned for building occupants in spaces to receive wood flooring during the conditioning period.
2. Wood Flooring Conditioning: Move wood flooring into spaces where it will be installed, no later than the beginning of the conditioning period.

a. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.
b. Open sealed packages to allow wood flooring to acclimatize immediately on moving flooring into spaces in which it will be installed.

B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

C. Install factory-finished wood flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Wood floors shall comply with requirements of FloorScore Standard.

B. Low-Emitting Materials: Wood flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 FIELD-FINISHED WOOD FLOORING

A. Certified Wood: Provide wood flooring produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Solid-Wood Flooring: Kiln dried to 6 to 9 percent maximum moisture content, tongue and groove and end matched, and with backs channeled.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

a. Aacer Flooring, LLC.
b. Bellawood.
c. International Hardwood Flooring, Inc.
d. Kentucky Wood Floors.
e. Oregon Lumber Company.
f. WD Flooring, LLC.
g. Yesteryear Floorworks Company.
h. Or Approved Equal.

1. Species and Grade: MFMA-RL Second and Better Grade hard maple.
2. Cut: Plain sawn.
3. Thickness: 3/4 inch (19 mm).
4. Face Width: 2-1/4 inches (57 mm).
5. Lengths: Random-length strips complying with applicable grading rules.

C. Urethane Finish System: Complete water-based system of compatible components that is recommended by finish manufacturer for application indicated.

1. VOC Content: When calculated according to 40 CFR 59, Subpart D (EPA Method 24), as follows:

a. Finish Coats and Floor Sealers: Not more than 350 g/L.
b. Stains: Not more than 250 g/L.

2. Finish system materials shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

3. Stain: Penetrating and nonfading type.

    a. Color: As selected by Architect from manufacturer's full range.

4. Floor Sealer: Pliable, penetrating type.
5. Finish Coats: Formulated for multicoat application on wood flooring.

D. Wood Filler: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved Samples, provide pigmented filler.

2.3 ACCESSORY MATERIALS

A. Wood Underlayment: As specified in Section 061600 "Sheathing."

B. Vapor Retarder: 1/2 inch by 4 feet by 8 feet C-D Exterior Grade Plywood.

C. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines: Wood Flooring."

D. Thresholds and Saddles: To match wood flooring. Tapered on each side.

E. Reducer Strips: To match wood flooring. 2 inches (51 mm) wide, tapered, and in thickness required to match height of flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

A. Remove coatings, including curing compounds, and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

B. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring.".

B. Wood Underlayment: Install according to requirements in Section 061053 "Miscellaneous Rough Carpentry."

C. Provide expansion space at walls and other obstructions and terminations of flooring of not less than 3/4 inch (19 mm).

D. Vapor Retarder: Comply with NOFMA's "Installing Hardwood Flooring" for vapor retarder installation and the following:

1. Wood Flooring Nailed to Wood Subfloor: Install flooring over a layer of asphalt-saturated felt.

E. Sound Control Underlayment: Install over vapor retarder in accordance with manufacturer's written instructions.

F. Solid-Wood Flooring: Blind nail or staple flooring to substrate.

1. For flooring of face width more than 3 inches (75 mm):

a. Install countersunk screws at each end of each piece in addition to blind nailing. Cover screw heads with wood plugs glued flush with flooring.
b. Install no fewer than two countersunk nails at each end of each piece, spaced not more than 16 inches (406 mm) along length of each piece, in addition to blind nailing. Fill holes with matching wood filler.

3.4 FIELD FINISHING

A. Machine-sand flooring to remove offsets, ridges, cups, and sanding-machine marks that would be noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.

1. Comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."

B. Fill open-grained hardwood.

C. Fill and repair wood flooring seams and defects.

D. Apply floor-finish materials in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and three finish coats.

1. Apply stains to achieve an even color distribution matching approved Samples.
2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.

E. Cover wood flooring before finishing.

F. Do not cover wood flooring after finishing until finish reaches full cure, and not before seven days after applying last finish coat.

3.5 PROTECTION

A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.

1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096400

SECTION 096500 - RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A. This Section includes the following:

1. Vinyl composition floor tile.
2. Resilient wall base.
2. Resilient flooring accessories.

B. Related Sections for product specifications, furnished and installed by the Resilient Floors Filed Sub-Bid, include the following:

1. Division 09 Section "Resilient Flooring."

1.3 REFERENCED STANDARDS

A. ASTM International:

1. E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
2. E 648 Standard Test Method for Critical Radiant Flux of Flooring Systems Using a Radiant Energy Source.
3. E 662 Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
4. F 925 Standard Test Method for Resistance to Chemicals of Resilient Flooring.
5. F 137 Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus.
6. F 1515 Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change.
7. F970 Standard Test Method for Static Load Limit.
8. D2047 Standard Test Method for Static Coefficient of Friction as Measured by the James Machine.
9. D 3389 Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform, Double-Head Abrader).
10. F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
11. F 1482 Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring.

12. F 386 Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces.
14. F 2240 Standard Test Method for Rubber Property-Durometer Hardness.
15. F 1514 Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change.
16. D 3389 Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform, Double-Head Abrader).
17. D 2199 Standard Test Method for Determining Dimensional Stability of Resilient Floor Tile after Exposure to Heat.
18. F 373 Standard Test Method for Embossed Depth of Resilient Floor Coverings.
19. F 2055 Standard Test Method for Size and Squareness of Resilient Floor Tile by Dial Gage Method.
20. F 511 Standard Test Method for Quality of Cut (Joint Tightness) of Resilient Floor Tile.
21. D-2859 Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
22. C 1028 Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
23. D 395 Standard Test Methods for Rubber Property—Compression Set.
24. D 792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

B. Other Referenced Documents:

1. National Fire Protection Association (NFPA): NFPA 253, Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source.
2. National Fire Protection Association (NFPA): NFPA 255, Test Method for Surface Burning Characteristics of Building Materials.
3. National Fire Protection Association (NFPA) 258 Test Method for Specific Density of Smoke Generated by Solid Materials.
4. The Collaborative for High Performance Schools (CHPS).
5. Title 16, CFR Chapter II, Subchapter D, Part 1630, Standard for the Surface Flammability of Carpets and Rugs (FF 70).

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Product data for each type of product specified.

1. Certification by tile manufacturer that products supplied for tile installation comply with State of Connecticut regulations controlling use of volatile organic compounds (VOC's).

C. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors and patterns available for each type of resilient floor tile indicated. If colors are preselected, only submit colors listed on Finish/Color Schedule.

D. Shop Drawings: Submit shop drawings showing layout, finish colors, patterns and textures.

E. Product certificates, in lieu of laboratory test reports when permitted by Architect, signed by manufacturer certifying that each product complies with requirements.

F. Quality Assurance Submittals: Submit the following:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
2. Manufacturer's Instructions: Manufacturer's installation and maintenance instructions.

G. Maintenance data for resilient floor tile, to include in Operating and Maintenance Manual specified in Division 01. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility for Floor Tile: Obtain each type, color, and pattern of product from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

B. Fire Performance Characteristics: Provide product with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648 and NFPA 253.
2. Smoke Density: Less than 450 per ASTM E 662 and NFPA 258.

C. Regulatory Requirements:

1. Fire Performance characteristics: Provide resilient stair treads with the following Fire performance characteristics as determined by testing products in accordance with ASTM method (and NFPA method) indicated below by a certified testing laboratory or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. ASTM E 648 (NFPA 253), Critical Radiant Flux of Floor Covering Systems: Class 1, Greater than 0.45 w/cm2.
b. ASTM E 662 (NFPA 258), Specific Optical Density of Smoke Generated by Solid Materials: Passes, <450.
c. ASTM E 84 (NFPA 255), Surface Building Characteristics of Building Materials: Class C.

D. Installer Qualifications: Engage an Installer experienced in rubber flooring installations, certified by the manufacturer, with at least 5 years experience installing rubber tile.

E. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, Manufacturer’s conditions, recommended adhesive depending on product, substrate type and type of installation, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with requirements in Division 01.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).

C. Store tiles on flat surfaces.

D. Move products and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.7 PROJECT CONDITIONS

A. Maintain a minimum temperature of 65 deg F in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).

B. Do not install products until they are at the same temperature as the space where they are to be installed.

C. Close spaces to traffic during tile installation.

1.8 SEQUENCING AND SCHEDULING

A. Install products and accessories after other finishing operations, including painting, have been completed.

B. Do not install tiles over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

1.9 WARRANTY

A. Manufacturer's Materials Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

B. All materials and workmanship shall be warranted for a period of twelve months from date of final acceptance of the building. Defective workmanship and materials shall be replaced without cost to the Owner.

C. Provide a ten year wear warranty for rubber flooring.

D. Warranties specified above shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.10 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

B. Leave 5% extra of each type of material for Owner's use. Leave minimum of forty (40) full vinyl tiles of each color, one (1) gallon of vinyl tile adhesive.

C. All broken boxes of tile at completion of job to become property of Owner.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION FLOOR TILE

A. Products: Subject to compliance with requirements, provide the following:

1. Similar to “Excelon Stonetex” as manufactured by Armstrong World Industries, Inc.; P.O. Box 3001, Lancaster, PA 17604.
2. Or similar from AB ColorPlus, American Biltrite (Canada) Ltd.;
3. Or similar from Congoleum Corporation;
4. Or similar from Mannington Mills, Inc.;
5. Or similar from Tarkett, Inc.;
6. Or similar from Vinylasa Tile, Distributed by American Tile Inc.
7. Or equal.

B. Tile Standard: Products complying with ASTM E 648 Critical Radiant Flux Class I - 0.45 or more watts/cm^{2}, Fire Test Data: ASTM E 662 Smoke Developed 450 or less. Static Load Limit: ASTM F 970 125 psi (8.8 kg/cm^2), ASTM F 1066, FS SS-T-312, Type IV, Composition 1 (non-asbestos formulated). Composed of polyvinyl chloride resin binder, plasticizers, fillers, and pigments with colors and texture dispersed uniformly throughout its thickness. Vinyl composition tile shall conform to the requirements of ASTM F 1066, Class 2 – through pattern.

C. Hardness: Manufacturer's standard hardness.

D. Wearing Surface: Smooth.

E. Thickness: 0.125 inch (3.2 mm).

F. Size: 12" x 12" (305 mm x 305 mm)

G. Seaming Method: Standard.

H. Colors and Patterns: Similar to Manufacturer’s color indicated on finish schedule to match existing.

I. Type 1 Underlayment: Moisture Control Underlayments and Patching Compounds: Two-coat 100% solid epoxy moisture management system where moisture emissions from new and existing concrete slabs exceeds tile manufacturer’s requirements or approved by tile manufacturer for

applications recommended by the flooring manufacturer.

1. Similar to Ardex MC Plus.
2. Or equal.

J. Type 2 Underlayment: Trowelable Underlayments and Patching Compounds: Latex-modified, Portland-cement-based formulation provided or approved by tile manufacturer for applications recommended by the flooring manufacturer.

1. Similar to Levelastic.
2. Similar to Gyp-crete.
3. Similar to Ardex K-15.
4. Or equal.

K. Adhesives (Cements): Water-resistant type recommended by tile manufacturer to suit resilient floor tile products and substrate conditions indicated.

1. Epoxy type recommended by rubber floor tile and stair accessory manufacturer.
2. Adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. VCT Tile Adhesives: Not more than 50 g/L.

3. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 RESILIENT WALL BASE

A. Rubber Wall Base: Complying with FS SS-W-40, Type I, 1/8" thick, 4" high (unless otherwise noted) cove x 120' lengths.

1. Subject to compliance with requirements, provide one of the following:

a. Nora Flooring Systems, Inc.
b. Roppe.
c. Johnsonite.
d. Or equal.

2. Colors: At rooms indicated on finish schedule, similar to solid color as indicated on finish schedule by Roppe.

2.3 ACCESSORIES

A. Products:

1. Similar to “#6 Rubber Stair Nosing” as manufactured by Roppe.
2. Or Equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine areas where installation of products specified in this Section will occur, with Installer present, to verify that substrates and conditions are satisfactory for tile installation and comply with tile manufacturer's requirements and those specified in this Section.

1. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
2. A surface texture equivalent to 80-100 grit sandpaper is required to insure a good adhesive bond.
3. For Vinyl Composition Floor Tile installations, a subfloor moisture (rest) content of 5% to a depth of 1" is the maximum allowed. (Hydrostatic moisture problems are excluded).

B. Do not proceed with installation until unsatisfactory conditions have been corrected. Start of work implies acceptance of underlying surfaces as satisfactory for proper installation of this work.

3.2 PREPARATION

A. General: Comply with ASTM-F-710 and manufacturer's installation specifications to prepare substrates indicated to receive tile.

B. Patch or level all surfaces in preparation for installing new resilient floor finishes.

C. Provide trowelable leveling and patching compounds per tile manufacturer's directions to fill cracks, holes, and depressions in substrates.

D. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush or other mechanical methods as required by the manufacturer.

E. Broom or vacuum clean substrates to be covered by tiles immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

3.3 INSTALLATION

A. General: Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of product installation included in Project.

B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.

C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.

1. Lay vinyl tiles in basket weave pattern with grain direction alternating between reversed in adjacent tiles.
2. Lay tiles in pattern with respect to location of colors, patterns, and sizes as indicated on Drawings.

D. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

E. Extend tiles into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

G. Install tiles on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly adhere edges to perimeter of floor around covers and to covers.

H. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.

I. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.

J. Handle rubber tiles front to front, back to back to prevent top surface wax from transferring to the back surface.

K. Hand roll tiles where required by tile manufacturer.

L. Install landing tile with adhesives recommended by manufacturer. Fit tiles to cover full surface of landing in a neat and craftsmanlike manner.

M. Apply resilient wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

1. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
2. Install inside and exterior corners before installing straight pieces. No seams allowed within 4' of any corner.
3. Form inside corners on job from straight pieces of maximum lengths possible by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce snug fit to substrate.
4. Form outside corners on job from straight pieces of maximum lengths possible by shaving back of base at point where bending will occur. Remove a strip perpendicular to length of base and only deep enough to produce a snug fit without bends whitening or removal of more than half the thickness of wall base.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing vinyl composition tile installation:

1. Remove visible adhesive and other surface blemishes using cleaner recommended by tile manufacturer.
2. Sweep or vacuum floor thoroughly. Do not wash floor for at least five days after installation.
3. After five days, strip floor using a commercial stripping solution and single disc floor machine fitted with 3M Green or equal pad. Strip at machine speed of 170 to 250 rpm. Do not flood floor with stripping solution or rinse water.
4. Rinse floor with clear water and allow to dry.
5. Apply 3 coats of high quality metal cross-linked acrylic floor polish. Allow 30 minutes drying time between coats. Follow procedures recommended by the polish manufacturer.
6. Do not allow traffic on floor for 24 hours after polishing is completed.

B. Protection:

1. Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of substantial completion.
2. Keep foot traffic off new stair treads for first 48 hours.
3. Keep furniture, fixtures and rolling traffic off for first 72 hours.
4. No maintenance for first 72 hours.

C. Accessories: Upon completion of all work, clean all base and reducing strips with an approved cleaning compound. Remove all adhesive from face of material and buff to a clean dull gloss.

D. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile manufacturer.

1. Cover tiles with undyed, untreated building paper until inspection for Substantial Completion.
2. Do not move heavy and sharp objects directly over tiles. Place plywood or hardboard panels over tiles and under objects while they are being moved. Slide or roll objects over panels without moving panels.

E. Reclean flooring not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean tiles using method recommended by manufacturer.

3.5 ADJUSTMENTS

A. Inspect work one month after building is occupied by Owner, and correct defects as follows:

1. Tile not seated level - heat and roll.
2. Tiles with breaks or cracks - heat, remove and replace with sound tile of same thickness and color.

3. Remove any unevenness under tile which may cause further breaks.

END OF SECTION 096500

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes modular, tufted carpet tile.

B. Related Requirements:

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Somerville High School Auditorium.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

    a. Review delivery, storage, and handling procedures.
    b. Review ambient conditions and ventilation procedures.
    c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.10 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Warranty Period: 20 years from date of Substantial Completion.
3. Wear-surface fiber wear shall not be more than 10% by weight in 20 years. (Note: Wear warranty shall not require use of chair pads.
4. Static-static generation at less than 3.0 kV at 70 degrees F, and 20% R.H. for not less than 20 years.
5. No delamination for a period not less than 20 years.
6. No Edge ravel for a period not less than 20 years.
7. No dimensional instability (i.e., shrinkage, curling and doming) which adversely affect the ability of the tile to lay flat for a period not less than 20 years.
8. Mold warranty.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Interface Flor, LLC or equal.

B. Color: Bluestone 100023

C. Pattern: Brushed Product Construction: Tufted Textured Loop

D. Fiber Content: Post consumer content type 6, 6 nylon

E. Yarn Manufacturer: Universal.

F. Post-Industrial: 48%-49%.

G. Post-Consumer: 1%

H. Total Recycled Content: 49%-49%.

I. Tufted Yarn Weight: 14oz/Yd (475g/m).

J. Pile Height: 16 inches (4.1mm).

K. Pile Thickness: 0.95in (2.4mm) according to ASTM D 6859.

L. Pile Density: 5305

M. Stitches: 8/in (3.49 ends/10cm).

N. Machine Gage: 1/2 in (47.2 ends/10cm).

O. Backing System: GlassBac Tile

P. Size: 19.69in x 19.69in (50cm x 50cm).

Q. Applied Soil-Resistance Treatment: Protekt.

R. Antimicrobial Treatment: (AATCC 138 washed) (AATCC 174 Parts 2&3) Intesept

S. Performance Characteristics: As follows:

1. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
2. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
3. Resistance to Insects: Comply with AATCC 24.
4. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
5. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
6. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
7. Electrostatic Propensity: Less than 3.0 kV according to AATCC 134.
8. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.
9. Emissions: Provide carpet tile that complies with the product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
10. Sustainable Carpet Assessment Standard: NSF-140 Gold
11. Radient Panel: (ASTM E-648) Class 1
12. Smoke Density: (ASTM E-662) < 450

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

2.3 ENVIRONMENTAL IMPACT AND MEASURMENTS

A. Greenhouse gas emissions from purchased electricity and on-site combust ion attributable to the manufacturing process (including outsourcing) must not exceed 1 lb of carbon dioxide per square meter (0.83 lbs per square yard), must be offset and certified by a third party

B. 2.Non-renewable energy per unit of production during manufacturing process (including outsourcing) must not exceed 15,000 BTU per square meter (12,542 per square yard).

C. 3.Solid waste generated in the manufacturing process (including outsourcing), regardless of disposal method, must not exceed 0.5 lbs per square meter (0.42 lbs per square yard).

D. 4.Water intake, for manufacturing purposes, during the manufacturing process (including outsourcing) must not exceed 1 gallon per square meter (0.83 gallons per square yard).

E. 5.Must meet all federal, state, and local environmental laws, including laws governing air emissions, waste water treatment and solid waste disposal/treatment

F. Manufacturer should voluntarily disclose all environmental citations, including date and description of incident.

G. Manufacturer should voluntarily state total pounds of toxic pollutants released into the environment in the most recently submitted Taxies Release Inventory (SARA 313) report.

2.4 INSTALLED ACCESSORIES

A. Leveling compound- Latex type as recommended by carpet manufacturer. Must be compatible with carpet adhesive and curing/sealing compound on concrete.

B. Installation connectors- Compounded acrylic adhesive, applied to PET polyester backing with PET polyester release liner (clear 3" x 3" polyester squares with small quantity of a pressure sensitive adhesive applied on one side of the polyester film). The squares connect the carpet modules together to form a stable surface over almost any hard surface. The connectors shall contain no liquid components and shall have "zero" calculated VOC's.

C. Carpet edge guard, non-metallic- Extruded or molded heavy duty vinyl or rubber carpet edge guard of size and profile indicated, and with minimum two inch wide anchorage flange; colors selected by architect/de signer from among standard colors available within the industry.

D. Miscellaneous materials- As recommended by manufacturer of carpet. Other carpeting products to be selected by installation provider to meet project requirements.

E. Electrostatic (Dissipation low-generation)

1. Surface Resistivity -Across face of carpet (< 2.0×10^9 and >1.5×10^5 or (0.15 to 2000 megaohms)
2. Transverse or Volume Resistivity- Through face of carpet (<2.0×10^{10} and > 1.5×10^5 ohms) or (0.15 to 2000 megaohms)

F. Modular carpet tile manufacturer must meet the following criteria:

1. Must have a closed loop “takeback/recycling” program that specifically allows for reclamation of each of the product types produced in the manufacturing history, nylon face and backing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. For wood subfloors, verify the following:

1. Underlayment over subfloor complies with requirements specified in Section 061000 "Rough Carpentry."
2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General:

1. Comply with manufacturer's instructions and recommendations. A "no-glue" method of installation is preferred using materials described in 2.4.2 above. In the event releaseable glue method of installation is required, the following adhesive description applies. Adhesive must be water-based and allow for removal of carpet tile at any time without damage to carpet or substrate. Adhesive must contain antimicrobial preservative and have "zero" calculated VOC's.
2. Install carpet under open-bottom obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.
3. Provide cutouts where required. Conceal cut edges with protective edge guards or overlapping flanges.
4. Run carpet under open bottom items such as heating convectors and install tight against walls, columns and cabinets so that the entire floor area is covered with carpet. Cover over all floor type door closures.
5. Install edging guard at all openings and doors wherever carpet terminates, unless indicated otherwise.
6. Cutting shall be done in accordance with the manufacturer's recommendation, using the tools designed for the carpet being installed.
7. Use leveling compound where necessary. Any floor filling or levelling shall have a minimum of 4'-0" of feather.
8. Expansion joints – do not bridge building expansion joints with continuous carpeting.

B. Installation:

1. Install carpet according to carpet manufacturer's printed instructions and with the Carpet and Rug Institute's Installation Standard.
2. "Chair Pads" shall not be recommended or required within installation instructions.

3.4 CLEANING AND PROTECTIONS

A. On completion of the installation in each area, all dirt, carpet scraps, etc. must be removed from the surface of the carpet.

B. Remove debris, and sort pieces to be saved from scraps to be redirected and recycled.

C. Construction manager shall protect carpeting against damage during construction.

D. At the completion of the work and when directed by the construction manager, vacuum carpet using commercial dual motor vacuum of type recommended by the carpet manufacturer. Remove spots and replace carpet where spots cannot be removed. Remove rejected carpeting and replace with new carpeting. Remove any protruding yards with shears or sharp scissors.

3.5 INSPECTION

A. Upon completion of the installation, verify that work is complete, properly installed and acceptable.

B. Preliminary Acceptance: Upon completion of the carpet installation of each floor, it shall be inspected by Owner, the Construction Manager and installation provider.

END OF SECTION 096813

SECTION 099100 – PAINTING (FILED SUB-BID REQUIRED)
(Part of Work of Section 090007 – PAINTING, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A. Locations: Exposed interior items and surfaces not indicated in Division 09 Section "High Performance Coatings."

B. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.

C. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.

1. Painting includes field-painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

D. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels, unless noted otherwise.

1. Prefinished items not to be painted include the following factory-finished components:

a. Acoustic materials.
b. Prefinished architectural woodwork and casework.
c. Prefinished wood doors.
d. Finished mechanical and electrical equipment.
e. Light fixtures and wiring devices.
f. Switchgear.
g. Distribution cabinets in closets or equipment rooms.

2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:

    a. Furred areas.
    b. Utility spaces.
    c. Duct shafts.

3. Finished metal surfaces not to be painted include:

    a. Anodized or coated aluminum.
    b. Stainless steel.
    c. Chromium plate.
    d. Copper.
    e. Bronze.
    f. Brass.

4. Operating parts not to be painted include moving parts of operating equipment, such as the following:

    a. Valve and damper operators.
    b. Linkages.
    c. Sensing devices.
    d. Motor and fan shafts.

5. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

E. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 05 Section "Metal Fabrications" for shop-priming ferrous metal and touch-up painting of ferrous metals.
2. Division 06 Section "Interior Architectural Woodwork" for interior architectural woodwork to be finished by this section.
3. Divisions 21, 22, 23 and 26: Painting mechanical and electrical work is specified in Divisions 21, 22, 23 and 26, respectively.

F. Related Sections for product specifications, furnished and installed by the Painting Filed Sub-Bid, include the following:

1. Division 09 Section "Painting."
2. Division 09 Section "High Performance Coatings."

G. Definitions:

1. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
2. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

3. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
4. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
5. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
6. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
7. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 01 Specification Sections.

B. Product data for each paint system specified, including block fillers and primers.

1. Provide the manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use.
2. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
3. Certification by the manufacturer that products supplied comply with State of Massachusetts regulations controlling use of volatile organic compounds (VOCs).

C. Samples for initial color selection in the form of manufacturer's color charts containing the full range of colors available for each type of product specified.

1. After color selection, the Architect will furnish color chips for surfaces to be coated.

D. Samples for Verification Purposes: Provide samples of each color and material indicated on Color Schedule, with texture to simulate actual conditions, on representative samples of the actual substrate.

1. Submit samples on the following substrates for the Architect's review of color and texture only:

a. Stained or Natural Wood: Provide two 4-by-8-inch samples of natural and stained wood finish on actual wood surfaces.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who is thoroughly trained and who has completed painting system applications exactly similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.

B. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

C. Surface-Burning Characteristics: Provide materials that have been tested according to ASTM E 84 and are listed in the UL "Building Materials Directory" with the following surface-burning characteristics when applied over Douglas Fir:

1. Flame Spread: 25.
2. Smoke Developed: 25.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

C. Store paint, coatings, reducing agents, and other solvents in original containers until opened: if not resealable, then must be transferred to UL approved safety containers. Provide proper ventilation, personal protection and fire protection for storage and use of same.

D. Comply with requirements set forth by Occupational Safety and Health Act for storage and use of painting materials and equipment.

1.6 EXTRA STOCK

A. Upon completion of work, provide Owner with at least one gallon of each type of color of product used.

B. Containers shall be tightly sealed and clearly labeled for identification.

1.7 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND SYSTEMS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Tnemec.
2. The Glidden Company (Glidden).
3. Benjamin Moore and Co. (Moore).
4. PPG Industries, Pittsburgh Paints (PPG).
5. Karnak Corporation.
6. Sherwin Williams.
7. Cabot (a Valspar Co.).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

1. Provide total paint system from one manufacturer with no cross coating between primer and finish coats.

B. VOC Content of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
3. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
4. Shellacs, Clear: VOC not more than 730 g/L.
5. Shellacs, Pigmented: VOC not more than 550 g/L.
6. Flat Topcoat Paints: VOC content of not more than 50 g/L.
7. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
8. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
9. Shellacs, Clear: VOC not more than 730 g/L.
10. Shellacs, Pigmented: VOC not more than 550 g/L.
11. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.

C. Chemical Components of Interior Paints and Coatings: Provide topcoat paints that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication of finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing 1 or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:

    a. Acrolein.
    b. Acrylonitrile.
    c. Antimony.
    d. Benzene.
    e. Butyl benzyl phthalate.
    f. Cadmium.
    g. Di (2-ethylhexyl) phthalate.
    h. Di-n-butyl phthalate.
    i. Di-n-octyl phthalate.
    j. 1,2-dichlorobenzne.
    k. Diethyl phthalate.
    l. Dimethyl phthalate.
    m. Ethylbenzene.
    n. Formaldehyde.
    o. Hexavalent chromium.
    p. Isophorone.
    q. Lead.
    r. Mercury.
    s. Methyl ethyl ketone.
    t. Methyl isobutyl ketone.
    u. Methylene chloride.
    v. Naphthalene.
    w. Toluene (methylbenzene),
    x. 1,1,1-trichloroethane.
    y. Vinyl chloride.

D. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

E. Colors: Provide color selections made by the Architect from the manufacturer's full range of standard colors.

2.3 STRUCTURAL STEEL COATING

A. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

B. Products: Subject to compliance with requirements, provide the following:

1. Karnak: 118 Black Asphaltum.

2.4 MASONRY BLOCK FILLER

A. Filler Coat Materials: Provide the manufacturer's recommended factory-formulated, latex-type concrete masonry block fillers that are compatible with the finish materials indicated.

B. Products: Subject to compliance with requirements, provide the following:

1. Tnemec: 130-6602 Filler

2.5 PRIMERS

A. Primers: Provide the manufacturer's recommended factory-formulated primers that are compatible with the substrate and finish coats indicated.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Concrete and Masonry Primers: Interior, semi-gloss enamel.

   a. Tnemec: 51-792 Sealer
   b. Sherwin Williams: Preprite 200 Interior Latex Wall Primer B28W200, or Con-Lux Jet-Plex 495 White.

2. Gypsum Drywall Primer: White, interior, latex-based primer.

   a. Moore: Moore's Latex Quick-Dry Prime Seal #201.
   b. Sherwin Williams: ProMar 200 Interior Latex Wall Primer W200, or ConLux Jet-Plex 495 White.

3. Gypsum Drywall Epoxy Primer: Water-based acrylic epoxy.

   a. Tnemec: 51-792 PVA Sealer

4. Ferrous Metal Primers: Synthetic, quick-drying, rust-inhibiting primers.

   a. Tnemec: 37H77 Chem Prime.
   b. Sherwin Williams: Kem Kromik Universal Primer B50 Z Series, or Con-Lux Rust Barrier Primers.

5. Galvanized Metal Primers:

   a. Tnemec: 37H77 Chem Prime.
   b. Sherwin Williams: DTM Acrylic Primer/Finish B66, W1, or Con-Lux Bond-Plex 66 Barrier White or 46 Barrier Green.

6. Aluminum Primers:

   a. Tnemec: 37H77 Chem Prime.
   b. Moore: No Primer Required.

c. Sherwin Williams: Galvite H.S. B50 WZ30, or Con-Lux Galva-Guard 44 Gray Primer.

2.6 UNDERCOAT MATERIALS

A. Undercoat Materials: Provide the manufacturer's recommended factory-formulated undercoat materials that are compatible with the substrate and finish coats indicated.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Ferrous Metal Primer:

a. Tnemec: 37H77 Chem Prime.
b. Sherwin Williams: Kem Kromik Universal Primer B50 Z Series, or Con-Lux Rust Barrier Primers.

2. Wood Undercoat:

a. Glidden: 310 Glidden Wood Undercoater.
b. Moore: Moore's Alkyd Enamel Underbody #217.
c. PPG: 6-6 Speedhide Quick-Dry Enamel Undercoater.

2.7 INTERIOR FINISH PAINT MATERIAL

A. Finish Paint: Provide the manufacturer's recommended factory-formulated finish-coat materials that are compatible with the substrate and undercoats indicated.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Interior, Semigloss, Odorless Alkyd Enamel: Semigloss, low-odor, alkyd enamel.

a. Tnemec: 23 Enduratone.
b. Moore: Moore's Satin Impervo Enamel #235.
c. Sherwin Williams: ProMar 200 Interior Alkyd Semi-Gloss B34 WZ1101 Series.

2. Interior, water based acrylic epoxy.

a. Tnemec: Series 113/114, Tufcoat
b. Sherwin Williams: Water Based Catalyzed Epoxy B70-200, or Con-Lux Epo-Plex 5000/5200 Series.
c. P.P.G.: High Solids Water Based Epoxy.

3. Interior, waterborne epoxy-amine adduct.

a. Tnemec: Series 287, Enviro-Tred

4. Interior, one-coat, rust-inhibitive primer/finish for dry overhead conditions.

a. Tnemec: Series 15 Uni-Bond.
b. Sherwin Williams: Opti-Bond Multi Surface Coating B50 W100, or Con-Lux Galva-Lon 89 White.

5. Interior, semigloss, odorless alkyd enamel.

a. Moore: Satin Impervo Enamel #235.
b. Sherwin Williams: ProMar 200 Interior Alkyd Semi-Gloss B54 W200 Series, or Con-Lux Satin-Lite 900 Series.

2.8 MISCELLANEOUS WOOD-FINISHING MATERIALS

A. Wood-Finishing Materials: Provide the manufacturer's recommended factory-formulated, wood-finishing materials that are compatible with the substrate and undercoats indicated.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Varnish-Type Surface Sealer:

a. PPG: 6-10 Sanding Sealer.
b. Sherwin Williams: Woodclassics Fast Dry Sanding Sealer B26 V43.

2. Oil-Type Interior Wood Stain: Slow-penetrating, oil-type wood stain.

a. Cabot: Alkyd Stain.
b. Glidden: 1600 Woodmaster Oil Stain.
c. Moore: 241 Moore's Interior Wood Finishes Penetrating Stain.
d. PPG: 77-302 Rez Medium Tint Base.

3. Polyurethane: Satin Finish:

a. PPG: 77-9 Polyurethane Satin Clear
b. Sherwin Williams: Woodclassics Fast Dry Oil Varnish (satin) A66-300 Series (satin).

4. Polyurethane: High Gloss:

a. PPG: 77-5 Polyurethane Glass Clear
b. Sherwin Williams: Woodclassics Fast Dry Oil Varnish (high gloss) A66-300 Series (gloss).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove fireproofing overspray, oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted in strict accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry and vacuum before painting.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
b. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
c. When transparent finish is required, backprime with spar varnish.
d. Stain and then seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.

4. Ferrous Metals: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).

a. Clean surfaces as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 1, Solvent Cleaning.
b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, according to the requirements of SSPC-SP3, Power Tool Cleaning and touch up with the same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

a. Comply with the requirements of SSPC-SP1 for interior surfaces, and SSPC-SP7, Brush Blast for exterior surfaces.

D. Galvanized Steel:

1. General:

a. Steel manufacturers are applying coating to galvanized steel called passivator that can interfere with paint adhesion and does not apply to shop primed steel.
b. Galvanized surface is coated with zinc to protect against corrosion as zinc extends life of steel.
c. Exposure to atmosphere, water, and soil can cause iron and steel to corrode, and create rust damages.
d. Typical galvanized coating can now be expected to last 25 to 50 years without maintenance in most urban and rural atmospheres.

2. Painting New Galvanized Surfaces:

a. Test surface for passivators or stabilizers, as many galvanized metal manufacturers, knowing that item may be stocked or stored in humid conditions, will apply "after galvanizing" treatment or "passivator" which will inhibit wet storage stains ("white rust").

b. Most sheet metal or coil stock, from which decking and curtain walls are fabricated, receive this treatment.
c. Passivator treatment is clear so it=s not readily detectable, but SSPC and American Hot-Dipped Galvanizers Association both state that this pre-treatment prohibits adhesion of finish coating from taking place and must be removed before applying finish coatings.
d. If test indicates the presence of passivators, apply continuous coating of galvanized steel primer before starting application of finish coatings.

3. Test Procedure for Passivators:

a. Prepare solution by dissolving 20gm of copper sulfate in one liter of water, using copper sulfate crystals.
b. Solvent wash small area per SSPC-SP1.
c. Sand small washed area using emery cloth.
d. Using cotton swab saturated with copper sulfate solution, apply swipe to both sanded and unsanded washed areas.
e. If sanded and unsanded surfaces turn black at same time and that time is less than 10 seconds, there is no passivation on surface other than light oil, which requires normal degreasing/cleaning operation before application of finish coatings.
f. If unsanded surface turns slower than sanded surface, or not at all, passivator of some type is present on surface; note that if neither surface turns, surface is probably alloy of zinc or some other metal.
g. Chemical etching, using products such as Amchem=s GALVAPREP SG-3, is one possible material to be used according to the supplier's procedures.

E. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
3. Use only thinners approved by the paint manufacturer and only within recommended limits.

F. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.

2. Provide finish coats that are compatible with primers used.
3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
4. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
5. The term exposed surfaces includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
9. Finish all doors on tops, bottoms, and side edges same as exposed faces.
10. Sand lightly between each succeeding enamel or varnish coat.
11. Omit primer on metal surfaces that have been shop-primed and touch-up painted.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.

1. Brushes: Use brushes best suited for the material applied.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

F. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.

G. Mechanical items to be painted include, but are not limited to, the following:

1. Piping, pipe hangers, and supports.
2. Heat exchangers.
3. Tanks.
4. Ductwork.
5. Insulation.
6. Supports.
7. Motors and mechanical equipment.
8. Accessory items.

H. Electrical items to be painted include, but are not limited to, the following:

1. Conduit and fittings.
2. Switchgear.

I. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled. Additional applications as directed by the Architect.

J. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.

L. Pigmented (Opaque) Finishes: Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

M. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

N. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.4 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:

1. Engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:

a. Quantitative materials analysis.
b. Abrasion resistance.
c. Apparent reflectivity.
d. Flexibility.
e. Washability.
f. Absorption.
g. Accelerated weathering.
h. Dry opacity.
i. Accelerated yellowness.
j. Recoating.
k. Skinning.
l. Color retention.
m. Alkali and mildew resistance.

3. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated.

B. Concrete:

1. Semigloss Enamel Finish: Three coats with total dry film thickness not less than 3.5 mils.

a. Primer: Interior, flat, latex-based paint.

1) Similar to Tnemec: 51-792 Sealer
2) Similar to Sherwin Williams: ProMar 200 Interior Latex Flat B30 W200, or Con-Lux Wall-Plex 400 Series.

b. First and Second Coats: Interior, semigloss, epoxy.

1) Similar to Tnemec: Series 111 Tufcoat
2) Similar to Sherwin Williams: Con-Lux Epo-Plex 5400 Series.

C. Previously painted concrete masonry units:

1. Semigloss, Alkyd, Enamel Finish: Two finish coats over washed surface.

a. Wash: Tri-Sodium Phosphate
b. First and Second Coats: Semigloss Alkyd Enamel paint.

1) Similar to Tnemec: 23 Enduratone
2) Similar to Sherwin Williams: ProMar 200 Interior Alkyd Semi-Gloss B34 W200, or Con-Lux Jet-Plex 495 Primer.

2. Glazed Finish: One finish coat acrylic epoxy paint over washed surface.

a. Sand.
b. Wash: Tri-Sodium Phosphate
c. Finish Coat: Waterbased Acrylic Epoxy Paint

1) Similar to Tnemec: 112 Tufcoat

D. Gypsum Drywall Systems:

1. Odorless Semigloss Alkyd Enamel Finish: Three coats with total dry film thickness not less than 2.5 mils.

a. Primer: White, interior, latex-based primer.

1) Similar to Moore: Moore's Latex Quick-Dry Prime Seal #201.
2) Similar to Sherwin Williams: ProMar 200 Interior Latex Wall Primer W200, or Con-Lux Jet-Plex 495 White.

b. First and Second Coats: Interior, semigloss, odorless, alkyd enamel.

1) Similar to Tnemec: 23 Enduratone.
2) Similar to Moore: Moore's Satin Impervo Enamel #235.
3) Similar to Sherwin Williams: ProMar 200 Interior Alkyd Semi-Gloss B34 W200 Series, or Con-Lux Satinlite 900 Series.

E. Woodwork and Hardboard, New and Previously Painted:

1. Semigloss Enamel Finish: Three coats.

   a. Undercoat: Interior enamel undercoat.

      1) Similar to Glidden: 310 Glidden Wood Undercoater.
      2) Similar to Moore: Moore's Alkyd Enamel Underbody #217.
      3) Similar to PPG: 6-6 Speedhide Quick-Dry Enamel Undercoater.

   b. First and Second Coats: Interior, semigloss, odorless, alkyd enamel.

      1) Similar to Glidden: 4200 Spread Ultra Semigloss Enamel.
      2) Similar to Moore: Moore's Satin Impervo Enamel #235.
      3) Similar to PPG: 27 Line Wallhide Semigloss Enamel.
      4) Similar to Sherwin Williams: ProMar 200 Interior Alkyd Semi-Gloss B34 W200 Series, or Con-Lux Satinlite 900 Series.

F. Stained Woodwork:

1. Stained Polyurethane Rubbed Finish: Three finish coats over stain.

   a. Stain Coat: Oil-type interior wood stain.

      1) Similar to Cabot: Alkyd Stain
      2) Similar to Glidden: 1600 Woodmaster Oil Stain.
      3) Similar to Moore: 241 Moore's Interior Wood Finishes Penetrating Stain.
      4) Similar to PPG: 77-302 Rez Medium Tint Base.

   b. First Coat: Surface Sealer

      1) Similar to PPG: 6-10 Sanding Sealer.
      2) Similar to Sherwin Williams: Woodclassics Fast Dry Sanding Sealer B26 V43.

   c. Second and Third Coats: Polyurethane

      1) Similar to PPG: 77-9 Polyurethane
      2) Similar to Sherwin Williams: Woodclassics Fast Dry Oil Varnish (satin) A66-300 Series.

G. Natural-Finish Woodwork:

1. Rubbed Polyurethane Finish: Two finish coats over sealer.

   a. First Coat: Sanding Sealer.

1) Similar to PPG: 6-10 Sanding Sealer.
2) Similar to Sherwin Williams: Woodclassics Fast Dry Sanding Sealer B26 V43.

b. Second and Third Coats: Polyurethane

1) Similar to PPG: 77-9 Polyurethane
2) Similar to Sherwin Williams: Woodclassics Fast Dry Oil Varnish (satin) A66-300 Series.

H. Ferrous Metal:

1. Full-Gloss Enamel Finish: Two coats over primer with total dry film thickness not less than 2.5 mils.

a. Primer: Synthetic, quick-drying, rust-inhibiting primer.

1) Similar to Tnemec: 37H77 Chem Prime.
2) Similar to Moore: Ironclad Retardo Rust-Inhibitive Paint #163.
3) Similar to Sherwin Williams: Kem Kromik Universal Primer B50 Z Series, or Con-Lux Rust Barrier Primers.

b. First and Second Coats: Exterior, gloss, alkyd enamel.

1) Similar to Tnemec: 23 Enduratone
2) Similar to Moore: Impervo High-Gloss Enamel #133.
3) Similar to Sherwin Williams: ProMar 200 Interior Alkyd Gloss B34 W200 Series.

I. Piping, Base and Covered:

1. Semigloss Alkyd Enamel: Two coats.

a. First and Second Coats: Interior, semi gloss, alkyd paint.

1) Similar to Tnemec: 23 Enduratone.
2) Similar to Sherwin Williams: ProMar 200 Interior Alkyd Semi-Gloss B34 W200 Series.

END OF SECTION 099100

SECTION 104400 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents

1.2 SUMMARY

A. This Section includes the following:

1. Fire extinguishers.
2. Fire extinguisher cabinets.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 21 Section "Fire Suppression" for fire protection systems.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

C. Samples for initial selection purposes in the form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of cabinet finish indicated or exposed to view.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.

B. Coordination: Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated and provided by Owner under separate Contract.

C. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. J.L. Industries.
2. Larsen's Manufacturing Co.
3. Potter-Roemer, Inc.
4. Or equal.

2.2 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard that comply with Underwriters' Laboratories.

B. Multipurpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10-lb nominal capacity, in enameled steel container.

2.3 MOUNTING BRACKETS

A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.

1. Provide brackets for extinguishers not located in cabinets.

2.4 CABINETS

A. Construction: Manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

1. Provide U.L. or Warnock-Hersey certified fire rated box (tub) construction, where installed in rated wall construction.

B. Cabinet Type: Suitable for containing the following:

1. Fire extinguisher.

C. Cabinet Mounting: Suitable for the following mounting conditions:

1. Semirecessed cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/2-backbend depth.

D. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.

1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

a. Square-edge trim with 1-1/2-inch backbend depth.
b. Trim Metal: Of same metal and finish as door.

E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

1. Enameled Steel: Manufacturer's standard finish, hollow steel door construction with tubular stiles and rails.
2. Door Glazing: Fully tempered 6 mm. float glass complying with ASTM C 1048, Condition A, Type I, Quality q3, Kind FT, Class as follows:

a. Class 1 (clear).

F. Extinguisher: Identify fire extinguisher in cabinet with “FIRE EXTINGUISHER” or “FIRE EXTINGUISHER AND FIRE BLANKET” lettering applied to door. Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location.

1. Application Process: Silk screen or sealed vinyl applique.
2. Door Style: Vertical Duo Panel.

G. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.

2.5 FINISHES FOR CABINETS, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

2.6 STEEL CABINET FINISHES

A. Surface Preparation: Solvent-clean surfaces complying with SSPS-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5 (white metal blast cleaning) or SSPC-SP 8 (pickling).

B. Baked-Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard two-coat baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with

paint manufacturer's instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils.

1. Color and Gloss: As selected by Architect from manufacturer's standard choices for color and gloss. Paint the following:

    a. Exterior of cabinet.
    b. Interior of cabinet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine rough-in for hose valves, and cabinets to verify locations of piping connections prior to cabinet installation.

B. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.

C. Notify Architect and do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.

1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
2. Fasten mounting brackets and cabinets to structure, square and plumb.

END OF SECTION 104400

SECTION 105200 - AUTOMATIC FIRE CURTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fire curtains.

B. Related Sections include the following:

1. Division 16 Sections for electrical wiring and connections and for smoke curtain machines.
2. Division 16 Section “Fire Alarm” for connections of smoke curtain machines to fire alarm.

1.3 STANDARDS AND LISTING

A. The system shall be Underwriters Laboratories Listed with the requirements of the following standards:

1. EN12101-1 – Specification for smoke barriers.
2. UL 10C- Positive pressure for fire door assemblies
3. B. UL 10D Listed – Fire Protective Curtains
4. C. UL 10D Oversize Certificate- Each curtain roller barrel shall have a UL listed oversize certificate for up to a 12 meter drop and 6 meters in width
5. D. NFPA 92B- Standard for Smoke Management Systems in Mall, Atria and Large Spaces
6. E. NFPA 70-National Electric code

B. The system shall operate under the power of gravity at all times to prove correct gravity fail safe capability.

C. The system manufacturer shall be certified to ISO 9001 1994 for the design, manufacture, installation and commissioning of Automatic Smoke Barriers, Tru-Roll and or equal.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for automatic smoke curtains. Include plans, sections, details, attachments to other work, and the following:

1. Operating clearances.
2. Requirements for supporting automatic smoke curtains, track, and equipment. Verify capacity of each track and rigging component to support loads.
3. Locations of equipment components, switches, motors and controls. Differentiate between manufacturer-installed and field-installed wiring.

C. Samples for Verification: For each type of fabric from dye lot to be used for the Work, with specified treatments applied, and showing complete pattern and texture repeat, if any. Mark top and face of fabric. Prepare Samples of size indicated below.

1. Size: Not less than 36 inches (900 mm) square.

D. Product Certificates: For each type of product, signed by product manufacturer.

E. Qualification Data: For Installer. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Maintenance Data: For automatic curtains to include in maintenance manuals.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in installing automatic smoke curtains similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify smoke-curtain openings and the dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 AUTOMATIC FIRE CURTAINS

A. Construction:

1. The curtain head box shall be manufactured from 1.2mm galvanized steel. The enclosure shall be rated at the same temperature as the curtain fabric.
2. Removable cover plates shall be incorporated to allow access to the curtain rollers.
3. Standard head box sizes shall be 150mm x 150mm for single rollers (maximum width 5.5m) and 250mm x 150mm for multiple rollers (over 5.5m wide). Larger head boxes may be required where the curtain drop is in excess of 3m.
4. A suitably weighted bottom bar shall be provided to prevent deflection and ensure correct operation under gravity. A polycarbonate extrusion shall be supplied as standard and shall be located in the profile formed in the bottom of the box.

5. The roller shall be constructed from an octagonal tube which will incorporate a 24v d.c. motor and gearbox and a sealed heavy duty ball bearing assembly.
6. A motor control circuit housed in a steel enclosure shall be mounted onto the motor end of the head box.
7. Provide each motorized curtain with back EMF controlled speed of descent of no less then 6 inches per second and no more then 24 inches per second.
8. The fabric curtain shall be manufactured from X32K woven glass fiber cloth incorporating a 'Panama' weave for increased stability. The fabric shall have a nominal weight of 540g/square meter and shall be tested to withstand temperatures of up to 1000C for a period of 60 minutes.
9. Products: Subject to compliance with requirements, provide the following:

    a. SD60 – Automatic Smoke Curtains as manufactured by BLE Smoke and Fire Curtains Ltd., Sheffield, England. U.S. Exclusive Distributor Contact: U.S. SMOKE & FIRE SERVICES LLC, Steven S. Sadeghian PHD, CEO, 12310 Pinecrest Rd, Reston,VA 20191 1-866-791-3354, 703-408-4700, 703-716-7300
    b. Colors: As selected by Architect from manufacturer's full range.
    c. Manufacturers:

        (a) U.S. Smoke & Fire Services LLC
        (b) U.S. Smoke & Fire Curtain LLC
        (c) Smoke Guard

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of automatic smoke-curtain work. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine inserts, clips, blocking, or other supports required to be installed by others to support boxes. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install automatic smoke-curtain system according to fabricator's written instructions.

3.3 OPERATION

A. The smoke curtain shall deploy upon a signal from the fire alarm system in an emergency situation.

B. The system must be proven to fail safe to the operational position on total loss of primary and auxiliary power.

C. Under normal operating conditions the curtains would be held in the retracted position via the motors operating at low voltage. The manufacture must be able to confirm that the motor windings are suitable for this type of operation.

D. Upon activation of the fire alarm the control panel will remove the supply voltage and the curtain shall descend under the power of gravity in a controlled manner. A dynamic braking system housed in the motor control circuit shall control the speed of the descent of the curtain. The descent shall be electronically synchronized on overlapping curtains with a bottom bar.

E. To retract the curtain the control panel shall supply 24v to the motor control circuits and motors will drive the curtains to the upper position. As the bottom bar or stopping bar hits the curtain head box a current limiting circuit will step back the voltage and current and hold the bottom bar in the retracted position.

F. Limit switches are not to be used to control the upper position of the curtain.

G. An optional braking system must be available at the manufacture stage to allow a two stage descent during gravity deployment. Should the main power fail to the group control panel, the supply is automatically switched to the integral standby battery. The curtain remains in the retracted position for 1 hour (fully retracted) loaded system). The curtain will remain fully operational until the battery low voltage cut off facility reads a voltage of 21v; the curtains will then safely descend under the power of gravity to the operational position.

1. Group- Control Panel: Provide Group Control panel (GCP) capable of controlling up to 6 no. BLE24v motor assemblies. During normal operation, the GCP will provide a 24v AC supply to the curtain motor holding them in the retracted position. Should smoke be detected, the fire alarm contact in the GCO will be opened by the fire alarm control system, the GCP will remove the 24v supply to the curtain motors and the curtains will descend under the power of gravity in a controlled manner.
2. Open on fire- configured to be gravity fail safe
3. Test Facility- key switch
4. Indication- Green led= Mains Healthy; Yellow LED= Battery Fault; Red LED= Fuse Blown; Green LED= Fire alarm Status Normal

3.4 MONITORING

A. Monitoring relays shall be installed in the group control panel to provide BMS contacts for mains failure and curtain zone deployment.

B. Monitoring relays shall be installed in the motor control circuits to provide BMS contacts for individual curtain deployment.

3.5 ACCEPTANCE TESTING

A. Fire alarm testing, the smoke curtain is required to deploy upon a signal from the fire alarm in an emergency situation. The test to verify deployment shall be conducted in the presence of the authority having jurisdiction per NFPA guidelines.

B. When a smoke curtain is required to deploy in an emergency situation, it is probable that the main supply to the control panel may have already failed and that the cables liking the curtains to the

control panel might have become damaged. Under these circumstances with no power available the curtain will have to deploy by gravity.

C. A total power failure should be simulated during each test to ensure gravity fail safe deployment. A test in which a curtain is powered down under normal test conditions from either main power or the battery supply only proves that the smoke curtain can be deployed when powered. This does not confirm an ability to be gravity fail safe.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to test system and to train Owner's Personnel to rig, adjust, operate, and maintain automatic smoke curtains.

3.7 ANNUAL TESTING & MAINTENANCE

A. Engage a factory authorized service representative to test, adjust and maintain system once per annum.

END OF SECTION 105200

SECTION 116143 - STAGE CURTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Stage curtains, scrims, and drops.
2. Window curtains.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for steel framing and supports for stage-curtain systems.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Somerville High School Auditorium.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and attachment details of curtains.
2. Include fabric assembly and hanging details.
3. Dimension operating clearances.
4. Include documentation of capacity of each batten, track, attachment, and rigging component to support loads.
5. Points of attachment for proscenium curtain and the corresponding static and dynamic loads imposed on structure.

B. Samples for Initial Selection: For each type of stage curtain indicated. Include color charts showing full range of colors, textures, and patterns available, together with 12-inch-square Sample (any color) of each fabric type and seam.

C. Samples for Verification: Full width by minimum 12-inch long section of each fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.

D. Delegated-Design Submittal: For stage-curtain systems and attachments to structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For the following, from manufacturer:

1. Fabric: Provide name of flame-retardant chemical used, identification of applicator, treatment method, application date, allowable life span for treatment, and details of any restrictions and limitations.

B. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For stage curtains and rigging to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of stage curtains.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install stage curtains until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify locations of supporting structural elements and construction contiguous with stage curtains and rigging by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of stage-curtain systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, faulty operation of rigging.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Stage-curtain systems and attachments to structure shall withstand the effects of gravity and operational loads and the following loads and stresses:

1. Design Loads: Weight of curtains.

B. Fire-Test-Response Characteristics: Provide stage curtains meeting the following requirements as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Flame-Propagation Resistance: Passes NFPA 701.

    a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or is treated with flame-retardant chemicals and whether it requires retreatment after cleaning or after a designated time period of use.
    b. Permanently attach 12-inch-square swatch of same fabric and dye lot for each fabric of a curtain assembly to the back of assembly for use as fire-resistance test strip.

C. Flame-proofing shall leave the fabric cleanable, dimensionally stable, and resistant to UV deterioration.

2.2 CURTAIN FABRICS

A. General: Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment according to performance requirements indicated. Provide fabrics of each type and color from same dye lot.

B. Heavyweight Woven Cotton Velour: Napped fabric of 100 percent cotton weighing not less than 25 oz./linear yd., with pile height not less than 79 mils; 54-inch minimum width.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. JB Martin Company, #2703 Overture
    b. KM Fabrics, Inc.; Memorable
    c. Valley Forge Fabrics, Inc.; 2525 Velour
    d. Or equal.

2. Color/Texture/Pattern: As selected by Architect from manufacturer's full range.

2.3 LINING

A. Polyester Lining: 100 percent polyester fabric; inherently and permanently flame resistant; 54-inch minimum width; beige.

2.4 CURTAIN-BOTTOM WEIGHTS

A. Individual Weights: Curtain manufacturer's standard segmented weights to suit each curtain type and location.

B. Proof Coil Chain: Grade 30, No. 8, zinc plated, 3/16 inch, ASTM A 413/A 413M.

C. Weight Tape: Curtain manufacturer's standard, continuous weight tape to suit each curtain type and location.

D. Pipe or Conduit Weight and Stiffener: Curtain manufacturer's standard or recommended stiffening pipe or conduit that slides into bottom hem, suitable for curtain type and location indicated.

2.5 CURTAIN FABRICATION

A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on fabric not visible to audience. Provide vertical seams unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width. Orient velour fabric with the fabric nap down.

B. Vertical and Top Hems: Machine sew hems as follows unless otherwise indicated:

1. Vertical Hems: Minimum 2 inches wide, and not less than 4 inches wide at borders, valance, teasers, and tormentors, with not less than a 1-inch tuck and with no selvage material visible from front of curtain. Sew open ends of hems closed.
2. Turnbacks: Provide leading-edge leading- and trailing-edge turnbacks for traveler curtains, formed by folding back not less than 12 inches one-half width of face fabric, with not less than a 1-inch tuck, and vertically secured by sewing.
3. Top Hems: Reinforced by double-stitching 3-1/2-inch-wide, heavy, jute webbing to top edge on back side of curtain with not less than 2 inches of face fabric turned under.

C. Fullness:

1. Flat: Provide zero percent fullness in curtains.
2. 75 Percent Fullness: Provide fullness, exclusive of turnbacks and hems, by sewing additional material into 3-inch double-stitched, flat, box pleats spaced at 12 inches o.c. along top hem reinforcement.

D. Grommets: Brass, No. 3.

1. Black Curtains: Provide brass or aluminum grommets with black finish.
2. Pleated Curtains: Center grommets on each box pleat and place 1 inch from corner of curtain; for snap hooks or S-hooks.

E. Bottom Hems: Machine sew hems as follows unless otherwise indicated:

1. For Curtains With Fullness:

a. Curtains That Do Not Hang to Floor: Hems not less than 3 inches deep, with 3/4-inch weight tape, and with open ends of hems sewn closed.
b. Floor-Length Curtains: Hems not less than 6 inches deep; with separate, interior, 100 percent cotton, heavy canvas chain pockets equipped with proof coil chain; with chain pockets sewn so that chain rides 2 inches above finished bottom edge of curtain; and with open ends of hems sewn closed.

2. Lining: Where indicated, provide lining for curtain in same fullness as face fabric and finished 2 inches shorter than face fabric. Sew or otherwise securely attach lining to top hem of face fabric. Attach lining to face fabric along bottom and side seams with 4-inch-long strips of heavy woven cotton tape. Sew lining to bottom edge of curtain allowing sufficient lining fabric for tucking to prevent shrinkage.

2.6 CURTAIN ACCESSORIES

A. S-Hooks: Manufacturer's standard heavy-duty plated-wire hooks, not less than 2 inches long.

B. Tie Lines: No. 4 or No. 4-1/2 cord or braided soft cotton tape, black or white to best match curtain; not less than 5/8 inch wide by 36 inches long, threaded through grommets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work.

B. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install stage-curtain system according to curtain manufacturer's written instructions.

3.3 CURTAIN INSTALLATION

A. Track Hung: Secure curtains to track carriers with S-hooks.

B. Batten Hung: Secure curtains to pipe battens with ties.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Train Owner's maintenance personnel to adjust, operate, and maintain stage curtains, draw-curtain machines, and tracks.

3.5 CURTAIN SCHEDULE

A. Stage Curtain: As indicated on Drawings and as follows:

1. Type: SR-01Valance.
2. Size and Arrangement: 40 feet-0 inches x 4 feet-0 inches ± (verify in field).
3. Fabric: Heavyweight woven cotton velour.
4. Lining: Polyester.
5. Fullness: 75 percent.
6. Bottom Weights: Proof coil chain 75 percent.
7. Hanging Accessories: Tie lines.
8. Battens: Use existing.

B. Stage Curtain: As indicated on Drawings and as follows:

1. Type: SR-02Proscenium.
2. Size and Arrangement: 2 color: 1143 colonial brick; 45 feet-0 inches x 22 feet-0 inches ± (verify in field).
3. Fabric: Heavyweight woven cotton velour.
4. Lining: Polyester.
5. Fullness: 75 percent.
6. Bottom Weights: Proof coil chain 75 percent.
7. Hanging Accessories: S-hooks.
8. Track: Use existing.
9. Track Shape: Straight.
10. Operation: Manual cord (pull rope).

C. Stage Curtain: As indicated on Drawings and as follows:

1. Type: SR-03, 04, 05, 06 traveler panels.
2. Size and Arrangement: 2 color: 1118 navy; 45 feet-0 inches x 22 feet-0 inches ± (verify in field).
3. Fabric: Heavyweight woven cotton velour.
4. Lining: Polyester.
5. Fullness: 75 percent.
6. Bottom Weights: Proof coil chain 75 percent.
7. Hanging Accessories: S-hooks.
8. Track: Use existing.
9. Track Shape: Straight.
10. Operation: Manual cord (pull rope).

D. Window Curtain: As indicated on Drawings and as follows:

1. Type: SR-07, 08 traveler panels.
2. Size and Arrangement: color: 1118 navy; 19 feet-0 inches x 20 feet-0 inches ± (verify in field).
3. Fabric: Heavyweight woven cotton velour.
4. Lining: Polyester.
5. Fullness: 75 percent.
6. Bottom Weights: Proof coil chain 75 percent.
7. Hanging Accessories: S-hooks.
8. Track: Use existing.
9. Track Shape: Straight.
10. Operation: Manual cord (pull rope).

END OF SECTION 116143

SECTION 140001 – ELEVATORS (FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 GENERAL PROVISIONS - FILED SUB-BID REQUIRED

A. Time, Manner, and Requirements for Submitting Sub-Bid: The work of this Section is stipulated as a Filed Sub-Bid under the General Bid Form. Sub-Bids for the work of this Section shall be for the complete work and filed in a sealed envelope in strict compliance with and before the date and time stated in the Invitation for Bid and Instructions to Bidders. The following information shall appear in the upper left hand of the envelope:

Name of Bidder:

Name of Project: Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

Section Number and Name of Sub-trade: 140001, ELEVATORS

B. Form of Sub-Bid: The Sub-Bid for the work of this Section shall be made on the Form of Sub-Bid, a copy for the use of Sub-Bidders in submitting Sub-Bids is included in the Bid Package.

C. Bid Deposit: A Bid Deposit equal to five percent of the value of the Bid must be submitted with the Sub-Bid. The value of the Bid includes Add Alternates. The Bid Deposit may be in the form of a bid bond, cash, or a certified check on, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to The City of Somerville, Massachusetts.

D. Sub-Sub-Bid Requirements:

1. Sub-bidders attention is directed to Mass. GL Chapter 149, Section 44F as amended which provides in part as follows:

a. Each sub-bidder shall list in Paragraph E of the "Form for Sub-Bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which (the section of the Specifications for that sub-trade) required such listing; provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name in said Paragraph E for any such class of work or part thereof and perform that work with persons on his own payroll, if such sub-bidder, after sub-bid

openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work or part thereof with persons on his own payroll and is qualified to do so. This Section requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

Classes of Work	Section Number
Not Applicable	

E. Reference to Drawings: Work to be performed is shown on Drawings numbered:

1. AD101,AD102,AD103,AD104,AD105,AD106,AD107,AD108,A001,A010,A101,A102, A103,A121,A122,A123,A401,A511,A512,A602,A630,A631,A632,A701,HD201,HD202 ,HD203,HD204,H000,H201,H202,H203,H204,H500,H501,H700,H701,H702,H800,ED2 01,ED202,ED203,E000,E100,E201,E202,E203,E301,E302,E303,E401,E402,E403,E500, AVD201,AVD202,AVD203,AV000,AV201,AV202,AV203

1.3 DESCRIPTION OF WORK

A. Related Sections: The following Sections describe Work to be included in the Elevators Sub-Bid, but specified elsewhere:

1. All Work of Division 14 Section "Machine Room-Less Elevators."
2. All Work of Division 14 Section "Wheelchair Lifts."

B. Alternates: Not Applicable.

1.4 TEMPORARY FACILITIES

A. Weather Protection:

1. Submit requirements to Construction Manager for temporary enclosures to permit work to be carried on during November through March in compliance with MGL Chapter 149, Section 44D(G), within 30 calendar days after Award of Contract.
2. Weather protection is defined as temporary protection of work which might be adversely affected by moisture, wind, and cold, and which requires covering and enclosing work areas to retain heat.

B. Heating: Submit requirements to Construction Manager for heating to permit work to be carried on during November through March in compliance with MGL Chapter 149, Section 44D(G), within 30 calendar days after Award of Contract.

C. Lifts and Hoists: All lifting and hoisting for this work shall be performed as work of this Section.

D. Waste Materials:

1. Removal of crating, packaging, and wrapping of material to be performed as work of Section 140001.

2. Waste materials related to crating, packaging, and wrapping of materials to be delivered to Construction Manager for removal from Project site.

E. Scaffolding and Staging: All scaffolding and staging for this work shall be performed as work of this Section.

END OF SECTION

SECTION 144200 – WHEELCHAIR LIFTS (FILED SUB-BID REQUIRED)
(Part of Work of Section 140001 – ELEVATORS, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 00 - Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 - General Requirements, apply to work of this Section.

B. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. The exact scope of work of this Section cannot be determined without a thorough review of all Specification Sections and other Contract Documents.

1.2 SUMMARY

A. This Section includes the following hydraulic elevators:

1. Enclosed, self-contained vertical platform wheelchair lift.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 06 Section “Miscellaneous Rough Carpentry”: Blocking in framed construction for lift attachment
2. Rubber Tile Floor Covering: by Division 09 Section "Resilient Flooring".
3. Field painting of hoistway entrances is specified in Division 09 Section "Painting."
4. Electrical service to each elevator, including fused disconnect switch to the hoistway and machine room and security card reader, is specified in Division 26 Section "Electrical."
5. All hoisting required for the completion of this Work.

C. Related Sections: The following Sections describe Work to be included in the Elevators Sub-Bid, but specified elsewhere:

1. Division 14 Section "Wheelchair Lifts" for wheelchair lifts.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specifications Sections.

B. Product Data for each principal component or product of each elevator, including certified test reports on required testing. Indicate capacities, sizes, performance and operating characteristics, features of control system, finishes, and similar information. Indicate any variations from specified requirements.

C. Shop Drawings including dimensioned drawings showing plans, elevations, sections and large-scale details indicating service at each landing, coordination with building structure and

relationships with other construction, and details of car enclosures and hoistway entrances. Include elevatoring diagrams to indicate elevator service to each level and include excavation requirements for jack.

D. Wiring diagram detailing wiring for power, signal and control systems differentiating clearly between manufacturer-installed wiring and field-installed wiring. Indicate maximum and average power demands.

E. Samples of all exposed finishes. Provide 6-inch- to 8-inch-square samples of sheet materials and 10-inch to 12-inch lengths of running trim members.

F. Maintenance Manuals: At the completion of the work and before final acceptance of the lift installation, the elevator contractor shall provide the following items listed. These items shall become the Owner's property.

1. Wiring Diagrams: Three sets of "as installed" straight line wiring diagrams showing the electrical connections of all equipment and all modifications to control circuits. One set of straight line wiring diagrams shall be reproducible. Include identification and location of all apparatus or equipment.
2. Parts Catalog: Three sets of complete parts catalogs listing all replaceable parts including manufacturer's identifying numbers and ordering instructions.
3. Printed instructions: Three sets of neatly bound instructions explaining all operating features.
4. Complete software documentation for all installed equipment.
5. The elevator installation shall be a design that can be maintainable by any licensed elevator maintenance company employing journeymen mechanics, without the need to purchase or lease additional diagnostic devices, special tools, or instructions from the original equipment manufacturer.
6. Provide on site capability to diagnose faults to the level of individual circuit boards and individual discreet components for the solid state controller.
7. If the equipment for fault diagnosis is not completely detachable within the controller, but requires a separate, detachable device, that device shall be furnished to the Awarding Authority as part of this installation. Such device shall become property of the Awarding Authority.

G. Certificates and Permits: Provide Owner with copies of all inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of elevators.

1.4 REFERENCES

A. ASME A17.1 - Safety Code for Elevators and Escalators.

B. ASME A17.5 - Elevator and Escalator Electrical Equipment.

C. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.

D. CSA B44 - Safety Code for Elevators and Escalators.

E. CSA B355 - Lifts for Persons with Physical Disabilities.

F. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.

G. NFPA 70 - National Electric Code.

H. CSA - National Electric Code.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with minimum 10 years experience in manufacturing of vertical platform lifts, with evidence of experience with similar installations of type specified.

B. Installer Qualifications: Licensed to install equipment of this scope, with evidence of experience with specified equipment. Installer shall maintain an adequate stock of replacement parts, have qualified people available to ensure fulfillment of maintenance and callback service without unreasonable loss of time in reaching project site.

C. Regulatory Requirements: In addition to local governing regulations, comply with applicable requirements of ASME/ANSI A117.1, Safety Code for Elevators and Escalators, ADA 2010 Standards for Accessibility and the Massachusetts Architectural Access Board, 521 CMR.

1.6 REGULATORY REQUIREMENTS

A. Provide platform lifts in compliance with:

1 ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
2. ASME A17.1 - Safety Code for Elevators and Escalators.
3. ASME A17.5 - Elevator and Escalator Electrical Equipment.
4. NFPA 70 - National Electric Code.

B. Provide platform lifts in compliance with:

1. CSA B355 - Lifts for Persons with Physical Disabilities.
2. CSA B44.1/ASME A17.5 - Elevator and Escalator Electrical Equipment.
3. CSA - National Electric Code.

C. Seismic Design: In accordance with seismic risk zone in accordance with Massachusetts State Building Code.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.8 PROJECT CONDITIONS

A. Do not use wheelchair lift for hoisting materials or personnel during construction period.

1.9 WARRANTY

A. Warranty: Manufacturer shall warrant the wheelchair lift materials and workmanship for one year following completion of installation.

B. Extended Warranty: Provide an extended manufacturer's warranty for the entire warranty period covering the wheelchair lift materials and workmanship for the following additional extended period beyond the initial one year warranty. Preventive Maintenance agreement required.

1. Five additional years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Provide system as manufactured by Garaventa Lift; United States - P.O. Box 1769, Blaine, WA 98231-1769. Canada - 7505 134A St., Surrey, BC V3W 7B3. ASD. Toll Free: 800-663-6556. Tel: (604) 594-0422. Fax: (604) 594-9915. Email: tmorisset@garaventa.ca. Web www.garaventa.ca of one of the following manufacturers:

B. ThyseenKrupp Access.

C. Hiro Lift USA inc.

2.2 UNENCLOSED VERTICAL WHEELCHAIR LIFT

A. Capacity: 750 lbs (340 kg) rated capacity.

B. Mast Height:

1. Similar to Model GVL-OP-60, 63 inches (1600 mm) maximum lifting height.

C. Platform Size and Nominal Clear Platform Dimensions:

1. Standard: 36 inches (914 mm) by 48 7/8 inches (1242 mm).

D. Platform Configuration:

1. Straight Through: Front and rear openings.

E. Landing Openings: Gates shall be self closing type.

1. Gate Height: 42-1/8 inches (1070 mm).

2. Gate Width: 41-3/4 inches (1060 mm).
3. Platform Gate: Travels with platform and opens at lower landing.
4. Upper Landing Gate: Detached, freestanding type.

F. Doors and Gates: Doors and gates shall be self closing type

1. Gate Height: Flush mount, 42-1/8 inches (1070 mm), Width: 42 inches (1067 mm),
2. Door Construction: Aluminum frame with panels of 16 gauge (1.5 mm) painted galvanized steel.
3. D-Handle Pull: 12 inch (305 mm) offset D-Handle."

G. Lift Components:

1. Machine Tower: Custom aluminum extrusion.
2. Base Frame: Structural steel.
3. Platform Side Wall Panels: 16 gauge (1.5 mm) galvanized steel sheet.
4. Platform Access Ramp: 12 gauge (2.5 mm) galvanized steel plates; slip resistant surfaces.

   a. Stationary type.
   b. Ramp: Automatic folding type.

5. Side Guard Panels: 42-1/8 inches (1070 mm) high mounted on platform.

   a. Outdoor Protection: Lift shall include modifications recommended by manufacturer for reliable performance in outdoor climate of project site.

6. Base Mounting at Lower Landing:

   a. Floor Mount: Base of lift shall be mounted on subfloor of the lower landing, for access onto the platform. Provide a ramp of 16 gauge (1.5 mm) galvanized steel sheet with slip-resistant surface.

H. Leadscrew Drive:

1 Drive Type: Self-lubricating acme screw drive.
2. Emergency Operation: Manual handwheel device to raise or lower platform.
3. Battery Powered Emergency Lowering: Battery powered platform lowering device that automatically activates in the event of power failure. Allows passenger to drive platform downward to lower landing. Does not operate lift in up direction.
4. Safety Devices:

   a. Integral safety nut assembly with safety switch.

5. Travel Speed: 10 fpm (3.0 m/minute).
6. Motor: 2.0 hp (560 W).
7. Power Supply:

   a. 208/240 VAC, single phase; 50 Hz on a dedicated 16 amp circuit.

I. Hydraulic Drive:

1. Drive Type: Chain hydraulic.
2. Emergency Operation: Manual device to lower platform and battery auxiliary power to raise or lower platform.
3. Safety Devices:

    a. Slack chain safety device.
    b. Shoring device.

4. Travel Speed: 17 fpm (5.2 m/minute).
5. Motor: 3.0 hp (2.2 kW); 24 volts DC.
6. Power Supply

    a. 208/240 VAC, single phase; 50 Hz on a dedicated 16 amp circuit.
    b. Powered by continuous building mains converted to 24 VDC, equipped with auxiliary power system capable of running lift up and down for a minimum of 5 trips with rated load.
    c. Powered by continuously charged battery system.

J. Platform Controls: 24 VDC control circuit with the following features.

1. Direction Control: Constant pressure rocker switch.
2. lluminated and audible emergency stop switch shuts off power to lift and activates audio alarm with battery backup.
3. Keyless operation.

K. Call Station Controls: 24 VDC control circuit with the following features.

1. Direction Control:

    a. Constant pressure rocker switch.
    b. Elevator style with illuminated and tactile buttons.

2. Keyless operation.
3. Call Station Mounting:

    a. Lower: Frame mounted.
    b. Upper: Frame mounted.

L. Safety Devices and Features:

1. Grounded electrical system with upper, lower, and final limit switches.
2. Tamper resistant interlock to electrically monitor that the gate is in the closed position and the lock is engaged before lift can move from landing.
3. Pit stop switch mounted on mast wall.
4. Electrical disconnect shall shut off power to the lift.
5. Under platform safety pan with five waterproof safety switches to detect obstruction under platform.

M. Finishes

1. Aluminum Extrusions: Manufacturer's standard anodized finish
2. Ferrous Components: Electrostatically applied baked powder finish, fine textured.

a. Color: As selected by Architect from manufacturer's full selection of finishes.

3. Lift Finish: Baked powder coat finish as selected by architect from manufacturer's full selection of finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify shaft and machine space are of correct size and within tolerances.

C. Verify required landings and openings are of correct size and within tolerances.

D. Verify electrical rough-in is at correct location.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install platform lifts in accordance with applicable regulatory requirements including ASME A 17.1, ASME A 18.1 and the manufacturer's instructions.

B. Install platform lifts in accordance with applicable regulatory requirements including CSA B355, and manufacturer's instructions.

C. Install system components and connect to building utilities.

D. Accommodate equipment in space indicated.

E. Startup equipment in accordance with manufacturer's instructions.

F. Adjust for smooth operation.

3.4 FIELD QUALITY CONTROL

A. Perform tests in compliance with ASME A 17.1 or A18.1 and as required by authorities having jurisdiction.

B. Perform tests in compliance with CSA B355 and required by authorities having jurisdiction.

C. Schedule tests with agencies and Architect, Owner, and Contractor present.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. At time of Substantial Completion of work (or portion thereof), provide suitable protective coverings, barriers, devices, signs, or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.6 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.

B. Make a final check of each elevator operation with Owner's personnel present and just prior to date of Substantial Completion. Determine that control systems and operating devices are functioning properly.

END OF SECTION 144200

TABLE OF CONTENTS

SECTION 230000

HEATING, VENTILATING AND AIR CONDITIONING

(FILED SUB-BID REQUIRED)

PART 1 - GENERAL 4

1.1 FILED SUB BID 4
1.2 GENERAL PROVISIONS 5
1.3 SCOPE OF WORK 5
1.4 RELATED WORK 7
1.5 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION 8
1.6 PRODUCTS INSTALLED, BUT NOT FURNISHED UNDER THIS SECTION 8
1.7 DEFINITIONS 8
1.8 CODES, REFERENCES AND PERMITS 9
1.9 GENERAL REQUIREMENTS 11
1.10 MATERIAL AND EQUIPMENT STANDARDS 11
1.11 SUBMITTALS 12
1.12 OPERATION AND MAINTENANCE DATA 17
1.13 RECORD DRAWINGS 19
1.14 WARRANTIES 20
1.15 COORDINATION 21
1.16 COORDINATION DRAWINGS 22
1.17 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS 23
1.18 INSPECTION OF SITE CONDITIONS 23
1.19 SURVEY AND MEASUREMENTS 24
1.20 DELIVERY, STORAGE AND HANDLING 24
1.21 PROTECTION OF WORK AND PROPERTY 24
1.22 SUPERVISION 24
1.23 SAFETY PRECAUTIONS 24
1.24 SCHEDULE 25
1.25 HOISTING, SCAFFOLDING AND PLANKING 25
1.26 CUTTING AND PATCHING 25
1.27 SLEEVES, INSERTS AND ANCHOR BOLTS 25
1.28 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS 26

1.29 HAZARDOUS MATERIALS 26
1.30 ACCESSIBILITY 27
1.31 SEISMIC RESTRAINT REQUIREMENTS 27
1.32 WELDING QUALIFICATIONS 27
1.33 ELECTRICAL WORK 27
1.34 PROJECT CLOSEOUT 28
PART 2 - PRODUCTS 31
2.1 PIPING AND FITTINGS 31
2.2 PIPE HANGERS AND SUPPORTS 33
2.3 SLEEVES 35
2.4 FIRESTOPPING 36
2.5 VALVES AND STRAINERS 36
2.6 STEAM TRAPS 40
2.7 PIPING, EQUIPMENT, PANEL AND VALVE IDENTIFICATION 41
2.8 MOTORS, DRIVES AND STARTERS 41
2.9 UNIT VENTILATOR 42
2.10 VIBRATION ISOLATION AND SEISMIC RESTRAINTS 45
2.11 DUCTWORK 46
2.12 DIFFUSERS, REGISTERS AND GRILLES 54
2.13 FANS 55
2.14 CONVECTORS 57
2.15 AIR FILTERS 58
2.16 AIR HANDLING UNITS (H&V) 58
2.17 GRAVITY RELIEF VENTILATORS 65
2.18 FACTORY PAINTING 65
2.19 INSULATION 65
2.20 ROOF CURBS 70
2.21 AUTOMATIC TEMPERATURE CONTROLS 70
PART 3 - EXECUTION 106
3.1 DEMOLITION 106
3.2 GENERAL 107
3.3 IDENTIFICATION 108
3.4 PIPING 110
3.5 FIRESTOPPING INSTALLATION 113

3.6 CONNECTIONS TO EQUIPMENT 113
3.7 BRANCH CONNECTIONS 114
3.8 RISERS 114
3.9 SUPPORTS 114
3.10 STRAINERS 116
3.11 VALVES AND EQUIPMENT ACCESSORIES 116
3.12 HYDROSTATIC TESTS 116
3.13 PIPING SYSTEM, CLEANING AND FLUSHING 117
3.14 DUCTWORK 117
3.15 AIR SYSTEMS BALANCING 118
3.16 BASES AND SUPPORTS 122
3.17 WATERPROOFING 123
3.18 MISCELLANEOUS IRON AND STEEL 123
3.19 PLACING IN SERVICE 123
3.20 CLEANING AND ADJUSTING 123
3.21 OPERATING AND MAINTENANCE INSTRUCTIONS 124
3.22 TRAINING 124

SECTION 230000

HEATING, VENTILATING AND AIR CONDITIONING

(FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 FILED SUB BID

A. Time, Manner, and Requirements for Submitting Sub-Bid: The work of this Section is stipulated as a Filed Sub-Bid under the General Bid Form. Sub-Bids for the work of this Section shall be for the complete work and filed in a sealed envelope in strict compliance with and before the date and time stated in the Invitation for Bid and Instructions to Bidders. The following information shall appear in the upper left hand of the envelope:

Name of Bidder:

Name of Project: Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

Section Number and Name of Sub-trade: #####, XXXXXX

B. Form of Sub-Bid: The Sub-Bid for the work of this Section shall be made on the Form of Sub-Bid, a copy for the use of Sub-Bidders in submitting Sub-Bids is included in the Bid Package.

C. Bid Deposit: A Bid Deposit equal to five percent of the value of the Bid must be submitted with the Sub-Bid. The value of the Bid includes Add Alternates. The Bid Deposit may be in the form of a bid bond, cash, or a certified check on, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to The City of Somerville, Massachusetts.

D. Sub-Sub-Bid Requirements:

1. Sub-bidders attention is directed to Mass. GL Chapter 149, Section 44F as amended which provides in part as follows:

a. Each sub-bidder shall list in Paragraph E of the "Form for Sub-Bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which (the section of the Specifications for that sub-trade) required such listing; provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name in said Paragraph E for any such class of work or part thereof and perform that work with persons on his own payroll, if such sub-bidder, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work or part thereof with persons on his own payroll and is qualified to do so. This Section requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

Classes of Work	Section Number
(1) Insulation	230000
(2) Sheet Metal Work	230000
(3) Automatic Temperature Controls	230000

E. Reference to Drawings: Work to be performed is shown on Drawings numbered:

HVAC

H000 HVAC Legend, Notes and Abbreviations

HD201 HVAC First Floor Demo Plan

HD202 HVAC Second Floor Demo Plan

HD203 HVAC Third Floor Demo Plan

HD204 HVAC Roof Demo Plan

H201 HVAC First Floor New Plan

H202 HVAC Second Floor New Plan

H203 HVAC Third Floor New Plan

H204 HVAC Roof New Plan

H500 HVAC Control Sequences

H501 HVAC Control Sequences

H700 HVAC Details

H701 HVAC Details

H702 HVAC Details

H800 HVAC Schedules

1.2 GENERAL PROVISIONS

A. The GENERAL REQUIREMENTS, DIVISION 1, and BIDDING AND CONTRACT REQUIREMENTS, and DIVISION 0 are hereby made a part of this Specification Section.

B. Examine all Drawings and all Sections of the Specifications and requirements and provisions affecting the work of this Section.

1.3 SCOPE OF WORK

A. This project includes the renovation of the Auditorium and kitchen. Selective demolition of existing systems shall be required. This work includes replacement of the kitchen hood supply and exhaust fans, unit ventilator, H&V air handling units, misc. convectors, insulated and lined ductwork, diffusers, and controls.

B. The work under this Section shall include the furnishing of all materials, labor, equipment and supplies and the performance of all operations to provide complete working systems, in general, to include the following items:

1. Piping and Fittings (all systems and types) including submitting sizing where called for on the drawings or in these specifications
2. Pipe Hangers and Supports
3. Identification
4. Sleeves, Firestopping
5. Valves and Accessories (all types)
6. Steam Traps
7. Electric Motors and Starters
8. Equipment Nameplates
9. Factory Tests
10. Vibration Isolation
11. Ductwork
12. Diffusers, Registers and Grilles
13. Fans
14. Convectors
15. Air Filters
16. Air Handling Units (H&V)
17. Unit Ventilator
18. Gravity Relief Ventilators
19. Insulation
20. Roof Curbs
21. Relocation of existing HVAC components that interfere with new construction and removal and disposal of obsolete components.
22. Operating and maintenance instructions and manuals

23. Coordination drawings

24. Shop drawings

25. Cleaning, Testing, Adjusting, & Balancing of all Ducted and Piped Systems and Equipment

26. Record (as-built) Drawings

27. HVAC Control Systems

28. Seismic Restraints

29. Training of Owners Personnel on Equipment, Systems, and Controls

C. The work to be done under this section is generally shown on the Mechanical HVAC Drawings.

1.4 RELATED WORK

A. Principal classes of Work related to the Work of this Section are listed below, and are specified to be performed under the indicated Sections of these Specifications. Refer to the indicated Sections for description of the extent and nature of the indicated Work, and for coordination with related trades. This listing may not include all related Work items. It is the responsibility of the Contractor to coordinate the Work of this Section with that of all other trades.

B. The following work is not included in this section and will be provided under other sections, except as specified herein:

1. Electrical power wiring for all HVAC equipment and to junction box(es) in mechanical areas. Power wiring from these box(es) to all control equipment (control panels, etc.) and all controls/interlock wiring shall be provided by the controls Contractor. Control wiring shall be from standby power source (if available).

2. Starters and variable speed drives that are not integral to equipment, unless specified otherwise.

3. Structural supports necessary to distribute loading from equipment to roof or floor.

4. Temporary light, power, water, heat, gas and sanitary facilities for use during construction and testing. Refer to Division 1, General Conditions.

5. Gypsum drywall enclosures of supply, return and exhaust ductwork on all rooftop/penthouse air handlers, supply and return air shafts, as shown on drawings.

6. Outdoor air intake and exhaust louvers.

7. Flashing of roof and wall penetrations.

8. Painting.

1.5 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION

A. Furnish pipe sleeves for placement into formwork by the General Contractor.

B. Furnish access panels and doors for installation by the General Contractor.

1. Furnish access panels for installation in walls, ceiling and floors at locations to permit access for adjustment, removal, replacement and servicing of all concealed equipment, valves and materials installed under this Section of the specifications.

2. Access panels will be installed under the Section of the related trades of the finished surfaces in which they are located.

3. Access panels shall be located in closets, storage rooms and/or other non-public areas if possible, positioned so that the equipment can be easily reached, and the size shall be sufficient for this purpose (min. 16" x 16"). When access panels are required in corridors, lobby or other habitable areas, they will be located as directed by the Owner's Representative.

4. Access panels shall be prime painted, keyed alike and provided with cylinder lock and two keys for each panel. Units shall be manufactured by Milcor, Inland Steel, Miami Carey or approved equal. Required fire resistance of walls and ceilings shall be maintained.

C. Furnish roof curbs for installation by the Roofing Subcontractor.

1.6 PRODUCTS INSTALLED, BUT NOT FURNISHED UNDER THIS SECTION

A. Install duct-mounted smoke detectors which will be furnished by the Electrical Subcontractor. The HVAC Subcontractor shall wire the appropriate fan to shut down upon detection of smoke. The Electrical Subcontractor shall power wire and wire the smoke detector to the fire alarm panel.

1.7 DEFINITIONS

A. As used in this Section, the following terms shall be understood to have the following meaning:

1. "**Contractor**," or "**Subcontractor**," unless otherwise qualified, shall mean the installer of the work specified under this Section, and shall be responsible for coordination of this work with the work of the ATC Contractor.

2. "**Furnish**" shall mean purchase and deliver to the project site, complete with every necessary appurtenance and product support.

3. "**Install**" shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting and proper operation at the proper location in the project.

4. "**Provide**" shall mean furnish and install.

5. **"Work"** shall mean all labor, materials, equipment, apparatus, controls, accessories and all other items required for a proper and complete installation.

6. "**Concealed**" shall mean hidden from sight in chases, furred in spaces, shafts, embedded in construction, in a crawl space, and above hung ceilings.

7. "**Exposed**" shall mean not installed underground or concealed as defined above.

8. "**Furnished by others**" shall mean materials or equipment purchased under other sections of the general contract and installed by this section of the specifications by this trade Contractor.

9. "**Owner's Representative**" shall be the party responsible to make decisions regarding all contractual obligations in reference to the Scope of Work for the Owner.

10. "**Date of Substantial Completion**" shall indicate the date where the work has been formally accepted as evidenced by completed final punch list or where the work has reached the stage that the Owner obtains beneficial use and commences utilization of the installed systems for business or occupancy purposes. The GENERAL REQUIREMENTS, DIVISION 1, shall supercede this definition where specifically defined.

11. "**Piping**" shall mean, in addition to pipe or tubing, all fittings, flanges, unions, valves, strainers, drains, hangers and other accessories relative to such piping.

12. "**ATC**" shall mean Automatic Temperature Controls, and shall be interchangeable with "**BAS**" (Building Automation System).

1.8 CODES, REFERENCES AND PERMITS

A. Materials, installation of systems and equipment provided under this section shall be done in strict accordance with the latest governing edition of the following standards, codes, specifications, requirements, and regulations, and any other Codes and Regulations having jurisdiction including but not limited to:

1. All Applicable NFPA Standards

2. State and Local Building Mechanical, Electrical, and Energy Codes

3. American Society of Mechanical Engineers (ASME)

4. American Society of Testing and Materials (ASTM)

5. American National Standards Institute (ANSI)

6. Underwriters' Laboratories, Inc. (UL)

7. Occupational Safety and Health Administration (OSHA)

8. Any other local codes or authorities having jurisdiction.

B. Heating and steam piping and kitchen hood systems shall be installed by Contractors and personnel appropriately licensed in the State (Installing Contractor).

C. All pressure vessels shall conform to ASME and State codes and regulations.

D. All equipment shall meet the more efficient requirement:

1. As shown on bid documents,

2. Minimum efficiencies state in ASHRAE 90.1-2007, or

3. Minimum efficiencies stated in the governing Energy Code.

E. Unless otherwise specified or indicated, materials, workmanship and equipment performance shall conform with the latest governing edition of the following standards, codes, specifications, requirements, and regulations, except when more rigid requirements are specified or are required by applicable codes but not limited to:

1. Air Conditioning and Refrigeration Institute (ARI)

2. Air Diffusion Council (ADC)

3. Air Movement and Control Association AMCA

4. American National Standards Institute (ANSI)

5. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE)

6. American Society of Mechanical Engineers (ASME).

7. American Society of Testing and Materials (ASTM)

8. American Welding Society, Inc. (AWS)

9. Associated Air Balance Council (AABC)

10. Copper Development Association (CDA)

11. Factory Mutual System (FM)

12. Illuminating Engineering Society (IES)

13. Institute of Electrical and Electronics Engineers (IEEE)

14. Insulated Cable Engineers Association (ICEA)

15. Manufacturer's Standardization Society of the Valve & Fitting Industry (MSS)

16. National Electrical Contractors Association (NECA)

17. National Electric Manufacturers Association (NEMA)

18. National Environmental Balancing Bureau (NEBB)

19. North American Insulation Manufacturer's Association (NAIMA)

20. Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA)

21. The Hydronics Institute (HI)

22. Thermal Insulation Manufacturer’s Association (TIMA)

F. Codes, laws and standards provide a basis for the minimum installation criteria acceptable. The drawings and specifications illustrate the scope required for this project, which may exceed minimum codes, laws and standards.

G. The date of the code or standard is that in effect at the Bid date.

H. Give all notices, file all plans, obtain all permits and licenses, and obtain all necessary approvals from authorities having jurisdiction. Deliver all certificates of inspection to the authorities having jurisdiction. No work shall be covered before examination and approval by the Owner’s Representative, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work to conform to requirements, satisfactory to Owner’s Representative, and without extra cost to the Owner. If work is covered before inspection and approval, this Contractor shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.9 GENERAL REQUIREMENTS

A. Nameplates

1. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, type or style, model number, catalog number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

B. Maintenance Information

1. Systems and equipment which require periodic maintenance to maintain efficient operation shall be furnished with complete necessary maintenance information. Required routine maintenance actions, as specified by the manufacturer, shall be stated clearly and incorporated on a readily accessible label on the equipment. Such label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product.

C. Equipment Guards

1. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts so located that any person may come in close proximity thereto shall be completely enclosed or guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be guarded or covered with insulation of type specified for service.

1.10 MATERIAL AND EQUIPMENT STANDARDS

A. Where equipment or materials are specified with the name of a manufacturer, such specification shall be deemed to be used for the purpose of establishing a standard for

that particular item. No equipment or material shall be used unless previously approved by the Owner's Representative.

B. Substitutions (approved equals) may be offered for review provided the material, equipment or process offered for consideration is equal in every respect to that indicated or specified. In order for Requests for substitution to be considered, all must be submitted for pre-approval of manufacturer within 30 days of award of contract. All requests must be accompanied by a list of minimum 5-year-old successful installations of similar scope (with Owner contact and phone number), complete specifications together with drawings or samples to properly appraise the materials, equipment or process. Allow 30 days for Owner's Representative's review.

C. If a substitution of materials or equipment in whole or in part is made, this Contractor shall bear the cost of any changes necessitated by any other trade as a result of said substitution.

D. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers as approved.

1.11 SUBMITTALS

A. Conform to the requirements of Division 1, General Conditions, for schedule and form of all submittals unless specifically noted otherwise in this section. Coordinate this submittal with submittals for all other finishes. Shop drawings and design layouts shall be prepared by licensed installing Contractors and shall note the name(s), license number(s) and license expiration date(s) of the Contractor(s) installing the heating, steam piping and kitchen hood systems.

B. Definitions:

1. Shop Drawings are information prepared by the Contractor to illustrate portions of the work in more detail than indicated in the Contract Documents.

2. Acceptable Manufacturers: The mechanical design for each product is based on the single manufacturer listed in the schedule or shown on the drawings. In Part 2 of the specifications certain Alternate Manufacturers are listed as being acceptable. In addition, the MATERIAL AND EQUIPMENT STANDARDS paragraph potentially allows for substitutions as being acceptable. These are acceptable only if, as a minimum, they:

a. Meet all performance criteria listed in the schedules and outlined in the specifications. For example, to be acceptable, an air handling unit must deliver equal CFM against equal external static pressure (with the allowed pressure drop of dirty filters) using equal or less horsepower as the air handler listed in the schedules.

b. Fit within the available space it was designed for, including space for maintenance and component removal, with no modification to either the space or the product. Clearances to walls, ceilings, and other equipment will be at least equal to those shown on the design drawings. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Engineer has determined that the manufacturer's products will

fit within the available space – this determination is solely the responsibility of the Contractor.

c. For rooftop mounted equipment and equipment mounted in areas where structural matters are a concern, the products must have a weight no greater than the product listed in the schedules or specifications.

d. Products must adhere to all architectural considerations including, but not limited to: being of the same color as the product scheduled or specified, fitting within the architectural enclosures and details.

C. Submittal Procedures, Format and Requirements

1. Review submittal packages for compliance with Contract Documents and then submit to Owner's Representative for review. Submit enough sets of shop drawings such that, after review, two sets will be kept by the reviewer, with only the remaining sets returned with reviewer's marks and comments.

2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:

a. Title.

b. Equipment number.

c. Name and location of project.

d. Names of Owner, Engineer and Seller.

e. Names of manufacturers, suppliers, vendors, etc.

f. Date of submittal.

g. Whether original submittal or resubmitted.

3. Shop drawings showing manufacturer's product data shall contain detailed dimensional drawings (minimum ¼" = 1' scale) including plans and sections (where physical clearance could be an issue). Provide larger scale details as necessary. Sheet metal drawings shall show elements of Architect's reflected ceiling plan, exposed ductwork, walls and partitions (highlighting fire walls and smoke partitions), diffusers, registers, grilles, all dampers (fire, smoke, balancing, backdraft, and control dampers), sleeves and other aspects of construction as necessary for coordination.

4. Submit accurate and complete description of materials of construction, manufacturer's published performance characteristics, sizes, weights, capacity ratings (performance data, alone, is not acceptable), electrical requirements, starting characteristics, wiring diagrams, and acoustical performance for complete assemblies. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.

5. Provide shop drawings showing details of piping connections to all equipment. If connection details are not submitted and connections are found to be installed incorrectly, this Contractor shall reinstall them within the original contract price.

    a. Alternate pipe joining methods such as grooved and permanent push-to-connect systems shall be shown on drawings and product submittals, and be specifically identified with the applicable manufacturer's style or series number. Installation shall include any additional hangers required for the alternate system.

6. Provide complete data for all auxiliary services and utilities required by submitted equipment. This shall include power, cooling water and compressed air requirements and points of connection.

7. Provide a complete description of all controls and instrumentation required including electrical power connection drawing for all components and interconnection wiring to starters, detailed information on starters, control diagrams, termination diagrams, and all control interfaces with a central control system.

8. Provide installation and erection information including; lifting requirements, and any special rigging or installation requirements for all equipment.

9. The Owner's Representative shall approve all materials before commitment for materials is made.

D. Product Data: Submit complete manufacturer's product description and technical information including:

1. Piping and Fittings (all services, types, and joining methods)

2. Pipe Hangers and Supports

3. Identification

4. Sleeves, Firestopping

5. Valves and Accessories (all types)

6. Steam Traps

7. Electric Motors and Starters

8. Factory Tests

9. Vibration Isolation

10. Complete ductwork, equipment layout, and piping shop drawings, construction details and construction standards

11. Diffusers, Registers and Grilles

12. Fans

13. Convectors

14. Air Filters

15. Air Handling Units (H&V)

16. Unit Ventilator

17. Gravity Relief Ventilators

18. Insulation

19. Roof Curbs

20. Coordination Drawing

21. Operating and maintenance instructions and manuals

22. HVAC Control Systems

23. Seismic Restraints

24. Color selection charts and samples for equipment and systems in finished areas

25. Testing, Adjusting, & Balancing Qualifications, Plan, and Reports

26. Identification, labels and tags, including database for all equipment and devices

27. O&M manual table of contents

28. O&M manual including completed Facility Support Services data sheets (from Part 4)

E. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in an individual (combined) submittal.

1. Access panel shop drawings shall be submitted to the Construction Supervisor for approval.

2. Do not submit multiple product information in a single bound manual.

3. Three-ring binders shall not be accepted.

F. Deviations

1. Concerning deviations other than substitutions, proposed deviations from Contract Documents shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the deviation to the attention of the Owner's Representative.

2. Without letters flagging the deviation to the Owner's Representative, it is possible that the Engineer may not notice such deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Owner's

Representative, the Seller shall hold the Engineers, his consultants and the Owner harmless for any and all adverse consequences resulting from the deviations being implemented. This shall apply regardless of whether the Engineer has reviewed or approved shop drawings containing the deviation, and will be strictly enforced.

3. Approval of proposed deviations, if any, will be made at discretion of Engineer.

G. Schedule: Incorporate shop drawing review period into construction schedule so that Work is not delayed. This Contractor shall assume full responsibility for delays caused by not incorporating the following shop drawing review time requirements into his project schedule: Allow at least 10 working days, exclusive of transmittal time, for review each time shop drawing is submitted or resubmitted with the exception that 20 working days, exclusive of transmittal time are required for the following:

1. HVAC temperature control submittals

2. Coordination Drawings

3. TAB Plan

4. TAB draft and final balancing reports.

5. O&M manuals including completed Facility Support Services data sheets (from Part 4)

6. As built drawings

7. If more than five shop drawings of a single trade are received in one calendar week.

H. Responsibility

1. Intent of Submittal review is to check for capacity, rating, and certain construction features. HVAC Contractor shall ensure that work meets requirements of Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with approved submittals to extent that they agree with Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of Contract Documents. The Engineer's noting of some errors while overlooking others will not excuse the HVAC Contractor from proceeding in error and will not absolve the Contractor from meeting the full design intent of the associated system(s). Contract Documents requirements are not limited, waived nor superseded in any way by review.

2. Inform Contractors, manufacturers, suppliers, etc. of scope and limited nature of review process and enforce compliance with contract documents.

I. In the event that the HVAC Subcontractor fails to provide Shop Drawings for any of the products specified herein:

1. The HVAC Subcontractor shall furnish and install all materials and equipment herein specified in complete accordance with these Specifications.

2. If the HVAC Subcontractor furnishes and installs material and/or equipment that is not in complete accordance with these Specifications, he shall be responsible for the removal of this material and/or equipment. He shall also be responsible for the replacement of this material and/or equipment with material and/or equipment that is in complete accordance with these Specifications, at the direction of the Owner's Representative.

3. Removal and replacement of materials and/or equipment that is not in complete compliance with these Specifications shall be done at no extra cost to the Owner.

4. Removal and replacement of materials and/or equipment that is not in complete compliance with these Specifications shall not be allowed as a basis for a claim of delay of completion of the Work.

J. Mark dimensions and values in units to match those specified.

K. Submit Material Safety Data Sheets (MSD) on each applicable product with submittal.

1.12 OPERATION AND MAINTENANCE DATA

A. Commence preparation of the Operating and Maintenance (O&M) Manuals immediately upon receipt of "Approved" or "Approved as Noted" shop drawings and submit each section within one month. The final submission shall be no later than two months prior to the projected date of Substantial Completion of the Project.

B. Submit O&M table of contents in the submittal phase. O&M manuals shall be built as submittals are accepted and shall include the individual equipment manufacturer's data retrieval sheet, as per Attachment A in Part IV for input into the Owner's Maintenance Management System. Form shall be provided and completed electronically.

C. Each O&M document shall include the manufacturer's web address for equipment - specific O&M information for Internet access by the Owner.

D. The manual shall consist of (3) sets of manuals and include (3) sets of CDs, which shall contain the scanned content of the entire manual. The manual shall highlight the actual equipment used and <u>not</u> be a master catalog of all similar products of the manufacturer. The manual shall be submitted for review prior to creation of the CDs.

E. The Manual shall contain the following:

1. Operations Manual

a. Systems description including all relevant information needed for day-to-day operations and management including:

1) Start-up procedures

2) Shut-down procedures.

3) Trouble-shooting checklist (i.e., common alarms with possible cause & effect, etc.)

b. Wiring diagrams, schematics, logic diagrams and sequence of operations that accurately depict the controls system.

c. Depiction of each interface screen where programmable logic and visual displays are provided. Descriptors shall be provided to define displayed data, alarms, etc.

d. A single sheet (for ease of removal) of all access codes and passwords necessary to access all levels of control and programming.

2. Maintenance Manual

a. Define all maintenance activities required to ensure system operation within manufacturers specified parameters. Maintenance documentation shall include:

1) Data retrieval sheet

2) Special instructions (i.e., lockout/tag-out, etc.)

3) Special tools (i.e., key, allen wrench, etc.)

4) Tasks

5) Frequency

6) Required materials, lubricants, etc.

b. Provide table of all required activities plotted vs. interval with adequate fill-in-space for “activity completion date” and “comments”. Where multiple instrument readings are required, provide data sheet formatted to accommodate activity.

c. Provide as part of each package, lubricating charts indicating equipment tag number, location, equipment service, greasing and lubricating requirements, lubricants, and intervals.

d. Provide as part of each package, a valve and system chart that corresponds to the valve tags. Provide directions for normal positions and positions for equipment failure modes.

e. Provide all information as listed on the Facility Support Services data sheet as per Attachment A in Part IV for input into the Owner’s Maintenance Management System. Form shall be provided and completed electronically.

f. The HVAC Subcontractor shall furnish spare-parts data for each different item of equipment furnished. The data shall include a complete

list of: parts and supplies, with current unit prices, lead time, and source of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment, or specified hereinafter to be furnished as part of the contract; and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 360 days at the particular installation. The foregoing shall not relieve the HVAC Subcontractor of any responsibilities under the guarantees specified herein.

g. Provide copy of all warranty information with associated date of substantial completion (commencement of warranty) and end date of coverage. Define all components/subsystems specifically included and excluded.

F. Provide O&M manuals for each of the following as a minimum:

1. Valves and Accessories (all types, including charts for all balancing valves)
2. Steam Traps
3. Electric Motors and Starters
4. Vibration Isolation
5. Fans
6. Convectors
7. Air Filters
8. Air Handling Units (H&V)
9. Unit Ventilator
10. Gravity Relief Ventilators
11. HVAC Control Systems

1.13 RECORD DRAWINGS

A. Refer to DIVISION 1, General Conditions, for record drawings and procedures to be provided under this section, unless specifically noted otherwise in this section.

B. Record Drawings (red-line drawings) will be updated by this Contractor daily for review with the monthly requisition. The record drawing shall be an accurate depiction of the systems as completed, including dimensions (vertical/horizontal) of concealed components off fixed building elements.

C. The HVAC Foreman shall maintain complete and separate set of prints of Contract Drawings at job site at all times and shall record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design.

D. At completion of work the HVAC Contractor shall prepare a complete set of record drawings on AutoCAD showing all systems as actually installed. The Architectural background AutoCAD files will be made available for the Contractor's copying, at his expense, to serve as backgrounds for the drawings. The HVAC Contractor shall transfer changes from field drawings onto AutoCAD drawings and submit copy of files and three sets of prints to Owner's Representative for comments as to compliance with this section. CADD layering as established by the A & E design team shall be maintained with any and all changes done by the Contractor.

E. The Architect and Engineer are not granting to the Contractor any Ownership or property interest in the CADD Drawings by the delivery of the CADD Disks to the Contractor. The Contractor's rights to use the CADD disks and the CADD Drawings are limited to use for the sole purpose of assisting in the Contractor's performance of its contractual obligations under its contract with respect to the Project. The Architect and Engineer are granting no further rights. Any reuse or other use by the Contractor will be at the Contractor's sole risk and without liability to the Architect and Engineer. The Contractor hereby waives and releases any losses, claims, damages, liabilities of any nature whatsoever, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor. The Contractor, to the maximum extent permitted by law, hereby agrees to indemnify, defend and hold the Architect and Engineer harmless from all loses, claims, damages, liabilities, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor.

F. Record Drawings, shall show "as-built" condition of all plans, mechanical room part plans, details, sections, piping diagrams, control diagram and sequence changes and corrections to schedules. Schedules shall show actual manufacturer model numbers and capacities of final installed equipment.

G. Record drawings shall include the specific locations of the following life safety and control points/sensors:

1. All smoke, fire and combination smoke/fire dampers.

2. All duct smoke detectors.

3. All outdoor air temperature and humidity sensors.

4. All duct mounted and room sensors, including temperature, humidity, CO_2, and occupancy sensors.

H. The HVAC Contractor shall submit the record set for approval a minimum of three weeks prior to seeking the permanent certificate of occupancy.

1.14 WARRANTIES

A. Submit manufacturer's standard replacement warranties for material and equipment furnished under this Section. Such warranties shall be in addition to and not in lieu of all liabilities which the manufacturer and the HVAC Subcontractor may have by law or by provisions of the Contract Documents.

B. All materials, equipment and work furnished under this Section shall be guaranteed against all defects in materials and workmanship for a minimum period of one year commencing with the Date of Substantial Completion. Where individual equipment sections specify longer warrantees, provide the longer warrantee. Any failure due to defective material, equipment or workmanship which may develop, shall be corrected at no expense to the Owner including all damage to areas, materials and other systems resulting from such failures.

C. Guarantee that all elements of each system meet the specified performance requirements as set forth herein or as indicated on the Drawings.

D. Upon receipt of notice from the Owner of the failure of any part of the systems during the guarantee period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.

1.15 COORDINATION

A. Refer to DIVISION 1, General Conditions, for record drawings and procedures to be provided under this section, unless specifically noted otherwise in this section.

B. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as required.

C. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections. Any conflicts shall be referred immediately to the Owner’s Representative for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Owner’s Representative's satisfaction at no expense to the Owner.

D. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section may interfere with work of other sections, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 3/8" scale or larger working drawings and sections, clearly showing how the work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.

E. Keep fully informed as to the shape, size and position of all openings required for all apparatus, piping, ductwork, etc., and give information in advance to build openings into the work. Furnish all sleeves, pockets, supports and incidentals, and coordinate with the Owner’s Representative for the proper setting of same.

F. All distribution systems which require pitch or slope such as condensate drains and water piping shall have the right of way over those which do not.

G. Make reasonable modifications in the work as required by structural interferences, interference with work of other trades, or for proper execution of the work without extra charge.

H. Keep fully informed as to the size, shape and location of all openings required for the work of this Section and give full information to all Subcontractors and the Owner's Representative.

1.16 COORDINATION DRAWINGS

A. Provide a set of HVAC coordination drawings for use in verifying required code clearances (as well as clearances for operation, repair, removal, and testing) of all equipment and for use in coordinating installation of equipment with other trades. Where practical, the CADD layering as established by the A&E team for the construction documents shall be utilized in the preparation of all coordination drawings. Where CADD layering deviates from the A&E team's layering convention, submit the proposed layering system for approval. The CADD layering used shall provide, as a minimum, the flexibility of illustrating trade specific items similar to the established A&E team layering standard.

B. The intent of the coordination drawings is to identify and resolve installation conflicts prior to fabrication and installation of any MEP trade.

C. The HVAC Contractor's floor plans shall be the basis for floor plan coordination. The Electrical Contractor's reflected ceiling plans shall be the basis for reflected ceiling plan coordination.

D. The CADD Drawings prepared by the Architect and Engineer contain representations of certain elements of the Project, and are not necessarily complete, nor are the CADD Drawings comparable or identical to final construction drawings. The Architect and Engineer make no representations or warranties with respect to the accuracy or completeness of the CADD Drawings. The Architect and Engineer do not recommend that the Contractor use the CADD Drawings in connection with the preparation of shop drawings. Should the Contractor choose to do so, however, the Contractor shall carefully review and compare the CADD Drawings with the corresponding final construction drawings to verify their accuracy and identify all discrepancies, differences, and inconsistencies in design, locations, dimensions, scope, and all other respects between the CADD Drawings and the corresponding final construction drawings. The Contractor, shall base the preparation and submission of shop drawings, and in general, shall base the performance of all its obligations with respect to the Project upon the information contained in the final construction drawings and not the CADD drawings. Nothing shall be construed as to relieve the Contractor of any of its obligations (such as, by way of illustration, the obligation to make field measurements or to coordinate drawings) under its contract with respect to the Project.

E. HVAC Coordination Drawings shall be prepared as outlined below.

1. Prepare HVAC Coordination Drawings showing all HVAC work to be installed as part of Section 230000. The Coordination Drawings shall be created using AutoCAD and shall have a scale of not less than 3/8" for mechanical/electrical rooms and ¼" for all other areas.

2. The HVAC Coordination Drawings shall show all equipment, pipes, sleeves, inserts, ducts, registers, diffusers and supports. Drawings shall include

dimensions and elevation tags for all equipment, devices and material. Under no conditions shall any pipe or conduit pass through any ductwork system

3. After incorporating all trades, resolve any areas of conflicts between trades under the direction of the General Contractor/Construction Manager and submit fully coordinated drawings to the Owner's Representative.

4. Do not install any of this work prior to the preparation and Engineer's review of the final Coordination Drawings. If HVAC work proceeds prior to the final Coordination Drawings, any changes to the HVAC work to correct the interferences and conflicts which result will be made by this Contractor at no additional cost to the Owner.

5. Coordination Drawings are for this Contractor's and Owner's Representative's use during construction and shall not be construed as replacing any shop, "as-built", or Record Drawings required elsewhere in these Contract Documents.

6. Owner's Representative's review of Coordination Drawings shall not relieve this Contractor from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirements of the Contract.

1.17 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. It is the intention of the Specifications and Drawings to call for complete, finished work, tested and ready for continuous operation. Any apparatus, appliance, material or work not shown on the Drawings, but mentioned in the Specifications or vice versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be provided by the HVAC Subcontractor or his/her Sub Subcontractors, without additional expense to the Owner.

B. The Drawings are generally diagrammatic. The locations of all items that are not definitely fixed by dimensions are approximate only. The exact locations must be determined at the site and shall have the approval of the Architect before being installed. The HVAC Subcontractor shall follow Drawings, including shop drawings, in laying out work and shall check the Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions. Where space conditions appear inadequate, notify the Architect before proceeding with the installation. The HVAC Subcontractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

C. Any requests for information (RFI) for resolving an apparent conflict or unclarity, or a request for additional detail, shall include a sketch or equivalent description of Contractors proposed solution.

D. Sizes of ducts and pipes and routing are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the intent and purpose of the Drawings, all necessary parts to make complete approved working systems ready for use, shall be furnished without extra charge.

1.18 INSPECTION OF SITE CONDITIONS

A. Prior to submission of bid, visit the site and review the related construction documents to determine the conditions under which the Work has to be performed. Send a report, in writing, to the Owner's Representative, noting any conditions which might adversely affect the Work of this Section of the Specifications.

1.19 SURVEY AND MEASUREMENTS

A. Base all required measurements, horizontal and vertical, from referenced points established with the Owner's Representative and be responsible for correctly laying out the Work required under this Section of the Specification.

B. In the event of discrepancy between actual measurements and those indicated, notify the Owner's Representative in writing and do not proceed with the related work until instructions have been issued.

1.20 DELIVERY, STORAGE AND HANDLING

A. No materials shall be delivered or stored on site until Shop Drawings have been approved.

B. All manufactured materials shall delivered to the site in original packages or containers bearing the manufacturer's labels and product identification.

C. Protect materials against dampness. Store off floors, under cover, and adequately protected from damage.

D. Inspect all equipment and materials, upon receipt at the job site, for damage and conformance to approved shop drawings.

1.21 PROTECTION OF WORK AND PROPERTY

A. This Contractor shall be responsible for the care and protection of all work included under this Section until the completion and final acceptance of this Contract.

B. Protect all equipment and materials from damage from all causes including, but not limited to, fire, vandalism and theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment at no additional cost to the Owner.

C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this Section and make good damage thus caused.

D. Damaged materials are to be removed from the site; no site storage of damaged materials will be allowed.

1.22 SUPERVISION

A. Provide a competent Supervisor with a minimum of 5 years of experience in HVAC Construction Supervision who shall be in charge of the HVAC work at the site.

1.23 SAFETY PRECAUTIONS

A. Life safety and accident prevention shall be a primary consideration. Comply with all of the safety requirements of the Owner and OSHA throughout the entire construction period of the project.

B. Furnish, place and maintain proper guards and any other necessary construction required to secure safety of life and property.

1.24 SCHEDULE

A. Construct work in sequence under provisions of Division 1 and as coordinated with the Owner's Representative.

1.25 HOISTING, SCAFFOLDING AND PLANKING

A. The work to be done under this Section of the Specifications shall include the furnishing, set-up and maintenance of all derricks, hoisting machinery, cranes, helicopters, scaffolds, staging and planking as required for the work.

1.26 CUTTING AND PATCHING

A. Provide all cutting and patching necessary for the proper installation of work to be performed under this Section.

B. All work shall be fully coordinated with all phases of construction, in order to minimize the requirements for cutting and patching.

C. Form all chases or openings for the installation of the work of this Section of the specifications, or cut the same in existing work and see that all sleeves or forms are in the work and properly set in ample time to prevent delays. Be responsible that all such chases, openings, and sleeves are located accurately and are of the proper size and shape and consult with the Owner's Representative and all trades concerned in reference to this work. Confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the approval of the Owner's Representative.

D. Fit around, close up, repair, patch, and point around the work specified herein to match the existing adjacent surfaces and to the satisfaction of the Owner's Representative.

E. Fill and patch all openings or holes left in the existing structures by the removal of existing equipment that is part of this Section of the Specifications.

F. All of this work shall be carefully done by workmen qualified to do such work and with the proper and smallest tools applicable.

G. Any cost caused by defective or ill-timed work required by this Section of the specifications shall be borne by the Subcontractor.

H. When, in order to accommodate the work required under this Section of the specifications, finished materials of other trades must be cut or fitted, furnish the necessary drawings and information to the trades whose materials must be cut or fitted.

1.27 SLEEVES, INSERTS AND ANCHOR BOLTS

A. Coordinate with other trades the location of and maintaining in proper positions, sleeves, inserts and anchor bolts to be supplied and/or set in place under this section of the specifications. In the event of incorrectly located preset sleeves, inserts and anchor bolts, etc., all required cutting and patching of finished work shall be done under this section of the specifications.

B. All pipes passing through floors, walls, ceilings or partitions shall be provided with fire stopping to maintain the fire rating of the structure. All penetrations and associated fire stopping shall be installed in accordance with the fire stopping manufacturer's listed installation details. Provide sleeves for all penetrations where required by the listed detail, for the penetration of all mechanical room floors and where specifically required on the drawings.

C. Field drilling (core drilling), when required, shall be performed under this section of the specifications, after receipt of approval by the Owner's Representative.

1. When coring cannot be avoided, provide ¼ inch pilot hole prior to coring. When coring through floor or slab, verify location of core on floor below and protect and piping, ductwork, wiring, furniture, personnel, etc., below the location of the core.

1.28 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

A. Provide all supplementary steel, factory fabricated channels and supports required for proper installation, mounting and support of all equipment and systems provided under this section of the specification.

B. Supplementary steel and factory fabricated channels shall be firmly connected to building construction in a manner approved by the Owner's Representative, as shown on the drawings, or hereinafter specified.

C. The type and size of the supporting channels and supplementary steel provided under this section of the specifications shall be determined by the Subcontractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.

D. All supplementary steel and factory fabricated channels shall be installed in a neat and workmanlike manner parallel to the walls, floors and ceiling construction. All turns shall be made with 90 degree and 45 degree fittings, as required to suit the construction and installation conditions.

E. All supplementary steel including factory fabricated channels, supports and fittings shall be galvanized steel, aluminum, or stainless steel where exposed or subject to rust producing atmosphere and shall be manufactured by Unistrut, H-strut, Powerstrut, ERICO or approved equal.

1.29 HAZARDOUS MATERIALS

A. Dispose of all hazardous materials in accordance with Federal and State laws. All handling shall conform to EPA requirements. A uniform hazardous waste manifest shall be prepared for all disposals and returned with all applicable signoffs prior to application for final payment. Provide breakout cost for this scope.

B. Recovered refrigerant shall be recycled by a licensed facility approved by the Owner's Representative.

C. Removed equipment or fluids containing any hazardous materials such as ethylene glycol, oil, mercury or chromate shall be recycled by a licensed facility approved by the Owner's Representative.

D. Where it has been identified that asbestos-containing material exists within the scope limits, refer to the Asbestos Abatement specification section for requirements. Where insulation is removed, provide new insulation (types and thicknesses as specified in this section). Where scope is not defined, provide unit prices with bid for all pipe and duct sizes involved.

1.30 ACCESSIBILITY

A. All work provided under this Section of the Specification shall be installed so that parts requiring periodic inspection, maintenance and repair are readily accessible. Work of this trade shall not infringe upon clearances required by equipment of other trades, especially code required clearances to electrical gear. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Owner's Representative.

1.31 SEISMIC RESTRAINT REQUIREMENTS

A. Submit working plans and calculations reviewed, signed and stamped by a professional engineer who is registered in the State where the project is located and has specific experience in seismic calculations, certifying that the plans meet all seismic requirements established by authorities having jurisdiction over the project, including bracing for any hazardous exhaust systems.

1.32 WELDING QUALIFICATIONS

A. Piping shall be welded in accordance with qualified procedures using performance qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME BPV IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer may be accepted as permitted by ASME B31.9 (or B31.1 for steam boiler piping over 15 psig and all steam and condensate piping over 150 psig). The Owner's Representative shall be notified 24 hours in advance of tests and the tests shall be performed at the work site if practicable. The welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record. Structural members shall be welded in accordance with Division 1.

B. A fire watchman with an approved fire extinguisher shall be posted at the site of the welding work, during that work, and for a minimum of 30 minutes after the work is completed, to see that sparks or drops of hot metal do not start fires.

1.33 ELECTRICAL WORK

A. All electrical apparatus and controls furnished, and the installation thereof, as a part of the HVAC work, equipment, and controls shall conform to applicable requirements under DIVISION 26 - ELECTRICAL.

1.34 PROJECT CLOSEOUT

A. Certificates Of Approval

1. Upon completion of all work, provide certificates of inspections from the following equipment manufacturers stating that the authorized factory representatives have inspected and tested the operation of their respective equipment and found the equipment to be in satisfactory operating condition and installed per the manufacturers installation instructions and requirements.

a. Air Handling Units (H&V)

b. Fans

c. Automatic Temperature Controls

B. Construction Observations By The Engineer

1. The engineer is contracted to make progress site visits during construction and one substantial completion (punch list) site visit for determining substantial completion.

2. The Trade Contractors and the General Contractor are required to inspect their own work and make any corrections to the work to comply with the specifications and the contract documents. It is not the responsibility of the engineer to develop lists of incomplete work items.

3. Progress Site Visits

a. The purpose of the progress site visit by the engineer is to observe if the work is proceeding in accordance with the contract documents.

b. The engineer will prepare a field report which will note in general the work completed since the last observation visit, work found not to be in accordance with the contract documents and work not corrected since the previous observation visit.

C. Substantial Completion

1. When the Contractor considers the Work under this Section is substantially complete, the Contractor shall submit written notice, through the General Contractor, with a detailed list of items remaining to be completed or corrected and a schedule of when each remaining work item will be completed. Should the engineer determine the list of remaining work does not constitute substantial completion the engineer will notify the Architect and/or Owner and he will not make a substantial completion site visit.

2. The following items shall be completed prior to the written request for substantial completion site visit:

a. Certification of successful operation of all systems.

b. Training of the Owner's personnel in the operation of the systems.

c. Record Drawings in accordance with the contract specifications.

d. Operation and Maintenance manuals.

e. Testing reports.

f. Balancing reports.

g. Manufacturers certificates of approvals.

h. Emergency contact list for reporting of malfunctioning equipment during the warrantee period.

i. Contractors Project Completion certificate in accordance with the building code requirements.

3. Should the Engineer, during the substantial completion visit, observe that the Work is substantially complete, s/he will provide a written listing of the observed deficiencies referred herein as the Punch List. The Punch List will provide for a place for the Contractor and general Contractor to sign off and date each item individually indicating that the observed deficiency item has been corrected.

4. Should the Engineer, during the substantial completion site visit, observe that the Work is not substantially complete, s/he will provide, a written list of the major deficiencies and a reason for the work not being considered substantially complete.

5. If the work is found not to be substantially complete then the engineer shall be reimbursed for his time to reobserve the work. A reobservation fee shall be charged to the Contractor through the contractual agreement for any further observations by the engineer.

6. The Contractor shall remedy all deficiencies listed in the punch list within the time frame required by the contract.

D. Engineers Construction Completion Certification

1. Where required by the applicable code, the Engineers Construction Completion Certification will be issued by RDK Engineers when all life safety and health related issues are complete, all required functional tests are complete and all reports are complete. The following is a minimum listing of the required systems to be tested with reports generated indicating they are complete and ready for use:

a. Air Balancing

b. Pipe Pressure Tests

2. There shall be NO outstanding items identified on the punch list for scope within any of these categories.

E. Final Completion

1. The following items shall be submitted prior to the written request for Final completion:

   a. Revised Substantial Completion items to be resubmitted in accordance with the review process comments.

   b. Warranties commencing the date of Substantial completion

   c. Individual Signed and dated Punch List acknowledging completion of all punch list items

2. When the Contractor considers all of the punch list work items complete, the Contractor shall submit written notice through the General Contractor that all Punch List items are complete and resolved and the work is ready for final observation site visit. The signature lines for completion of each punch list item shall be signed by the Contractor indicating the work is complete and signed by the General Contractor indicating s/he has inspected the work and found it to be complete. Should the Engineer find the work to be finally complete and all Punch List items are complete the Engineer will make a recommendation to the Architect or Owner. If the Engineer has found the punch list work to be incomplete during final inspection a written listing of the observed deficiencies will be prepared by the Engineer.

3. If the work is not fully complete then the engineer shall be reimbursed for his time to reobserve the work. A reobservation fee shall be charged to the Contractor through the contractual agreement for any reobservations by the engineer.

F. Re-observation Fees

1. The re-observation fee shall be $1200.00 per visit.

G. Contractor's Project Completion Certificate

1. Upon completion of work and prior to request for Certificate of Occupancy, each Trade Contractor and the General Contractor shall issue a certificate stating that work has been installed generally consistent with construction documents and all applicable codes. RDK Engineers can furnish a blank Contractor's certificate form upon request. The certificate shall certify:

   a. Execution of all work has been installed in accordance with the approved construction documents.

   b. Execution and control of all methods of construction was in a safe and satisfactory manner in accordance with all applicable local, state and federal statutes and regulations.

2. The certificate shall include the following information:

a. Project.

b. Permit Number.

c. Location.

d. Construction Documents.

e. Date on Plans and Specifications submitted for approval and issuance of the Building Permit.

f. Addendum(a) and Revision Dates.

3. The certificate shall be signed by the Contractor and include the following:

a. Signature.

b. Date.

c. Company.

d. License Number.

e. License Expiration Date.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

A. General Requirements for Pipe

1. Pipe material shall be indicated in the Schedule of Pipe and Fittings for each type of service.

2. Steel pipe shall conform to ASTM A53 Grade B or ASTM A106 Grade B (for systems with temperatures that could go over 750 degrees F) black steel. Pipe thickness (schedule) shall be as specified for the service.

B. General Requirements for Fittings

1. Pipe fittings shall be indicated in the Schedule of Pipe and Fittings for each type of service. Fittings shall be rated to match the larger of the pipe pressure rating in the Schedule or the valve rating listed in the valve tables in the Part 2 Valve and Strainer section of this specification.

2. All fittings shall be installed per code requirements and the manufacturer’s best recommendations.

3. Malleable iron pipe fittings shall conform to ASME B16.3, type required to match adjacent piping.

4. Cast iron (CI) pipe fittings shall conform to ASME B16.1 or ASME B16.4 type required to match adjacent piping.

5. Steel pipe fittings shall have the manufacturer's trademark affixed in accordance with MSS SP-25 so as to permanently identify the manufacturer. For 90° elbows, provide long radius fitting unless they will not physically fit, in which case short radius may be used. Flanges shall be flat faced weld neck up to Class 125 and raised face weld neck type for Class 150 and above.

6. The steel pipe joining methods below are only allowed when they are specifically listed in the Schedule of Pipe and Fittings:

   a. Type S1: Welded fittings shall conform to ASTM A234 with WPA marking. Butt-welded fittings shall conform to ASME B16.9, and socket welded fittings shall conform to ASME B16.11. Make fusion welded joints as required by ANSI/ASME B31.1.

   b. Type S2: Steel flanged fittings including flanges, bolts, nuts, bolt patterns, etc. shall be in accordance with ASME B16.5 for the class required (Class 150 minimum). Flange material shall conform to ASTM A53 Grade B. Blind flange material shall conform to ASTM A516 for cold service and ASTM A515 for hot service. Bolts shall be high strength or intermediate (Class 150 only) strength with material conforming to ASTM A193.

   c. Type S3: Cast Iron (CI) flanged fittings shall be of malleable cast iron conforming to ASTM A47, Grade 32510. Bolts shall be high strength or intermediate (Class 125 only) strength with material conforming to ASTM A193. Class 125 iron flanges shall be limited to 175 psig / 230^{o}F (up to 12") and 125 psig / 230^{o}F (14" – 24"). Class 250 iron flanges shall be limited to 400 psig / 250^{o}F (up to 12") and 250 psig / 250^{o}F (14" – 24").

   d. Type S4: Ductile iron (DI) flanged fittings shall conform to ASTM A536, Grade 65-45-12. Bolts shall be high strength or intermediate (Class 150 only) strength with material conforming to ASTM A193. Class 150 ductile iron flanges shall be limited to 225 psig / 230^{o}F. Class 300 ductile iron flanges shall be limited to 425 psig / 450^{o}F.

   e. Type S5: Threaded joints: For use up to 2" pipe size. Pipe threads shall conform to ASME B1.20.1. Nipples shall conform to ASTM A733 or ASTM B687. Class 125 iron threaded fittings shall be limited to 150 psig / 250^{o}F or 125 psi at 350^{o}F. Class 250 iron threaded fittings shall be limited to 340 psig / 250^{o}F. Class 150 ductile iron threaded fittings shall be limited to 185 psig / 250^{o}F or 150 psig / 300^{o}F (maximum temperature). Class 300 ductile iron threaded fittings shall be limited to 1200 psig / 250^{o}F or 600 psig / 450^{o}F (maximum temperature).

7. Composition gaskets for flanges shall conform to ASME B16.21. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1/16 inch thickness, full face or self-centering flat ring type. Gaskets shall contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR). NBR binder shall be used for hydrocarbon service. Gaskets shall be suitable for pressure and temperatures of piping system.

8. Unions shall conform to FS WW-U-531 or FS WW-U-516, type to match adjacent piping.

9. Flexible pipe connectors shall be as specified in Vibration Isolation paragraph.

C. Schedules of Pipe and Fittings

1. As used in the pipe and fitting schedule tables, closed loop systems have expansion tanks and are not open to the atmosphere, examples are chilled, hot, dual temperature and closed heat pump condenser water systems. Open loop systems are open to the atmosphere with open condenser water system being the most common.

2. Relief valve piping shall have the same pressure/temperature ratings as the fluid being relieved. Exposed outdoor piping shall be stainless steel.

STEAM AND CONDENSATE SERVICES:
UP TO 125 PSIG (353ºF SATURATED), OR ANY PUMPED CONDENSATE TO 175 PSIG:
(Some joint types or materials may have lower pressure and/or temperature limits and Contractor shall ensure they are only used where those limits will NOT be exceeded.)

Service	Pipe Material & Schedule or Type	Joint Types Allowed	Fitting Material	Min. Pressure Class (psig) & / or Schedule
Steam up to 2”	Steel / Schedule 40 (80 if threaded)	S1 or S5	Steel, CI, DI	125 / Sched. 40 (80 if threaded)
Condensate up to 2”	Steel / Schedule 80 Seamless	S1 or S5	Steel, CI, DI	125 / Schedule 80
Steam 2.5”-12”	Steel / Standard Weight	S1, S2, S3, or S4	Steel, CI, DI	125 / Standard Weight

2.2 PIPE HANGERS AND SUPPORTS

A. Hangers shall be as manufactured by Carpenter & Patterson, Inc., Grinnell Corporation, B-Line Systems, ERICO, or equal. Hangers shall transmit the load exclusively to the structure of the building. All hangers and supports to conform to MSS standards SP-58 and SP-69 and ANSI B 31.1.

B. Provide all additional structural steel required for proper installation of hangers, anchors, guides and supports; hangers shall be arranged to maintain the required grading and pitch of piping, to prevent vibration and to provide for expansion and contraction.

C. Maximum spacing of hangers and supports for steel pipe:

Pipe Size (inches)	Horizontal	Vertical
Up to 1	6 feet	10 feet

1¼-2½	9 feet	15 feet
3-and up	12 feet	15 feet

D. Reduce Steel pipe spacing to a maximum of 10', regardless of pipe, as necessary for fittings, valves, and other concentrated loads.

E. Steel tubing shall have maximum hanger and support spacing of 8 feet (horizontal) or 10 feet (vertical).

F. If any other piping material is used, the maximum hanger and support spacing shall be the lesser of manufacturers recommendation or the listed spacing in the mechanical code (currently IMC-2009 Table 305.4).

G. Branch piping and runouts of over 5 feet shall have at least one hanger or support.

H. Furnish additional hangers or supports at vertical or horizontal changes of direction and at locations of concentrated loads due to valves, fittings, strainers, and accessories.

I. Hangers and supports shall provide for 2" of vertical adjustments.

J. Hanger rods shall be steel, threaded and furnished with two removable nuts at each end of positioning rod and hanger and locking each in place.

K. Except as otherwise noted, hanger rods shall be of the following sizes:

SCHEDULE OF PIPE HANGER ROD SIZES

Pipe sizes (inches)	**Single rod diameter (inches)**	**Double rod diameter (inches)**
½-2	3/8	3/8
2½-3	½	3/8

L. Pipe covering protection saddles shall not be loaded to more than 80% of maximum loading as rated by the manufacturer.

M. Insulated piping insulation shields:

1. Up to 3" pipe size: 18 gauge galvanized steel, located outside the vapor barrier, minimum 180° arc, 12" long, or pipe covering protection saddles.

N. Vertical support shall be by means of riser clamps (anchors with split ring type allowable up to 2" size only) and adjustable pipe support with flange anchored to floor or supplementary steel.

O. Rods, clamps and hangers shall be electro-galvanized coated.

P. Valve and piping supports, from the floor, shall be equal to Carpenter & Paterson, Inc. Figure 101, adjustable pipe support and complete with pipe standard and flange, anchored to floor.

1. Supports shall be installed at each control valve, riser, tee or elbow and where any unsupported section exceeds 4'-0" in length measured along piping centerline.

Q. Upper Attachments to Building Structure:

1. Existing Reinforced Concrete Construction: Upper attachment welded or clamped to steel clip angles that are expansion-bolted to the concrete. Expansion bolting shall be located so that piping loads place bolts in shear. Submit details for approval.

2. Structural Steel Framing: Upper attachments welded or clamped to structural steel members. Additional steel members may be necessary in some support locations where piping locations differ from that known on contract drawings. Submit details for approval.

3. Expansion Fasteners and Power Set Fasteners: In existing concrete slab construction, expansion fasteners may be used for hanger loads up to one-third the manufacturer's rated strength of the expansion fastener. Power set fasteners may be used for loads up to one-fourth of rated load. When greater hanger loads are encountered, additional fasteners may be used and interconnected with steel members combining to support the hanger.

2.3 SLEEVES

A. Size sleeves to provide a minimum of 1 inch clearance around piping and ductwork, and to allow continuous runs of insulation where specified. Ensure that insulated piping and ductwork do not touch sleeves.

B. Pack clearance spaces with Thermafibre Firestopping. Caulk with fire-resistant, resilient waterproof compound, RectorSeal Biostop 500+ or equal. Ensure that fire ratings of floors and walls are maintained.

C. Piping sleeves shall be according to the following:

1. Through interior non-masonry walls, use 18 gauge rolled and tack welded galvanized steel sleeves, set flush with finished surfaces on both sides.

2. Through interior masonry walls, exterior walls above grade and roofs, use machine cut and reamed standard weight steel piping, set flush with finished surfaces on inside and to suit flashing on outside.

3. For floors in mechanical equipment rooms, and similar areas where a water dam is required, use machine cut and reamed standard weight steel piping set flush to underside of structure and extending 6 inches above finished floor.

4. For other floors, use 18 gauge rolled and tack welded galvanized steel, or machine cut and reamed plastic pipe or standard weight steel piping set flush to both finished surfaces. Refer to Room Finish Schedule.

5. Cover pipe sleeves in walls and ceilings of finished areas other than equipment rooms with satin finish stainless steel, or satin finish chrome or nickel plated

brass escutcheons, with non-ferrous set screws. Do not use stamped steel split plates. Split cast plates with screw locks may be used.

6. In non-rated walls, escutcheon plates shall be of adequate size to allow for piping with full insulation to pass through the wall uninterrupted. The interior diameter of the plate shall fit snugly around the outside diameter of the insulation.

D. Duct sleeves shall be minimum 18 gauge galvanized steel. Provide adequate bracing for support of sleeves during concrete and masonry work. For fire rated floors and walls, build fire dampers into structure to attain fire rated construction, in a manner acceptable to the local and state authorities.

E. Cover exposed duct sleeves in finished areas with 18 gauge galvanized steel plates in the form of duct collars. Fix in position with non-ferrous metal screws.

2.4 FIRESTOPPING

A. Provide asbestos-free firestopping material capable of maintaining an effective barrier against flame, gases, and temperature. Provide noncombustible firestopping that is nontoxic to human beings during installation or during fire conditions. Devices and equipment for firestopping service shall be UL FRD listed or FM P7825 approved for use with applicable construction, and penetrating items.

1. Fire Hazard Classification: Material shall have a flame spread of 25 or less, a smoke developed rating of 50 or less when tested in accordance with UL 723 or UL listed and accepted.

2. Firestopping Rating: Firestopping materials shall be UL FRD listed or FM P7825 approved for "F" and "T" ratings at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected, except that "F" and "T" ratings may be 3 hours for firestopping in through-penetrations of 4-hour fire rated wall or floor.

2.5 VALVES AND STRAINERS

A. General:

1. Valves and strainers shall be constructed of the materials shown in the tables for each system and be rated by the manufacturer for the appropriate pressure class required for the listed pressure and temperature limits and for the fluid used and per the valve tables.

2. The manufacturers and model numbers indicated below are to be used as a means of identifying the type, quality, materials and workmanship required. Note that some of the manufacturers listed for a type of valve do not make valves for all pressure/temperature limits and/or all sizes. All valves of each type (400 psig ball, 150 psig globe, etc.) for the project shall be by the same manufacturer.

3. All valves shall be located and oriented as to valve stem direction to permit proper and easy operation, and access to valve for maintenance of packing, seat and disc. Valve stems shall not be tilted down unless approved by the manufacturer. Where valves are more than seven feet above the floor, stems

shall be horizontal and all valves 2-1/2" and above shall have chain wheel and "endless link" style chain for operation from floor; where impact wheel is required, it shall be provided. Packing and gaskets shall not contain asbestos. Provide unions adjacent to equipment end of all threaded and soldered or permanent push-to-connect end valves. Provide grooved joint couplings adjacent to equipment end of all grooved end valves.

B. Service:

1. Shutoff or Isolation Valves shall be provided in all branch connections to mains and where shown on piping diagrams.

a. In general, for 2½" and larger piping use flanged gate valves for steam and condensate systems.

b. In general, for piping smaller than 2½" use threaded, sweat, connections; gate valves for steam and condensate systems.

2. Drain Valves and Manual Vent Valves

a. Globe with plug-type disc or ball valves (as shown on drawings).

3. Vacuum Breakers

a. Vacuum breakers shall be swing-check valves with 15-degree seat angle Provide at least one vacuum breaker for each steam coil and heat exchanger.

C. Swing Check Valves: Bronze valves shall conform to MSS SP-80, of the type required for the pressure class and body connection type listed in the tables. Iron valves shall conform to MSS SP-71, of the type required for the pressure class and body connection type listed in the tables. Steel valves shall conform to ASME B16.34, of the type required for the pressure class and body connection type listed in the tables. Valves shall be as manufactured by Stockham, Milwaukee, Crane, Nibco, Victaulic (grooved), Grinnell (grooved), or Hammond.

D. Globe Valves (including angle valves): Bronze valves shall conform to MSS SP-80, of the type required for the pressure class and body connection type listed in the tables. Iron valves shall conform to MSS SP-85, of the type required for the pressure class and body connection type listed in the tables. Steel valves shall conform to ASME B16.34, of the type required for the pressure class and body connection type listed in the tables. Maximum seat leakage for manual valves shall be no more than 10 cc/hr per inch of diameter. Control valves leakage shall be no more than that allowed by ANSI seat leakage Class IV (0.01% of full open valve capacity). Valves shall be as manufactured by Stockham, Milwaukee, Crane, Nibco, or Hammond. For areas where clearances are restricted, non-rising stems may be used – Contractor shall indicate locations on submittal.

E. Gate Valves: Bronze valves shall conform to MSS SP-80, of the type required for the pressure class and body connection type listed in the tables. Iron valves shall conform to MSS SP-70, of the type required for the pressure class and body connection type listed in the tables. Steel valves shall conform to ASME B16.34, of the type required for the

pressure class and body connection type listed in the tables. Maximum seat leakage shall be no more than 10 cc/hr per inch of diameter. Valves shall be as manufactured by Stockham, Milwaukee, Crane, Nibco, or Hammond. For areas where clearances are restricted, non-rising stems may be used – Contractor shall indicate locations on submittal.

F. Ball Valves: Valves shall meet FS WW-V-35C, Type II, and have the appropriate trim to meet the required pressure/temperature ratings listed in the tables. Valves shall have locking handles to allow servicing and removal of piping or equipment. Valves on insulated piping shall have stem extension assemblies equal to the insulation thickness. Valves shall have 100% tight shut-off (no seat leakage). Valves shall be as manufactured by Conbraco Industries (Apollo), Watts, Stockham, Nibco, Hammond, or Milwaukee. Ball valves for modulating control service shall have characterized disc to provide equal percentage flow characteristics and extended rangeability. Modulating ball valves shall be Bray VCB series or Belimo B series.

G. Butterfly Valves: Provide butterfly valves of the type and materials listed in the tables. Valve necks shall allow a minimum of 2" insulation. Valves shall have the trim required to meet the listed pressures and temperatures listed in the tables. Valves shall have visual position indication. Valve seats shall have zero or near zero (bubble-tight) bi-directional seat leakage. Valves 6" and larger and all steam valves shall be gear operated. Non-steam valves under 6" shall be lever operated with balance stops.

1. General Service: Standard lug or grooved (in grooved systems) type with ductile or cast iron body, resilient EPDM seats, bronze, nickel, PPS (Polyphenylene Sulfide), Nylon 11 or EPDM coated ductile iron disc and 416 stainless steel stem. Valves shall comply with MSS SP-25, MSS SP-67, and API-609. Valves shall be as manufactured by Mueller, Centerline, DeZurik, Milwaukee, Nibco, Hammond, Keystone, Bray Model 31H, Victaulic Masterseal (grooved), Grinnell Model B302 (grooved), or SF Equipment.

2. High Performance: Valves shall have lug-style carbon steel body, 316 stainless steel eccentric disc, offset 17-4 PH stainless steel shaft, and filled PTFE soft seat. Valves shall comply with ANSI B16.5, ANSI B16.34, MSS SP-25, MSS SP-61 (zero leakage), MSS SP-58, and API-609. Valves shall be as manufactured by Flowseal (Crane), Neles-Jamesbury, DeZurik, Posi-Seal, Milwaukee, Hammond or Bray/McCannalok.

H. Strainers

1. Strainer-body connections shall be the same size as the pipe lines in which the connections are installed. The bodies shall have arrows clearly cast on the sides to indicate the direction of flow. Each strainer shall be equipped with an easily removable cover and sediment basket. The body or bottom opening shall be equipped with a tapped blowdown opening. Provide full size nipple and appropriate type of valve for blowdown. The basket shall be of stainless steel with small perforations of sufficient number to provide a net free area through the basket of at least 5 times that of the entering pipe. The flow shall be into the basket and out through the perforations. Bronze strainers shall conform to MSS SP-80, of the type required for the pressure class and body connection type listed in the tables. Iron strainers shall conform to MSS SP-71, of the type required for

the pressure class and body connection type listed in the tables. Steel strainers shall conform to ASME B16.34, of the type required for the pressure class and body connection type listed in the tables. Y-type strainers are listed in the tables, provide basket type strainers of same construction where shown on drawings. Strainers shall be as manufactured by Mueller, Sarco, Watts, Armstrong, Keckley, or Yarway.

I. Air Vents: Provide air vents at all high points in the piping systems meeting the pressure and temperature limits shown on the table for each system.

1. Automatic: Normal Capacity – Float operated with bronze or steel body and stainless steel internals, ball-check valve type with materials as required for the pressure/temperature listed in the table for the system. Provide each vent with safe drainage piping for venting air/water to drain.

2. Manual: For low pressure/temperature water and glycol systems, provide 1/8-in. brass body, chrome plated with two-detachable keys. For higher pressure/ temperature systems, provide globe valves with plug-type disc or ball valves with materials, as required and allowed in the table for the system.

J. Drain Valves: Drain valves shall be one of the type listed for isolation in the table for each piping system. Provide drain connections at all equipment and all low points in the piping systems to allow for complete drainage. Drain connections shall have full size threaded hose end connections with cap/plug. For piping up to 4", provide minimum ¾" valves. For piping between 4" and 10", provide minimum 1½" valves. For piping larger than 10", provide minimum 2" valves. Provide 50' of premium grade hose for each size drain.

K. Valve Lubrication: Furnish a lubrication gun in the mechanical equipment room with extra lubricant sticks sufficient to repack each valve. Guns shall be extra heavy, lever type hydraulic hand type with automatic shutoff, 1500 psi gauge and 12" long connecting hose. Lubricant shall be as required by valve manufacturer for the service intended.

STEAM AND STEAM CONDENSATE SERVICES:
Maximum 125 psig Saturated Steam (353°F), or Any Pumped Condensate to 175 psig

Valve Type	Size	Type	Application	Body/Trim Body/Seat	Type of Connection	Minimum Pressure Rating/Class
Ball	To 2"	2 piece	Isolation or ATC open-close (non-modulated)	Steel/Stainless Steel/Reinforced PTFE	Threaded	125 psig steam
Butterfly	2½" - 24"	High Performance (Double offset)	Isolation or ATC, open-close or Modulation (with C_v selected at 2/3 open)	Steel/Stainless Steel/Reinforced PTFE	Flanged	ANSI Class 150 with zero leakage bi-directional Note: Mmodulation is limited to 50 psig steam systems.

STEAM AND STEAM CONDENSATE SERVICES: Maximum 125 psig Saturated Steam (353°F), or Any Pumped Condensate to 175 psig						
Valve Type	**Size**	**Type**	**Application**	**Body/Trim Body/Seat**	**Type of Connection**	**Minimum Pressure Rating/Class**
Butterfly	2½" - 24"	High Performance (Triple offset)	Isolation or ATC Modulation (with C_v at 2/3 open)	Steel/Stainless Steel or laminated	Flanged	ANSI Class 150 with zero leakage bi-directional.
Gate	To 2"	Screwed Bonnet	Isolation	Bronze/Bronze	Threaded	ANSI Class 125
Gate	2½" - 12"	OS&Y, Rising stem	Isolation	Iron/Bronze	Flanged	ANSI Class 125
Globe	To 2"	Union or Screwed Bonnet	Balancing or ATC Modulation	Bronze/Stainless Steel	Threaded	ANSI Class 125
Globe	2½" - 12"	Bolted Bonnet	Balancing or ATC Modulation	Iron/Stainless Steel	Flanged	ANSI Class 125
Check	To 2"	Swing	Piping	Bronze/Bronze	Threaded	ANSI Class 125
Check	2½" - 12"	Swing	Piping	Iron/Bronze	Flanged	ANSI Class 125
Strainer	To 2"	Y-type	Piping	Bronze or Iron/Stainless 3/64" screen	Threaded	ANSI Class 125
Strainer	½" – 2"	Y-type	Piping	Steel/Stainless 3/64" screen	Threaded	ANSI Class 125
Strainer	2½" - 12"	Y-type	Piping	Iron/Stainless 3/64" screen	Flanged	ANSI Class 125

2.6 STEAM TRAPS

A. Balanced pressure thermostatic traps/airvents shall be designed for steam working pressures up to 125 psig. Traps shall have brass bodies and caps with natural brass finish. Bellows, valve head and renewable valve seat shall be stainless steel

B. Float-and-Thermostatic traps shall be designed for a steam working pressure of 30 psig, but shall operate with a supply pressure of between ¼ and 15 psig. The capacity of the traps shall be sized for 2 times the equipment capacity. Where modulating control valves are used, trap capacity shall be based on a pressure differential of 1/4 psi. Each float-and-thermostatic trap shall be provided with a hard bronze, monel, or stainless steel valve seat and mechanism and brass float, all of which can be removed easily for inspection or replacement without disturbing the piping connections. Inlet to each trap shall have a cast iron strainer, either an integral part of the trap or a separate item of equipment.

C. Traps shall be by TLV, Gestra, Spirax-Sarco, Hoffman, Illinois, Barnes & Jones, or approved equal.

2.7 PIPING, EQUIPMENT, PANEL AND VALVE IDENTIFICATION

A. All piping, equipment, panels and valves furnished and/or installed under this Section of the Specifications including automatic temperature controls shall be identified with pipe markers, valve tags, equipment plates and/or bar codes. Refer to Part 3 – IDENTIFICATION for materials and methods of installation.

2.8 MOTORS, DRIVES AND STARTERS

A. All equipment shall be provided complete with motors and drives, unless otherwise indicated.

B. Motors shall be Premium Efficiency (as available by size/speed/horsepower) and shall conform to NEMA Standards and shall be suitable for load, duty service and location. Motors shall have nameplates giving manufacturer's name, serial number, horsepower, efficiency, speed and current characteristics. Motors shall be Century "E+3", General Electric "Energy Saver Premium", Reliance "Premium Energy Efficient" Series, Baldor "Super Premium Efficiency", or approved equal.

C. Motors shall be tested in accordance with the standards of ANSI C50 and conform therewith for insulation resistance and electric strength. Minimum efficiency levels shall be as listed in latest edition of ANSI/ASHRAE Standard 90.1 or the state's energy code, whichever is higher. All motors shall be tested in accordance with IEEE Standard 112, Test Method B. Provide on nameplate the type of bearing grease to use.

D. Motors for use with variable frequency drives (VFD) shall be inverter duty rated and labeled, meet NEMA MG-1 Part 31, and have a minimum Class F or H insulation. All VFD motors shall have AEGIS™ or approved equal Shaft Ground Rings to prevent electrical bearing damage from capacitively coupled shaft voltages. For motors up to 100 HP, ring shall be installed on either the drive end or non-drive end. Motors over 100 HP shall have ring installed on the drive end of the motor with an insulated bearing on the non-drive end to prevent circulating currents. If rings are not factory installed, Contractor shall install them in the field following manufacturer's requirements and, to start factory warranty, shall register them with AEGIS™ in the Owner's name. Failure to install or register the rings will require Contractor to take on the responsibility of providing a 15 year warranty and to replace any failed motor bearings during the 15 year period.

E. Motors ½ HP and larger shall be squirrel cage induction, ball or roller bearings with pressure grease lubrication, specifically wound for the scheduled voltages.

F. Motors less than ½ HP shall be capacitor start of split phase type, specifically wound for 120V/1PH/60HZ alternating current, unless otherwise noted. Fractional horsepower motors, integral to equipment intended for installation in finished public spaces, shall be provided with an overload device responsive to motor current. The device shall be integral to the motor or separate as part of the controls.

G. Motors shall be furnished complete with conduit terminal box of size adequate to accommodate conduits and wires as sized on the Electrical Drawings or specified under this Section.

H. Motor capacity shall be sufficient to operate associated driven devices under conditions of operation and load and with overload and at least the horsepower indicated or specified. All motors shall be of the premium efficiency, high power factor, low energy consuming type most suitable for the application and installed environment. Any motor replacement necessary for compliance to the application shall be at no additional cost to the Owner.

I. Motors shall be suitable for continuous duty at rated horsepower with temperature rise not to exceed 40°C for drip proof motors, 50°C for splash proof motors, 55°C for totally enclosed or explosion proof motors. All non-VFD motors shall be capable of 15% overload without overheating and suitable for operation for the ambient conditions of its specific location.

J. Direct connected motors shall be furnished with adjustable base. Motors connected to driven equipment by belt or shaft shall be furnished with adjustable sliding bases, except fractional HP motors, which shall have slotted mounting holes.

K. Drives for belted motors shall be as manufactured by Dodge Manufacturing Company, Browning Manufacturing Company, T.B. Woods Company or equal with adjustable motor sheaves and adjustable slide bases. The drive belts shall be as short as practicable. All fans and fan units shall be furnished with cogged-type triple V-belt drives, each sized for 150% of the design drive capacity. All multiple belt drives shall have matched sets of belts.

L. Where starters or variable speed drives are not integral with packaged equipment specified in this section, the Electrical Subcontractor shall furnish all starters and drives in accordance with Division 16 drawings and specifications.

M. For packaged equipment, motor controllers shall be equipped with all poles, auxiliary contacts and other devices necessary to permit the interlocking and control sequences required. Controller operating coils shall be generally designed for 120 volt operation, and 3 phase motors shall be provided with thermal overload protection in all phases.

N. All electrical apparatus furnished under this Section shall be approved by UL (or other agencies approved by the authority having jurisdiction) and shall be labeled or listed where such is applicable. Where custom-built equipment is specified and the UL label or listing is not applicable to the completed product, all components used in the construction of such equipment shall be labeled or listed by UL where such is applicable to the component.

2.9 UNIT VENTILATOR

A. Unit Construction

1. Unit shall be constructed of heavy gauge steel components to form a ridged frame that is suitable for rigorous classroom duty. Unless painted for cosmetic reasons, the frame shall be entirely of galvanized material to prevent corrosion. Exterior panels must be constructed of heavy gauge steel that have been cleaned and pretreated prior to painting to afford the maximum corrosion resistance possible, even after scratches that might appear during normal use. These panels shall be coated with at least 2 mil of the highest quality, polyester baked-on

textured powder paint. Unit tops shall be constructed of heavy gauge steel coated with a textured finish baked on powder paint to resist both corrosion and marring during normal use. Units shall be constructed such that normal unit operation is not affected by removal of front panels for routine maintenance or troubleshooting/adjustments of control components. Units requiring all front panels to be installed for correct unit operation shall not be accepted.

B. Insulation

1. The standard unit shall be constructed such that there shall be no fiberglass in the airstreams

C. Drain Pans

1. Stainless steel drain pans shall be furnished on all units. Pans shall be sloped in two planes to prevent standing water. Drain stubs shall be at least 7/8" OD. Both left and right hand stubs shall be furnished on all units; connection shall be field reversible. Drain pans on ceiling units shall have drains located 4.5" above the bottom of the unit to allow for installation of traps on the drain line by the installing contractor.

D. Ceiling Units

1. Ceiling units shall have two hinged front panels for easy access to filters and for routine maintenance. Retaining chains shall be furnished for both panels to ensure maximum safety in accessing the unit through these panels. Normal unit operation shall not be affected by opening of the front panels to allow maximum flexibility for troubleshooting/adjusting of controls. End panels shall be easily removable by use of 5/32" hex wrench on no more than four fasteners per panel. These fasteners shall be accessible from the outside of the unit. End panels that are not easily removable from the outside are not acceptable.

E. Discharge

1. Ceiling units shall be fitted with a duct collar arrangement

F. Fan Motor

1. All units shall be furnished with an integrally protected, programmable, electronically commutated, polyphase motor (ECM) that has been preprogrammed with the capability of delivering at least three distinct air volumes. For steam units these air volumes shall be 100% rated air for Max, approximately 70% of rated air for high, and approximately 50% of rated air for low. Motors that are not programmable to ensure constant correct air delivery shall not be acceptable.

G. Fans

1. Fans shall be large diameter (at least 8") for low speed, quiet operation and shall be constructed of high impact mineral filled polymer material (500-1500 CFM). Fans must be mounted on a continuous, precision ground hollow shaft that is supported on one end by a long life bearing and connected to the motor shaft by

a coaxial steel coupling with resilient inner ring. Motors shall be easily removable and secured in a wire motor mount bolted to the unit frame. The wire mount shall be mechanically isolated from the frame of the unit by resilient bushings at each mounting point of the motor mount assembly.

H. Outdoor Air Dampers

1. Damper shall be constructed of one piece heavy gauge extruded aluminum material that has been stiffened by use of multiple components to afford maximum rigidity, strength and corrosion resistance. Seats shall be deep pile polyester material on all side edges; damper blades shall use dual durometer PVC seals with memory suitable for use from -30°F to 160°F. The damper shafts shall pass through trouble-free nylon bearings and be connected to the damper blade using multiple fasteners that utilize vibration resistant components for maximum trouble-free life. The damper must be insulated with closed cell foam insulation. Provide optional cold weather damper for maximum cold weather protection.

I. Face And Bypass Damper

1. Face and bypass dampers must be constructed of heavy gauge aluminum material that has been stiffened by use of multiple components to form a cross section that forms a rectangle to afford maximum rigidity. Damper shafts shall pass through trouble free nylon bearings and be connected to the damper blade using multiple fasteners that utilize vibration resistant components for maximum trouble-free life.

J. Agency Listings

1. All units shall be listed by NRTI (Nationally Recognized Testing laboratory) such as ETL. All units shall have certified performance under applicable ARI 840 program for unit ventilators. The manufacturer shall furnish proof of such certification prior to final approval of the product.

K. Coils

1. Steam coils shall be the freeze resistant double tube, distribution type utilizing a tube in tube design with a long life copper header. Non-distributing type coils are not acceptable. Ferrous materials in the header are also not acceptable. Coils shall be pressure tested at no less than 350 psig at the factory to ensure they are leak tight.

L. Filters

1. The units shall be furnished with 2”, 30% MERV 8 filters. This filter shall be placed in the air stream such that all outdoor and/or return air passes through a single filter. Separate filtration of the outdoor air and return air is not acceptable.

M. DDC Ready Package

1. Provide DDC ready package consisting of a terminal block, 75 VA control transformer, proportional modulating damper actuators, proportional modulating valve actuators, fan speed switch, and unit disconnect switch where applicable.

2.10 VIBRATION ISOLATION AND SEISMIC RESTRAINTS

A. General

1. For each seismic restraint, provide certified calculations to verify adequacy to meet the following design requirements:

2. Ability to accommodate relative seismic displacements of supported item between points of support.

3. Ability to accommodate the required seismic forces.

4. For each respective set of anchor bolts provide calculations to verify adequacy to meet combined seismic-induced sheer and tension forces.

5. For each weldment between structure and item subject to seismic force, provide calculations to verify adequacy.

6. Restraints shall maintain the restrained item in a captive position without short circuiting the vibration isolation.

7. Seismic restraint shall be installed in accordance with the State Building Code. As a minimum provide:

   a. Maximum distance between braces in the lateral direction shall be 30 feet for piping 2” and smaller and 40’ for piping 2-1/2” and larger.

   b. Maximum distances between braces in the longitudinal direction shall be 80 feet.

   c. Tops of risers shall be provided with 4-way braces.

   d. Flexible couplings shall be provided within 12” of floor and wall non-breakable penetrations and within 24” of all building expansion joints.

   e. Hangers closest to the sway bracing shall be installed with an extended rod to the piping to resist upward movement of the piping.

   f. Lateral sway bracing shall not be required on piping supported with rods less than 6” long.

8. Seismic bracing for lateral and longitudinal bracing may be of the splayed wire (tension type), or pipe and fixed hanger (tension/compression type), and shall be complete with manufacturer’s recommended sizing, locations, and calculations. One system only (tension or compression/tension) shall be installed.

9. C clamps for attachment to the building structure must be provided with retaining straps.

10. 4-Way bracing may be of the splayed wire type or fixed angle brace with U-bolt.

    a. All vibration isolators shall be the product of a single approved manufacturer or as manufactured by an individual mechanical equipment manufacturer.

    b. Model numbers hereinafter specified are from Mason Industries. Other equivalent units by Consolidated Kinetics, Vibration Mountings and Controls or equal are acceptable.

B. Unit Ventilator, Exhaust Fans, Supply Fans, etc.

1. Steel spring and 0.3" deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

2. Mason Model DNHS, 1" deflection.

C. Ductwork

1. The first five hanger locations on the discharge side of each HV unit shall be provided with double deflection neoprene hangers.

2. Mason Model HD or WHD.

2.11 DUCTWORK

A. Reference Standards

1. Material, construction and installation shall meet applicable requirements of the current editions (unless otherwise shown) of the following standards and references, unless more stringent requirements are specified or shown on the Drawings (such as hazardous exhaust systems):

Standard	As Applicable to
SMACNA HVAC Duct Construction Standards (Metal and Flexible, 2005)	Sheet Metal Ductwork; Duct Liners; Adhesives; Fasteners; Flexible Ductwork
SMACNA HVAC Air Duct Leakage Test Manual	Duct Leakage Testing
NFPA 90A	Fire Dampers; Fire Resistance Standards for Ducts and Liners
NFPA 96	Kitchen Hood Exhaust Ductwork
SMACNA Guidelines for Welding Sheet Metal	Welded Galvanized, Black Iron and Stainless Steel Ductwork

B. General

1. Provide all required supporting and hanging devices to attach entire HVAC system including ductwork and equipment, and to prevent vibration. Include

vertical and horizontal supports as required by codes to meet minimum applicable earthquake resistance standards.

2. Ductwork shall be free from vibration at all times.

3. No pipe, conduit, hanger, Architectural element or structural member shall pass through duct without Engineer's written approval. Where the pipe or conduit cannot possibly be relocated and when written approval has been obtained, increase duct size to maintain full cross-sectional area at point of interference. Provide streamlined enclosure for pipe or conduit, per SMACNA.

4. All offsets and transformations necessary due to structural conditions shall maintain the full cross-sectional area of ductwork shown on Drawings.

C. Ductwork Pressure Class, Seal Class, and maximum design velocities shall be as shown on the drawings and as specified herein.

D. Duct Construction

1. Unless otherwise specified, use the pressure classifications for the types of ductwork as shown on the drawings. Note: Some systems require minimum gauges (such as Kitchen Hood Exhaust).

2. Ducts required to be continuously welded, such as kitchen exhaust (hoods and dishwasher) and with all penetrations sealed (damper rods, access doors, etc.) shall be liquid-tight and shall be airtight. The leakage test shall yield a zero leak rate. All welding shall use inert gas shielding with filler rod equal to or exceeding the base metal properties.

3. Non-welded duct seals and joints shall be as listed by SMACNA or Ductmate for the specified pressure and seal classes.

4. Material: Unless otherwise specified or shown on drawings, all ductwork shall be fabricated from G-60 galvanized steel or 316 stainless steel. Galvanized steel shall meet AST A525 and A527 standards and stainless steel shall meet ASTM A240 standards.

5. Round ductwork shall be furnished where shown or called for on the drawings, and may be substituted for rectangular, as an option to the Sheet Metal Sub Subcontractor when approved by the engineer, it can be easily fit in the available space and is round duct and fittings shall be of spiral lockseam construction.

6. Elbows and Bends:

a. Wherever possible, all elbows and bends for rectangular ducts shall be full radius (centerline radius of 1.5 times duct width). Elbows for grease exhaust shall have a centerline radius of 2.0 times duct width, unless this physically can't fit, then full radius may be used. Turning vanes and mitered elbows are not allowed.

b. Where centerline radius must be less than 1.5 times duct width (on supply, return and exhaust ductwork other than grease exhaust) in the

plane of bend, elbows shall be minimum 2" inside (not centerline) radius throat with radius heel and full length splitter vanes installed as shown on drawings or per SMACNA. Splitter vanes are not required on bends less than 30°. When centerline radius (r) divided by the duct width (w) is less than 1.5, provide the following number of splitter vanes:

r/w	No. of Vanes for Elbow Angle of 45° - 90°	No. of Vanes for Elbow Angle of 30° - 44°
1.49 – 0.70	1	0
0.69 - 0.60	2	1
Under – 0.60	3	2

c. For round ductwork provide stamped elbows, with centerline radius equal to 1-1/2 times duct diameter, or sealed, gored elbows as follows:

Elbow Angle	No. of Gores
0 – 36	2
37 – 72	3
73 – 90	5

d. Elbows for flat oval ducts shall have centerline radius equal to 1-1/2 times duct diameter in plane of bend, or sealed, gored elbows with gores as specified above for round ducts.

7. Transitions: Diverging air flow transitions shall be made with each side pitched out a maximum of 15 degrees, for an included angle of 30 degrees. Transitions for converging air flow shall be made with each side pitched in a maximum of 30 degrees, for an included angle of 60 degrees, or shall be as indicated. Factory-fabricated reducing fittings for systems using round duct sections when formed to the shape of the ASME short flow nozzle, need not comply with the maximum angles specified.

8. Insulated Nonmetallic Flexible Duct Runouts: Flexible duct runouts shall be used only where indicated. Runout length shall be as shown on the drawings, but shall in no case exceed 4 to 6 feet. Runouts shall be preinsulated, factory fabricated, and shall comply with NFPA 90A and UL 181. Either field or factory applied vapor barrier shall be provided. Where coil induction or high velocity units are supplied with vertical air inlets, a streamlined and vaned and mitered elbow transition piece shall be provided for connection to the flexible duct or hose. The last elbow to these units, other than the vertical air inlet type, shall be a die-stamped elbow and not a flexible connector. Insulated flexible connectors may be used as runouts. The insulated material and vapor barrier shall conform to the requirements of this specification 230000, (Insulation paragraph). The insulation material surface shall not be exposed to the air stream.

9. General Service Duct Connectors: Flexible duct connectors approximately 6 inches in width shall be provided where sheet metal connections are made to fans or where ducts of dissimilar metals are connected. For round/oval ducts, the flexible material shall be secured by stainless steel or zinc-coated, iron clinch-type draw bands. For rectangular ducts, the flexible material locked to metal collars shall be installed using normal duct construction methods. The composite connector system shall comply with NFPA 701 2004 (Standard of

Methods of Fire Tests for Propagation of Textiles and Film) and be flame retardant.

10. High Temperature Service Duct Connections (such as kitchen grease duct): Material shall be approximately 3/32 inch thick, 35 to 40-ounce per square yard weight, plain weave fibrous glass cloth with, nickel/chrome wire reinforcement for service in excess of 1200 degrees F. Connections shall be listed and labeled for the application.

E. Ductwork Accessories

1. Access Doors shall be rated for the duct pressure class they are installed in. For hazardous exhaust systems, minimum gauge shall be the same as the duct.

   a. Frame: same materials as duct with seal

   b. Door: hinged, with exterior (and, for insulation ducts, interior) panel.

   c. Locks: doors 16" and under, one lock doors over 16", two locks

   d. Seals: foam gaskets for ultra-low leakage

   e. Insulation (for insulation ducts): ½" foam board with aluminum foil face, 0.12K at 75°F.

   f. Manufacturer: Ruskin model ADH-2, Inland Steel, Miami Carey or approved equal.

2. Sizes:

SCHEDULE OF DUCTWORK ACCESS DOOR SIZES	
Duct width (inches)	**Access door size (inches)**
<=10	10 x 6
12 - 16	12 x 8
Over 16	18 x 24

3. Provide at all fire dampers, air inlets, motorized dampers, smoke detectors, duct mounted coils, humidifiers, air flow switches, where specified for cleanouts and where shown on the drawings.

4. Fire Dampers

   a. Fire dampers shall be 1-1/2 hour fire rated for use in up to 2 hour rated construction, unless otherwise indicated. Use 3 hour rated dampers when located in over 2 hour fire rated construction. Fire dampers shall conform to the requirements of NFPA 90A and UL 555. Fire dampers shall be automatic operating type (with spring loaded closure) and shall have a dynamic rating suitable for the maximum air velocity (minimum 2,000 feet per minute for low pressure up to 2” and 3,000 feet per minute for all pressure classes above 2” unless shown as higher on drawings) and pressure differential (based on construction class, with 4” minimum)

to which it will be subjected. Fire dampers shall be approved for the specific application, and shall be installed according to their listing.

b. Fire dampers shall be equipped with a steel sleeve or adequately sized frame installed in such a manner that disruption of the attached ductwork, if any, will not impair the operation of the damper. Sleeves or frames shall be equipped with perimeter mounting angles attached on both sides of the wall or floor opening. Ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce the ceiling of the assemblies shall be constructed in conformance with UL-05.

c. Fire dampers shall be curtain type with damper blades out of the air stream. Where duct dimensions are larger than the largest available fire damper, provide blade type dampers. Where blade type dampers connect to a vertical duct (in shaft) and are located within 24" of the riser duct, the damper blades shall be vertical. Provide locking quadrant for blade type fire dampers that are also used for manual balancing. Dampers shall not reduce the duct or the air transfer opening cross-sectional area. The installation details required for meeting their UL listing, as given in manufacturer's instructions for fire dampers shall be followed. Fire dampers link temperature shall be rated for 212^{o}F. Fire dampers used on stainless steel or aluminum duct systems shall be constructed of stainless steel.

5. Manual Volume Dampers

a. Manual volume dampers shall be provided where shown on the Drawings at every branch take off from the main duct, and elsewhere as required by the Balancing Sub Subcontractor, and shall be single or multiple blade type with sleeve bearings, interlocking blades and frame shall be of the same material as the ductwork. In ducts over 15" deep provide multiple opposed blade type, gang operated dampers with a maximum blade width of 8". Damper blades shall be fabricated of 16 gauge steel with hemmed edges, and a maximum length of 48". Damper operating rod shall be full blade length extended through the duct to externally mounted bearing plates. On insulated ductwork, bearing plates shall be installed flush with insulation finish and fastened to the duct. Operating lever shall be of the indicating type with locking quadrant.

b. For dampers in inaccessible locations, such as above gypsum ceilings provide remote cable actuated dampers.

6. Backdraft Dampers

a. Back draft dampers shall be provided where indicated and required, and shall consist of a set of externally adjustable counter weighted louvers that open automatically due to excess pressure and prevent reverse flow. The edges of the blades shall be provided with seals to prevent rattling and minimize air leakage. The damper blades shall be supported on

metal frames designed for wall mounting as indicated. The dampers shall be rated for operation up to a minimum of 2,500 fpm and be standard catalog products of Ruskin, Vent Products, American Warming and Ventilating or approved equal.

7. Motor Operated Control Dampers and Actuators

   a. Motor operated control dampers and actuators shall be furnished by the Automatic Temperature Control Sub Subcontractor and installed by the Sheet Metal Sub Subcontractor unless specified as part of a piece of equipment.

8. Duct Smoke Detectors

   a. Install duct smoke detectors as furnished by the Electrical Contractor in strict accordance with NFPA 72, Appendix A, and NFPA 90A.

   b. Smoke detectors shall automatically stop their respective fan(s) upon detecting the presence of smoke. Wiring connection from each smoke detector to its respective fan(s) shall be by the Controls Contractor.

9. Air Deflectors and Branch Connections

   a. Air deflectors shall be provided at duct mounted supply outlets, at takeoff or extension collars to supply outlets, at duct branch takeoff connections, and at 90 degree elbows, as well as at locations as indicated on the drawings or otherwise specified. Conical branch connections or 45 degree entry connections may be used in lieu of deflectors or extractors for branch connections. All air deflectors, except those installed in 90 degree elbows, shall be provided with an approved means of adjustment. Adjustment shall be made from easily accessible means inside the duct or from an adjustment with sturdy lock on the face of the duct. When installed on ducts to be thermally insulated, external adjustments shall be provided with stand-off mounting brackets, integral with the adjustment device, to provide clearance between the duct surface and the adjustment device not less than the thickness of the thermal insulation. Air deflectors shall be factory-fabricated units consisting of curved turning vanes or louver blades designed to provide uniform air distribution and change of direction with minimum turbulence or pressure loss. Air deflectors shall be factory or field assembled. Blade air deflectors, also called blade air extractors, shall be approved factory fabricated units consisting of equalizing grid and adjustable blade and lock. Adjustment shall be easily made from the face of the diffuser or by position adjustment and lock external to the duct. Stand-off brackets shall be provided on insulated ducts and are described herein. Fixed air deflectors, also called turning vanes, shall be provided in 90 degree elbows.

10. Volume Extractors

a. Volume extractors Shall be manufactured by the drum louver or supply air register manufacturer of all aluminum construction. Position adjustment operator shall be key-operated screw with access through face of register. Extractor blades shall be spaced 1" on center.

11. Blankoff Plates

a. Any blankoff plates or conversions required for mounting control dampers or coils shall be the responsibility of the Sheet Metal Sub Subcontractor.

12. Insulated Metal Panels

a. Provide 18 gauge, insulated double wall sandwich construction, 1½" thick where called for on the Drawings and for blanking off unused portions of wall louvers.

13. Test Openings

a. Provide instrument test opening enclosures in the ductwork at the discharge of each fan and fan coil, inlet of each fan and fan coil, and where directed by the Balancing Sub Subcontractor. The enclosures shall be installed before the application of the insulation and shall be of the proper height to extend beyond the insulation. The attachment of the test opening enclosure shall be made airtight.

14. Flexible connections shall be 6" wide connections constructed of heavy glass fabric double coated with neoprene. Flexible connections shall meet the requirements of the National Board of Fire Underwriters.

15. Duct Clean Out Doors - Provide clean out doors, sixteen feet on center, for all horizontally installed ductwork and at each length of straight duct run less than 16 feet. Provide access door constructed of same material as duct work served. Provide two hand operated plastic knobs with threaded brass inserts for opening and tight sealing of the door. Clean out doors shall be as specified for access doors.

F. Duct Sleeves, Framed Prepared Openings, Closure Collars

1. Duct Sleeves

a. Duct sleeves shall be provided for round ducts 15 inches in diameter or less passing through floors, walls, ceilings, or roof, and installed during construction of the floor, wall, ceiling, or roof. Round ducts larger than 15 inches in diameter and square, rectangular, and oval ducts passing through floors, walls, ceilings, or roof shall be installed through framed prepared openings. The Contractor shall be responsible for the proper size and location of sleeves and prepared openings. Sleeves and framed openings are also required where grilles, registers, and diffusers are installed at the openings. Framed prepared openings shall be fabricated from 20 gauge galvanized steel, unless otherwise indicated. Where sleeves are installed in bearing walls or partitions, black steel pipe,

ASTM A 53, Schedule 20 shall be used. Sleeve shall provide 1 inch clearance between the duct and the sleeve or 1 inch clearance between the insulation and the sleeve for insulated ducts.

2. Framed Prepared Openings

a. Openings shall have 1 inch clearance between the duct and the opening or 1 inch clearance between the insulation and the opening for insulated ducts.

3. Closure Collars

a. Collars shall be fabricated of galvanized sheet metal not less than 4 inches wide, unless otherwise indicated, and shall be installed on exposed ducts on each side of walls or floors where sleeves or prepared openings are provided. Collars shall be installed tight against surfaces. Collars shall fit snugly around the duct or insulation. Sharp edges of the collar around insulated duct shall be ground smooth to preclude tearing or puncturing the insulation covering or vapor barrier. Collars for round ducts 15 inches in diameter or less shall be fabricated from 20 gauge galvanized steel. Collars for round ducts larger than 15 inches and square, and rectangular ducts shall be fabricated from 18 gauge galvanized steel. Collars shall be installed with fasteners on maximum 6 inch centers, except that not less than 4 fasteners shall be used.

G. Acoustic Duct Liner

1. Provide acoustic duct lining of the type and as specified in the INSULATION SECTION of these specifications. Duct sizes shown are clear internal dimensions, increase duct sizes to compensate for lining thickness. See insulation table on drawing for scope of acoustic duct lining. Factory fabricated double-wall internally insulated duct with perforated panel may be used in place of lining.

2. Ductwork Contractor shall coordinate with insulation Contractor and indicate (label) all locations where sheet metal nosing or other lining erosion protection has bridged the thermal barrier on ductwork supplying cool air (below 60°F) in concealed or unconditioned spaces. Since this bridges the insulation, these locations require exterior insulation to prevent possible condensation.

H. Air Vents, Penthouses, and Goosenecks

1. Air vents, penthouses, and goosenecks shall be fabricated from aluminum or stainless steel sheets with aluminum or stainless steel structural shapes. Sheet metal thickness, reinforcement, and fabrication shall conform to THE SMACNA HVAC DUCT CONSTRUCTION STANDARDS, 2ND ED., 1995. Louver blades shall be accurately fitted and secured to frames. Edges of louver blades shall be folded or beaded for rigidity and baffled to exclude driving rain. Air vents, penthouses, and goosenecks shall be provided with bird screen.

I. Bird Screens and Frames

1. Bird screens shall conform to ASTM E 437, Type I, Class 1, 2 by 2 mesh, 0.063 inch diameter aluminum wire or 0.031 inch diameter stainless steel wire. Frames shall be removable type either stainless steel or extruded aluminum.

J. Kitchen Grease Hood Exhaust Ductwork

1. Grease hood exhaust ducts shall be a minimum 16 ga. carbon steel (concealed) or 18 ga. 304L (exposed). Ducts shall be continuously welded and liquid tight. Construction standard shall be as required by NFPA standards.

2. Exterior of uninsulated carbon steel duct shall be coated with high temperature paint.

3. Provide cleanout openings with grease-tight access panels (minimum 12”x12”) at each change of direction and at 10 ft. intervals along straight duct runs. Provide sign for all access panels stating: “ACCESS PANEL – DO NOT OBSTRUCT”.

4. Provide dished pan at bottom of risers with 2” half-coupling, removable plug, welded to bottom center of pan.

5. Diverging and converging transitions shall not exceed 20° from line of air flow.

6. All elbows shall be long radius (R=2W). If space does not allow long radius elbows to physically fit, standard radius (R=1.5W) elbows may be used.

7. All transitions and fittings shall be streamlined to minimize turbulence. No interior duct supports or vanes shall be used for grease exhaust ductwork.

8. Horizontal duct sections shall not form grease traps and shall pitch toward hood as required by NFPA and the International Mechanical Code.

9. For all fans that are not roof mounted upblast type, provide additional access panels within 3 feet of inlet and outlet.

10. If any damper is used at the hood, provide an access panel within 18”.

K. Dishwasher Exhaust Ductwork

1. Ductwork shall be a minimum 18 gauge stainless steel, liquid-tight and detergent-proof, all welded construction.

2. Provide 16 gauge stainless steel volume damper at each dishwasher discharge connection and with Ventlok Hivel 641 and 609 seals.

3. Pitch ductwork toward dishwasher.

2.12 DIFFUSERS, REGISTERS AND GRILLES

A. Units shall be factory-fabricated of steel, corrosion-resistant steel, or aluminum (as scheduled) and shall distribute the specified quantity of air evenly over space intended without causing noticeable drafts, air movement faster than 50 fpm in occupied zone, or dead spots anywhere in the conditioned area. Outlets for diffusion, spread, throw, and

noise level shall be as required for specified performance. Performance shall be certified according to ADC 1062:GRD. Inlets and outlets shall be sound rated and certified according to ADC 1062:GRD. Sound power level shall be as indicated (where level is not indicated, maximum level shall be NC30). Diffusers and registers shall be provided with volume damper with accessible operator, unless otherwise indicated; or if standard with the manufacturer, an automatically controlled device will be acceptable. Volume dampers shall be opposed blade type for all diffusers and registers, except linear slot diffusers. Linear slot diffusers shall be provided with round or elliptical balancing dampers. Where the inlet and outlet openings are located less than 7 feet above the floor, they shall be protected by a grille or screen according to NFPA 90A. Acceptable manufacturer's: Anemostat, Kreuger, Metalaire, Nailor, Price, Titus, or Tuttle and Bailey.

B. Diffusers: Diffuser types shall be as indicated. Ceiling mounted units shall be furnished with anti-smudge devices, unless the diffuser unit minimizes ceiling smudging through design features. Diffusers shall be provided with air deflectors of the type indicated. Air handling troffers or combination light and ceiling diffusers shall conform to the requirements of UL-03 for the interchangeable use as cooled or heated air supply diffusers or return air units. Ceiling mounted units shall be installed with rims tight against ceiling. Sponge rubber gaskets shall be provided between ceiling and surface mounted diffusers for air leakage control. Suitable trim shall be provided for flush mounted diffusers. Duct collar connecting the duct to diffuser shall be airtight and shall not interfere with volume controller. Return or exhaust units shall be similar to supply diffusers.

C. Registers and Grilles: Units shall be four-way directional-control type, except that return and exhaust registers may be fixed horizontal or vertical louver type similar in appearance to the supply register face. Registers shall be provided with sponge-rubber gasket between flanges and wall or ceiling. Wall supply registers shall be installed at least 6 inches below the ceiling unless otherwise indicated. Return and exhaust registers shall be located 6 inches above the floor unless otherwise indicated. Four-way directional control may be achieved by a grille face which can be rotated in 4 positions or by adjustment of horizontal and vertical vanes. Grilles shall be as specified for registers, without volume control damper.

2.13 FANS

A. General

1. Fans shall be tested, rated and certified according to AMCA 210. Fans may be connected to the non-overloading motors either directly or indirectly with V-belt drive. Motors shall not, unless otherwise indicated, exceed 1,800 rpm, shall be premium efficiency, have open drip proof (ODP) or totally enclosed fan cooled (TEFC) housing and, where fans are shown on drawing as explosion proof, motors shall be explosion proof. Motors shown on the drawings as used with VFD's shall be VFD duty rated and labeled. Motors used on all smoke control fans shall have minimum Class F insulation. Motors and drives shall meet the requirements of the separate specification "Motors, Drives and Starters" paragraph. V-belt drives shall be designed for not less than 140 percent of the connected driving capacity. Motor sheaves shall be variable pitch for 15 hp and

below and fixed pitch as defined by ARI Guideline D. Variable pitch sheaves shall be selected to drive the fan at a speed which will produce the specified capacity when set at the approximate midpoint of the sheave adjustment. When fixed pitch sheaves are furnished, a replaceable sheave shall be provided when needed to achieve system air balance. Motors for V-belt drives shall be provided with adjustable rails or bases. Removable metal guards shall be provided for all exposed V-belt drives, and speed-test openings shall be provided at the center of all rotating shafts. Fans shall be provided with personnel screens or guards on both suction and supply ends, except that the screens need not be provided, unless otherwise indicated, where ducts are connected to the fan. Fan and motor assemblies shall be provided with vibration-isolation supports or mountings as indicated. Vibration-isolation units shall be standard products with published loading ratings. Each fan shall be selected to produce the capacity required at the fan static pressure indicated. Sound power level shall be as indicated. The sound power level values shall be obtained according to AMCA 300. Standard AMCA arrangement, rotation, and discharge shall be as indicated.

2. Provide each fan with motors and accessories as shown on the drawings, specified elsewhere, and as required for proper operation.

3. Fan manufacturer shall be as scheduled on the drawings, or provided they meet all requirements of these specifications, scheduled capacities and efficiencies, and fit with proper accessibility. Acceptable manufacturers shall be Greenheck, Twin City, Cook, Buffalo, Trane, Chicago, Hartzell, Kanalflakt, New York Blower, Pace or Penn.

B. Centrifugal and Plenum Fans

1. Centrifugal fans shall be fully enclosed (except for plenum fans which shall have protective guards for all moving parts), single-width single-inlet, or double-width double-inlet, AMCA Pressure Class I, II, or III as required or indicated for the design fan size and speed (with the next higher class used if the fan is within 30 rpm of the maximum speed for the listed pressure class). Impeller wheels shall be rigidly constructed, accurately balanced both statically and dynamically. Fan blades may be forward curved, backward-inclined or airfoil design in wheel sizes up to 30 inches. Fan blades for wheels over 30 inches in diameter shall be Backward-inclined or airfoil design. Fan wheels over 36 inches in diameter shall have overhung pulleys and a bearing on each side of the wheel. Fan wheels 36 inches or less in diameter may have one or more extra long bearings between the fan wheel and the drive. Bearings shall be sleeve type, self-aligning and self-oiling with oil reservoirs, or precision self-aligning roller or ball-type with accessible grease fittings or permanently lubricated type. Grease fittings shall be connected to tubing and serviceable from a single accessible point. Bearing life shall be L10 rated at not less than 80,000 hours as defined by ABEMA 9 and ABEMA 11. Fan shafts shall be steel, accurately finished, and shall be provided with key seats and keys for impeller hubs and fan pulleys. Each fan outlet shall be of ample proportions and shall be designed for the attachment of angles and bolts for attaching flexible connections.

C. In-Line Centrifugal Fans

1. In-line fans shall have centrifugal backward inclined blades, stationary discharge conversion vanes, internal and external belt guards, and adjustable motor mounts. Fans shall be mounted in a welded tubular casing. Air shall enter and leave the fan axially. Inlets shall be streamlined with conversion vanes to eliminate turbulence and provide smooth discharge air flow. Fan bearings and drive shafts shall be enclosed and isolated from the air stream. Fan bearings shall be sealed against dust and dirt and shall be permanently lubricated, and shall be precision self aligning ball or roller type. Bearing life shall be L10 rated at not less than 80,000 hours as defined by ABEMA 9 and ABEMA 11.

D. Centrifugal Type Power Roof Ventilators

1. Fans shall be direct or V-belt driven as scheduled with backward inclined, non-overloading wheel. Motor compartment housing shall be hinged or removable and weatherproof, constructed of heavy gauge aluminum. Fans shall be provided with roof curb, and extended base. Motors shall be provided with nonfusible, horsepower rated, manual disconnect mounted on unit. Grease-laden kitchen exhaust fans shall be centrifugal type according to UL 705 and fitted with V-belt drive, round hood, and windband upblast discharge configuration, hinged housing for easy access for cleaning, integral residue trough and collection device, motor and power transmission components located in outside positively air ventilated compartment. Lubricated bearings shall be provided.

E. Ceiling Fans

1. Motors shall be direct drive PSC type with permanently sealed ball bearings. All motors to have built in, self-resetting (internal) thermal overload protector. Fan performance shall be AMCA certified. Provide a minimum fan blade diameter of 60”. Fan blades to be straight with contoured shaped design for maximum efficiency. All fans to have factory installed secondary support cable assembly connected to motor shaft. Secondary support cable assembly shall be a minimum of 6 feet of galvanized cable (1/8”x7x7) with a rated breaking strength of 1700 pounds. Provide UL Listed solid state speed control, downrod, and tilted fan canopy as noted on the drawings. Acceptable ceiling fans shall be Leading Edge, Hunter Fan CO., or Emerson Air Comfort Products.

2.14 CONVECTORS

A. Convectors shall be of the types and capacities scheduled and specified and shall be manufactured by Sterling, Modine, Trane or approved equal.

B. The steam heating coils shall be, mechanically bonded copper/aluminum coil. Coils shall be factory tested for 200 psi working pressure.

C. Cabinets shall be constructed with minimum 18 gauge electro galvanneal steel internal cabinets, side panels and top. The front panel shall be minimum 16 gauge electro galvanneal steel. Provide cabinets with factory end pockets to have adequate space in cabinet for installation of field piping (per details shown on drawings) and wiring.

1. Cabinet finish shall be a neutral eggshell baked enamel prime coat. Provide powder coated baked enamel final finish with color selected by the architect.

2. Cabinet shall be supplied with adjustable rear mounting brackets for adjustment and alignment to wall surface areas.

2.15 AIR FILTERS

A. Air filters shall be listed according to requirements of UL 900.

B. The HVAC Subcontractor shall furnish a minimum of 4 additional complete sets of filters for all air handling equipment using filters. In addition to the filters furnished with each piece of equipment from the manufacturer, the HVAC Subcontractor shall provide a minimum of two complete sets of filters to be used during the construction and then the testing and balancing period. Finally, a complete new set of filters shall be installed upon substantial completion of the project, prior to final acceptance by the Owner's Representative.

C. Extended Surface Pleated Panel Filters: Filters shall be 2 inch depth, sectional, disposable type of the sizes indicated and shall have an average efficiency of 25 to 30 percent (MERV-8) when tested according to ASHRAE 52.1. Initial resistance at 400 feet per minute shall not exceed 0.2 inches water gauge. Filters shall be UL Class 2. Media shall be nonwoven cotton and synthetic fiber mat. A wire support grid bonded to the media shall be attached to a moisture resistant fiberboard frame. All four edges of the filter media shall be bonded to the inside of the frame to prevent air bypass and increase rigidity. Filter shall be equal to Farr 30/30.

D. Holding Frames: Frames shall be fabricated from not lighter than 16 gauge aluminum or stainless steel sheet steel with rust-inhibitor coating may be used where indicated. Each holding frame shall be equipped with suitable filter holding devices. Holding frame seats shall be gasketed. All joints shall be airtight.

E. Filter Gauges: Filter gauges shall be dial type, diaphragm actuated draft and shall be provided for all filter stations, including those filters which are furnished as integral parts of factory fabricated air handling units. Gauges shall be at least 3-7/8 inches in diameter, shall have white dials with black figures, and shall be graduated in 0.01 inch, and shall have a minimum range of 1 inch beyond the specified final resistance for the filter bank on which each gauge is applied. Each gauge shall incorporate a screw operated zero adjustment and shall be furnished complete with two static pressure tips with integral compression fittings, two molded plastic vent valves, two 5 foot minimum lengths of 1/4 inch diameter aluminum or vinyl tubing, and all hardware and accessories for gauge mounting.

2.16 AIR HANDLING UNITS (H&V)

A. Coordination

1. If equipment is supplied by a manufacturer other than the one named, coordinate with the General Contractor and affected subcontractors to ensure the specified performance is met. This coordination shall include (but is not limited to) the following:

a. Structural supports for units.

b. Size and location of concrete bases/housekeeping pads

c. Location of unit supports.

d. Ductwork sizes and connection locations

e. Piping size and connection/header locations

f. Interference with existing or planned ductwork, piping and wiring

g. Electrical power requirements and wire/conduit and over current protection sizes.

h. Trap height requirements

2. The Mechanical Contractor shall be responsible for costs incurred by the General Contractor, Subcontractors, and Consulting Engineers to accommodate units furnished by a manufacturer other than manufacturer named as basis of design.

B. Ratings And Certifications

1. Air Handling Unit safety: ETL or UL 1995

2. Air Handling Unit energy use: ASHRAE 90.1

3. Fans: AMCA 210

4. Air Coils: AHRI 410

5. Air Handling Unit certification program: ANSI/AHRI 430

6. Filter media: ANSI/UL 900 listed Class I or Class II

7. Control wiring: NEC codes & ETL requirements

C. Delivery, Storage And Handling

1. Follow manufacturer’s recommendations for handling, unloading and storage.

2. Protect, pack, and secure loose-shipped items within the air-handling units. Include detailed packing list of loose-shipped items, including illustrations and instructions for application.

3. Seal openings to protect against damage during shipping, handling and storage.

4. Wrap indoor units with a tight sealing membrane. Wrapping membrane shall cover entire AHU during shipping and storage. Cover equipment, regardless of size or shape.

5. Clearly mark AHU sections with unit tag number, segment sequence number, and direction of airflow. Securely affix safety-warning labels.

D. Extra Materials

1. Provide one set of filters for balancing, and one additional set for final turnover to owner.

2. Provide one extra set of belts, in addition to the factory-installed set.

E. Warranty

1. Provide warranty for 18 months from date of shipment. Warranty shall cover manufacturer defects. Warranty work shall be performed by manufacturer's factory-trained and factory-employed technician.

2. Include factory-provided controls in the parts warranties.

3. Parts associated with routine maintenance, such as belts and air filters shall be excluded.

F. System Startup

1. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

2. Comply with manufacturer's start-up requirements to ensure safe and correct operation and integrity of warranty.

G. Acceptable Products

1. Johnson Controls YORK Solution

2. McQuay Vision Plus

3. Trane Performance Climate Changer

4. Approved Equal (Prior written approval by engineer of record is required)

H. General Description

1. Air Handling Unit (AHU) consists of a structural base, insulated casing, access doors, fans, motors, coils, filters, dampers, components, and accessories. Unit layout includes mixing box, filter, steam coil, and supply fan sections.

2. Provide AHU to meet the specified levels of performance for scheduled items including airflow, static pressure, heating capacity, electrical characteristics, sound, casing leakage, panel deflection and casing thermal performance.

3. AHU shall maintain structural integrity when wall panels are removed.

4. Provide internal components and accessories as specified and scheduled. Components and accessories shall be installed by the AHU manufacturer in an ISO-9002 certified facility.

5. Ship units in one piece. Split units only where necessary for shipping and installation.

I. Base Rail

1. Provide a structural base rail under the full perimeter of the unit, formed from mill galvanized steel.

2. Provide clearance for proper external trapping of drain pans and steam condensate.

3. Provide base rail and lifting lug system that does not require additional support for rigging. Include base rail lifting lugs at unit corners.

J. Casing

1. Provide double wall AHU casing. Exposed insulation is not acceptable.

2. Panel assembly shall meet UL standard 1995 for fire safety. Panel insulation shall comply with the requirements of NFPA 90A.

3. Provide an insulation system that is resistant to mold growth in accordance with a standardized test method such as UL 181 or ASTM C 1338.

4. Encapsulate insulation with sheet metal so that air does not contact insulation. Solid lined panels insulated with spray injected foam shall be hermetically sealed at each corner and around their entire perimeter, to eliminate airflow through the panel and to eliminate microbial growth potential within the casing wall.

5. Provide casing with minimum thermal resistance (R-value) of 13 hr-ft2-°F/BTU.

6. Roof, wall, floor, and access door panels shall be galvanized steel.

7. Provide a unit frame of galvanized steel that provides the overall structure of the unit and does not rely on the casing panels for structural integrity. Unit shall conform to ASHRAE Standard 111 Class 6 (confirm standard) for casing leakage no more than 1% of design airflow at 1.25 times design static pressure up to a maximum of +8 inches w.g. in positive pressure sections and -8 inches w.g. in negative pressure sections.

8. Provide wall panels and access doors that deflect no more than L/240 when subjected to 1.5 times design static pressure up to a maximum of +8 inches w.g. in positive pressure sections and -8 inches w.g. in negative pressure sections. ‘L’ is the panel-span length and ‘L/240’ is the deflection at panel midpoint.

9. Provide floors and roofs that deflect no more than L/240 when subjected to a 300 lb static load at mid-span. ‘L’ is the panel-span length and ‘L/240’ is the deflection at panel midpoint.

10. Provide an exterior finish that shows a breakdown of less than 1/8” on either side of a scribed line when subjected to ASTM B117 500 hour, 5% salt spray conditions. This is equivalent to an ASTM D1654 rating of ‘6.’

K. Access Doors

1. Provide double wall access doors that meet requirements for the AHU casing.

2. Provide industrial style stainless steel hinges that permit 180 degrees of door swing.

3. Provide latches with roller cam mechanisms that ensure a tight seal. Rotating knife-edge or “paw” latches are not acceptable.

L. Fans

1. Provide double width double inlet (DWDI) housed fans.

2. Provide fans with the following accessories:

   a. OSHA-compliant belt guard enclosing the fan motor and drive

3. Provide fans with polished steel shafts with first critical shaft speed at least 125% of the maximum operating speed for the fan pressure class. Shaft shall have an anti-corrosion coating.

4. Provide fan motor on an adjustable base to allow adjustable and consistent belt tension. Fan and motor shall be mounted on a formed steel fan isolation base.

5. Mount the fan and motor assembly on a common adjustable base. This common base shall attach to vibration isolators, which mount to structural support channels. These channels shall span the AHU floor and mount directly to the AHU frame.

6. Provide vibration isolation springs with 2” static deflection.

7. Connect DWDI fans to the unit casing or bulkheads with canvas flexible connection.

M. Bearings And Drives

1. Provide bearings complying with ANSI/AFBMA 9 for fatigue life ratings.

2. Provide fan bearings with an average life L50 of at least 200,000 hours.

3. Provide permanently lubricated bearings on forward curved fans smaller than 18”. On other fans, provide re-greaseable bearings with hydraulic grease fittings and lube lines extended to the motor side of the fan or to the exterior of the unit (primary access side).

4. Provide drives selected with a 1.5 service factor. Sheaves shall be machined from a close grain cast iron and statically balanced by the manufacturer. Provide a fixed pitch sheave on the motor.

5. Provide multiple belt drives on belt driven fans with motors 10 hp or greater. Belts shall be V-type, precision molded, raw edge construction, anti-static, oil- and heat-resistant.

N. Electrical Motors

1. Provide fan motors built in accordance with the latest standards of the NEMA and IEEE.

2. Provide AHU and fan motors in compliance with ASHRAE 90.1.

3. Provide fan motors with the following characteristics:

a. Voltage, Frequency and Phase, as scheduled.

b. Motor RPM, as scheduled

c. Minimum service factor of 1.15

d. Premium efficiency, or as required to meet ASHRAE 90.1

e. NEMA design ball bearing type

f. Rated for continuous duty at full load in a 104°F (40°C) ambient

g. Open drip proof (ODP)

h. Suitable for use in variable frequency application, per NEMA MG-1 Part 30

i. Premium Efficiency Inverter ready per NEMA STD MG1 PART 31.4.4.2

O. Heating Coils

1. Provide coils manufactured by AHU manufacturer, except where noted in contract documents.

2. Coils shall meet or exceed performance scheduled on drawings.

a. When applicable, provide coils with performance certified in accordance with AHRI Standard 410 for coil capacity and pressure drop. Circuit coils such that the fluid velocity is within the range of certified rating conditions at design flow.

3. Provide coil segment casing that meets or exceeds casing performance of the unit.

4. Provide panels that are easily removable with no special tools.

5. Locate access doors to provide clearance for pipe insulation, connectors, and accessories. Space shall allow a minimum of 90 degrees of door swing.

6. Provide coils built in their own full perimeter frame. Tube sheets on each end shall have fully drawn collars to support and protect tubes. Horizontal coil casing and support members shall allow moisture to drain. Casing and support members shall not block finned area.

7. Individual coils shall be removable from the side of the AHU.

8. Provide a 1/4" FPT plugged vent/drain tap on each connection. Circuiting shall allow draining and venting when installed. Extend vent, drain, and coil connections through AHU casing.

9. Insulate gap between coil stub out connection and AHU casing with a spool-shaped sleeve grommet. Adhesive rings applied the casing walls are not acceptable.

10. Steam distributing coils shall be operable at 50 psig pressure and a corresponding saturated steam temperature of 298° F. Factory test steam coils with 315 psig compressed air under water. Dehydrate and seal coils prior to shipping.

11. Provide steam-distributing coils with a tube outer diameter (OD) of 1" and an inner distribution tube of 5/8" O.D. Circuit coils for gravity drain of condensate without trapping. Steam shall discharge in the direction of condensate flow to ensure even heat transfer across each tube.

12. Provide steam coil headers made of seamless copper tubing. Pipe connections shall be steel or red brass. Header connections (tubes and piping connections) shall be silver-brazed or TIG welded.

13. Provide coils with die-formed, continuous aluminum fins. Fins shall have fully drawn collars to accurately space fins and protect tubes. Fins shall be 0.006" or 0.008 or 0.01" thick.

P. Filters

1. Provide filter segments with filters and frames as scheduled.

2. Provide side or front loading filters for filter segments located upstream of coil segment(s) with an access door on the drive side through which filters can be easily loaded.

3. Provide face loading filters for segments located downstream of coil segment(s). Provide an 18” (minimum) access plenum and access door on the drive side through which face loading filters can be easily loaded.

4. Provide Class 2 or Class 1 filter media per U.L. 900 and as required by local codes.

5. Filter types, efficiencies, and nominal depths shall be as follows:

   a. Angled filters –2” 30% pleated filters, as scheduled.

6. Provide a flush mounted, factory installed differential pressure gage on the drive side of unit to measure pressure drop across filters. Manufacturer shall provide fully functional gauges, complete with tubing.

Q. Dampers

1. Provide dampers tested in accordance with AMCA 500.

2. Provide factory-installed dampers, as shown on drawings.

3. Dampers shall have airfoil blades, extruded vinyl edge seals, and flexible metal compressible jamb seals.

4. Dampers shall have a maximum leakage rate of 4 CFM/square foot at 1" w.g., and shall comply with ASHRAE 90.1.

5. Damper blades shall be parallel acting unless otherwise indicated.

6. Damper blades shall be galvanized steel.

R. Finishes

1. Manufacturer shall clean the exterior surfaces of units prior to finishing, painting, or shipment.

2. Unpainted air-handling units constructed of galvanized steel shall pass the ASTM B-117 test for 220-hour salt spray solution (5%) without any sign of red rust. (confirm)

2.17 GRAVITY RELIEF VENTILATORS

A. Gravity relief ventilators shall be low silhouette for relief applications with gravity or negative pressure system. Each ventilator shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number.

B. Ventilator hoods shall be galvanized steel construction with precision formed, arched panels with interlocking seams. Vertical end panels are fully locked into hood end panels. Provide base height of 12" with curb cap having pre-punched holes for installation.

C. Provide factory motorized damper. Damper shall be balanced for minimal resistance to flow and prevent outside air from entering back into the building. Damper shall have galvanized frames with pre-punched holes for installation.

D. Provide factory birdscreen constructed of ½ inch galvanized mesh. Mount birdscreen horizontally across the intake area of the hood.

2.18 FACTORY PAINTING

A. Units which are not of aluminum, stainless steel, or galvanized construction (according to ASTM A 123 or ASTM A 525) shall be factory painted with a corrosion resisting paint finish. Internal and external ferrous metal surfaces shall be cleaned, phosphatised and coated with a paint finish which has been tested according to ASTM B 117, ASTM D 1654, and ASTM D 3359. Evidence of satisfactory paint performance for a minimum of 125 hours for units to be installed indoors and 500 hours for units to be installed outdoors shall be submitted. Rating of failure at the scribe mark shall be not less than 6, average creepage not greater than 1/8 inch. Rating of the inscribed area shall not be less than 10, no failure. On units constructed of galvanized steel which have been welded, exterior surfaces of welds or welds that have burned through from the interior shall receive a final shop docket of zinc-rich protective paint according to ASTM D 520 Type I.

2.19 INSULATION

A. Scope: Provide all labor, equipment, materials and accessories, and perform all operations required, for the correct installation of insulation on the following systems and all other necessary items connected into the systems subject to condensation, loss of heat, or personnel protection (above 120 degrees F):

1. Piping insulation (other than pre-insulated underground piping), jackets and accessories (including all valves and fittings with easily removable sections for maintenance of strainers, balance valves, and unions).

2. Ductwork insulation, jackets, and lining (including all fittings).

3. Fire wrap insulation where indicated or required to maintain fire separation.

B. Environmental Requirements: Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

C. Quality Assurance: Insulation materials must be asbestos free, UL listed, and manufactured at facilities certified and registered to conform to ISO 9000 Quality Standard. All insulating products and jackets shall carry a 25/50-flame spread/smoke developed rating as tested in accordance with ASTM E 84.

D. Workmanship: All insulation shall be installed by a licensed applicator and applied in accordance with the manufacturer's recommendations. All work shall comply with all applicable federal, state, and local codes including, but not limited to, OSHA. All work shall conform to industry and trade accepted standards for commercial and industrial insulations. Verify that piping, heat trace, and ductwork has been tested (including applicable pressure/leakage tests) before applying insulation materials. Surfaces to be insulated shall be cleaned free of dirt, scale, moisture, oil and grease. No vapor barrier leaks or insulation voids will be accepted. Continue insulation vapor barrier through penetrations except where prohibited by code. All fire rated walls and penetrations shall be sealed with fire stopping. Locate insulation and cover seams in least visible locations. Neatly finish insulation at supports, protrusions, and interruptions. For all systems requiring a vapor barrier seal all terminations including fittings, wall penetrations, and supports with vapor barrier mastic such as Foster 30-35 or equal. In addition, in brine or chilled water pipe systems vapor seal pipe terminations every four pipe sections, using Foster 30-35 or equal. Bevel and seal ends of insulation at equipment, flanges, and unions. Where insulation is used over stainless surfaces, the material shall be chlorine free.

E. Delivery and Storage of Materials

1. Deliver all materials to the job site and protect the insulation against dirt, water, chemical and mechanical damage before, during and after installation. Do not install damaged insulation and remove it from the job site.

2. Deliver insulation, coverings, cements, adhesives coatings etc. to the site in factory-fabricated containers with the manufacturer's stamp or label affixed showing fire hazard ratings of the products, name of manufacturer and brand.

3. Installed insulation that has not been weatherproofed shall be protected from inclement weather by an approved waterproof sheeting installed by the Contractor. Any water-damaged insulation shall be removed and replaced by the Contractor at no additional cost.

F. Manufacturers: Johns Manville (JM), CertainTeed, Owens-Corning, 3M, Armstrong, Knauf, or approved equal. Note that the listed manufacturers may not be able to supply all the insulation products required for the project. Unless otherwise noted, JM

insulation products are listed to provide the minimum standards required for each type of insulation.

G. Pipe Insulation: Provide the following products depending on temperature of each system. Insulation shall be marked to show the locations of all unions, break flanges, strainers, check and balancing valves.

1. For piping with a service temperature between 40°F and 600°F such as steam, and steam condensate, provide glass fiber insulation equal to JM Micro-Lok. Insulation shall be rigid molded and noncombustible, meeting ASTM C 547, Type I. K-factor shall be 0.23 at 75°F mean temperature. All purpose vapor retardant jacket shall be JM AP-T PLUS. Jacket shall be white kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, secure with self sealing longitudinal laps and butt strips or AP Jacket with outward clinch expanding staples.

H. Minimum pipe insulation thicknesses shall be as shown on the drawings.

I. Field Applied Piping and Fitting Jackets

1. Provide covers for insulation of all pipe fittings (i.e. elbows, tees, end caps, reducers, unions, flanges, mechanical joints), strainers and valves with surface temperatures between –20°F and 150°F (all low pressure steam and condensate systems with glass fiber insulation). Provide easily removable sections for cleaning and maintenance of unions, balancing valves, and strainers. Fitting covers shall be 30-mil thick white PVC equal to JM Zeston 2000 molded high impact, UV resistant covers. Attach with water-resistant pressure sensitive color matching vinyl tape to maintain vapor barrier. Insulate all fittings per manufacturer's recommendations to prevent surface temperature from exceeding the 150°F limit.

J. Ductwork Insulation – General

1. Provide duct and plenum insulation of type(s) indicated in these specifications. Minimum total R-value for each location and duct system shall be as shown on the drawings.

2. R-values shown on drawings may be obtained by adding the individual R-values of both the lining (where shown or used) and external duct insulation.

K. Ductwork Insulation (External Wrap) - General

1. Where duct is internally lined (coordinate locations with ductwork sub-Contractor), exterior insulation is not required unless called for in the specifications, shown on the plans, or where required to provide the minimum R-value shown on the drawings.

2. Where ducts are insulated or lined, flexible connectors to equipment shall be insulated. Duct flanges and standing seams shall be insulated the same as the duct.

3. Where service access is required, bevel and seal ends of easily removable insulation. Removable sections shall also be provided (and labeled) at all duct test holes.

4. The underside of duct work 24" or greater shall be secured with mechanical fasteners and speed clips spaced approximately 18" on center. The protruding ends of the fasteners should be cut off flush after the speed clips are installed, and then, when required, sealed with UL listed tapes or vapor-retardant adhesive.

L. Ductwork Insulation (External Wrap): Provide the following insulation types for the listed ductwork.

1. Insulate concealed ducts and plenums, depending upon the required R-value (see drawings) for the duct and its location, with 0.75 lb/cu ft dense fiber glass insulation equal to JM Microlite or Owens Corning SOFTR Type 75. Insulation shall meet ASTM C 1290 Type III, flexible blanket with a maximum K-factor of 0.30 at 75°F mean temperature. Operating service temperature range shall be 40°F to 250°F. Vapor barrier jacket shall be FSK aluminum foil reinforced with fiberglass scrim laminated to UL rated kraft paper with maximum permeance of 0.02 perms. Jacket shall be secured with UL listed pressure sensitive tape and/or outward clinched expanded staples (with minimum 2 inch lapped vapor barrier) and vapor barrier mastic as needed. K-factors and R-values listed assume 25% compression during installation. The minimum R-value based on thickness, shall be:

Thickness	R-value
1 ½”	4.2
2”	5.6
3”	8.3

2. Insulate exposed ducts and plenums, depending upon the required R-value (see drawings) for the duct and its location, with 3.0 lb/cu ft dense fiber glass insulation. Insulation shall be equal to JM Type 814 Spin-Glas or Owens Corning Type 703 meeting ASTM C 612, Type 1A & IB; rigid board with a maximum K-factor of 0.23 at 75°F mean temperature. Operating service temperature range shall be 0°F to 450°F. Vapor barrier jacket shall be AP type (kraft paper bonded to aluminum foil, reinforced with fiber glass yarn) with maximum permeance of 0.02 perms. Jacket shall be secured with UL listed pressure sensitive tape and/or outward clinched expanded staples (with minimum 2 inch lapped vapor barrier) and vapor barrier mastic as needed. The minimum R-value, based on thickness, shall be:

Thickness	R-value
1 ½”	6.5
2”	8.6

M. Acoustic Duct Liner – General:

1. Liner minimum thickness shall be minimum 1” (unless otherwise noted on drawings) or as required to provide the minimum R-values shown on the drawings. Ductwork dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness. Do not use liner on

kitchen, pool, shower, fume exhaust, hospital operating rooms (and similar areas) or other wet, grease ladened, or potentially hazardous exhaust systems.

2. Liner shall have rugged coating system installed on the air side of liner and all edges. Coating shall be cleanable by dry cleaning methods without damage. Maximum pressure drop of lined ductwork shall not exceed 5% more than unlined ductwork of the same inside dimensions. Liner shall be roll type or board type as required for duct size and to meet specified requirements.

3. Liner shall be rated up to 5,000 ft/min.

4. Repair liner surface penetrations with manufacturer's approved adhesive meeting ASTM C 919.

N. Duct Liner: Provide flexible duct liner equal to JM Permacote Linacoustic (rectangular duct) or Spiracoustic (round duct) meeting ASTM C 1071 with K-factor shall be 0.25 (1" thick) at 75°F mean temperature when tested per ASTM C 518. Liner shall have an air surface coated with acrylic coating treated with EPA register anti-microbial agent proven to resist microbial growth as determine by ASTM G 21 and G 22. Noise reduction coefficient shall be minimum 0.65 for 1" thick liner or higher for thicker liner based on type "A" mounting and tested in accordance to ASTM C 423. Install liner with full coverage adhesive meeting ASTM C 919 or JM SuperSeal. Secure liner with galvanized steel pins, welded or mechanically fastened. Weld pins shall not mar the exterior finish or surface of the duct. Liner shall be attached to pin with pressed on washer. Mechanical liner fasteners shall be spaced as indicated by SMACNA, NAIMA, or manufacturer. Pin length should be such as to limit compression of liner. All exposed edges of the liner must be factory or field coated. The minimum R-value, based on thickness, shall be:

Thickness	R-value
1"	4.0
1 ½"	6.0
2	8.0

O. Fire Wrap Insulation (for systems that are not protected by fire dampers): For all kitchen grease hood exhaust ducts and for any other systems which are shown on the drawings that penetrate fire rated walls, floors, ceilings or shafts, provide fully encapsulated fire rated insulation equal to Unifrax FryeWrap Elite 1.5, Fire Master Fast XL, or 3M Fire Barrier System 615+. Fire Wrap insulation shall be non-asbestos and rated to maintain 2-hour (both T and F - ratings) fire separation with zero clearance to combustibles at all points for the entire duct run after it leaves the fire zone (fire penetrates fire rated construction).

1. For grease ducts, fire wrap insulation shall pass all requirements of ASTM E2336 and be a minimum of two 1.5-inch thick overlapping layers with minimum 3" perimeter and longitudinal overlaps.

2. Installation shall be in accordance with manufacturer's instructions to maintain rating with all cut edges sealed with aluminum tape. Insulation shall be held in place with minimum ½ inch wide and 0.015-inch thick stainless steel bands and

clips. Provide insulation pins and clips (per manufacturer's recommendations) on the bottom of horizontal ducts to prevent sagging.

3. Seal all fire rated penetrations per manufacturer's details to maintain full 2-hour rating.

4. Provide removable insulation sections for all access and clean-out doors per manufacturer's details to maintain full 2-hour rating. Install easy to read warning labels on insulation every 20 feet and at each clean-out door. Labels shall say "Fire Resistive Enclosure – Do Not Remove".

5. Exposed duct wrap systems shall be protected where subject to physical damage.

2.20 ROOF CURBS

A. As supplied by equipment manufacturer for roof mounted equipment. Provide pre-fabricated adjustable curbs for duct penetrations through roofs.

B. Provide roof curbs shop-fabricated from 0.064-in. aluminum sheet with heliarc welded joints, integral cants, and flanges, and wood nailer. Sizes as indicated or as required for equipment.

C. Provide insulation liner of 1 1/2-in. minimum thickness glass fiber: NFPA 90A Standards, flame spread rating of 25 or less, smoke rating 50 or less; coated with neoprene or equal as protection from erosion.

D. Provide ventilated roof curb extension for kitchen hood exhaust fan. Refer to detail on H7.02.

2.21 AUTOMATIC TEMPERATURE CONTROLS

A. Automatic Temperature Controls shall be as specified herein.

B. All bidders must be building automation Contractors in the business of installing direct digital control building automation systems for a minimum of 3 years. Bidder must have an office within 50 miles of the job site staffed with factory-trained engineers capable of trouble shooting and maintaining all systems for the project. All bidders must be authorized distributors or branch offices of the manufacturers specified.

C. All bidders must have a trained staff of application engineers, who have been certified by the manufacturer in the configuration, programming and service of the automation system. The Installer shall have successfully completed the Control Systems Manufacturer's classes on the control system he is to install. The Installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request. All systems design and programming shall be done by the bidder's staff and not subcontracted to a third party.

D. Acceptable Vendors: The below listed vendors are acceptable providing they meet the requirements of these specifications. Any proposed deviations from these specifications or drawings shall be highlighted in the bid form or attached proposal and agreed to in

writing by the Owner and Engineer prior to acceptance of the bid. No deviations will be allowed after that time. The BAS shall be by:

1. Honeywell International or approved equal

E. The above list of manufacturers applies to Webserver, controllers, software, custom application programming language, Building Network Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (e.g., sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

F. Scope of Work

1. Except as otherwise noted, the control system shall consist of all Building Network Controllers, Custom Application Controllers, Application Specific Controllers, Webserver, routers, software, sensors, transducers, relays, control valves, control dampers, valve and damper operators, control panels, and other accessory equipment to fully provide all required control functions. Provide a complete system of electrical interlock wiring to fill the intent of the specification and provide for a complete and operable system. Except as otherwise specified, provide operators for equipment such as dampers if the equipment manufacturer does not provide these. Coordinate requirements with the various Contractors.

2. The BAS Contractor shall review and study all HVAC drawings and all mechanical and electrical specifications to familiarize him with all equipment and sequences. BAS Contractor shall provide all the required quantities and types of devices necessary to completely perform all sequences, whether or not such devices are explicitly shown on the drawings or specified. If any devices are not specified they shall be of the same high quality of specified components.

3. The BAS Contractor shall hire licensed electricians and shall provide all required interlock wiring and wiring of all control devices including sensors, control valves and damper actuators, control panels, etc.) Scope of wiring includes the provision of additional required power wiring beyond what is shown on the electrical drawings. Any additional wiring required from electric panels shall be coordinated with the Division 16 electrical Contractor and paid for by the BAS Contractor. All wiring shall comply with the requirements of the electrical section of these specifications.

4. When the BAS system is fully installed and operational, the BAS Contractor and representatives of the Owner will review and check out the system and train the Owner’s personnel. At that time, the BAS Contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications. The BAS Contractor shall carry 24 hours of additional on-site programming to allow for field modifications that may be needed to optimize the various systems to fully conform to the requirements of these specifications and work with the actual operating conditions as installed.

5. The building is to be commissioned and Contractor shall provide all labor required to fully test and demonstrate that all systems operate as designed.

6. The Contractor shall furnish and install a complete building automation system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. At a minimum, provide controls for the following:

   a. Graphics, reports, trending, alarms and occupancy (occupied, unoccupied and warm-up/cool-down) schedules as appropriate for all equipment.

   b. Interface with controls provided by equipment manufacturers.

   c. Supply and exhaust air fans.

   d. Heating and ventilating units.

   e. Finned tube radiation.

   f. Gravity Relief Ventilators.

   g. Convectors.

   h. Existing Cabinet Unit Heaters

   i. Existing Cast Iron Radiation.

   j. Carbon dioxide detection.

   k. Filters.

   l. Monitoring points for fire alarm system signals, etc.

   m. Power and control wiring to all DDC devices, equipment interlocks, control valves and dampers, BAS panels, etc.

   n. All other equipment scheduled or shown on drawings

   o. Proposed O&M Manual Table of Contents.

   p. O&M Manuals

   q. Proposed acceptance testing plan, test forms, reports and narratives.

   r. All completed acceptance testing documentation and report of successful completion of the required 30 day performance test. This is a separate submission prior to job completion.

   s. Subcontractor Project Completion Certificate for the control system. See “Project Closeout” for requirements. This is a separate submission prior to job completion.

7. Provide services and manpower necessary for testing of system in coordination with the HVAC Contractor, Balancing Contractor and Owner’s representative and in accordance with the acceptance testing plan and functional performance test narratives.

8. All work performed under this section of the specifications shall comply with all codes, laws and governing bodies. If the drawings and/or specifications are in conflict with governing codes, the Contractor shall submit a proposal with appropriate modifications to the project to meet code restrictions. If this specification and associated drawings exceed governing code requirements, the specification will govern. The Contractor shall obtain and pay for all necessary construction permits and licenses.

G. System Description

1. The Building Automation System (BAS) shall consist of Webserver based microcomputer controllers of modular design providing distributed processing capability, and allowing future expansion of both input/output points and processing/control functions. The intent is for the BAS to seamlessly connect devices throughout the building, regardless of sub-system type. Gateways shall not be used unless there is no other solution for systems integration.

2. For this project the system shall consist of the following components:

a. Webserver: The BAS shall function as a Webserver to allow an operator to view and/or modify any point in the system via the Internet and/or the Owner's Intranet (coordinate this with the Owner). HTML pages shall be capable of being accessed via any computer connected to the Internet and/or company Ethernet backbone via standard Internet browser software after confirmation of authorized user name and password. Provide a firewall for the BAS network. Systems requiring any version of the workstation software loaded on the accessing computer shall not be acceptable.

b. Ethernet-based Building Network Control Units (BNCU): The BAS Contractor shall furnish Ethernet-based Building Network Controllers as described in Part 2 of the specifications. These controllers shall connect directly to the Webserver over Ethernet, provide communication to all Custom Application Controllers, Application Specific Controllers, Input/Output Modules, and serve as a communication link to equipment furnished by others (if applicable).

c. Custom Application Controllers (CAC):

1) Provide the necessary quantity and types of Custom Application Controllers to meet the requirements of the project for control of the designated mechanical equipment. All controllers shall be seamlessly integrated utilizing the same network and the same programming language.

2) Each controller shall be completely programmable and provide functionality based on I/O configuration rather than application. For example, the Custom Application Controllers shall have the ability to provide local lighting control.

3) Each CAC shall operate completely standalone, containing all of the I/O (including 15% spare points of each type) and programs to control its associated equipment. Provide each CAC with LED screen.

d. Application Specific Controllers (ASC):

1) Provide the necessary quantity and types of Application Specific Controllers to meet the requirements of the project for control of the designated equipment. All controllers shall be seamlessly integrated utilizing the same network and the same programming language.

2) Each ASC shall be capable of executing the required sequences of operation and provide the I/O point capacity and types as indicated on the drawings.

3) Each ASC shall operate completely standalone, containing all of the I/O and programs to control its associated equipment. Provide each ASC with LED screen.

e. Portable Service Tool: Provide one portable service tool (or portable computer if required) for monitoring and testing of the BNCUs, CACs, and ASCs. The portable service tool will be for use by the Balancing Contractor. The portable service tool shall be returned to the BAS Subcontractor upon completion of the project.

H. Work by Others

1. The BAS Contractor shall cooperate with other Contractors performing work on this project necessary to achieve a complete and neat installation. To that end, each Contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work.

2. The BAS Contractor shall furnish all control dampers (not furnished by equipment manufacturers), control valves, sensor wells, flow meters and other similar equipment for installation by the Mechanical Contractor.

3. The BAS Contractor shall provide field supervision to the designated Contractor for the installation of the following:

a. Control dampers and valves.

b. Blank-off plates for dampers that are smaller than duct size.

c. Air flow monitoring stations.

d. Location of all sensor wells and tappings in all duct systems.

4. The Electrical Contractor shall provide:

a. All power wiring to HVAC equipment and motors, and to junction boxes (for control power) in mechanical rooms, where shown on the electrical drawings.

b. Furnish smoke detectors and wire to the building fire alarm system. HVAC Contractor to mount devices. BAS Contractor to hardwire to fan shut down and BAS alarm.

I. Code Compliance

1. Provide BAS components and ancillary equipment, which are UL-916 listed and labeled.

2. All equipment or wiring used in conditioned air streams, spaces or return air plenums shall comply with NFPA 90A Flame/Smoke/Fuel contribution rating of 25/50/0 and all applicable building codes or requirements.

3. All wiring shall conform to the National Electrical Code and the Division 16 specifications – whichever is more stringent.

4. Comply with FCC rules, Part 15 regarding Class A radiation for computing devices and low power communication equipment operating in commercial environments.

5. Comply with FCC, Part 68 rules for telephone modems and data sets.

J. Submittals

1. All shop drawings shall be prepared in both hard copy and electronic form (in a standard format such as AutoCAD 2007 or newer, or Visio Professional). In addition to the drawings, the Contractor shall furnish a CD/DVD containing the identical information. Drawings shall be B size or larger. See Submittals Paragraph for additional requirements. Upon request, RDK Engineers will provide via email the CADD floor plan drawings for use by the BAS Contractor. The drawings are diagrammatic and final floor plans and equipment locations are the responsibility of the BAS Contractor.

2. Shop drawings shall include a riser diagram and floor plans depicting locations of all controllers, routers, hubs, Webservers, etc. with associated network architecture and wiring. Also included shall be individual schematics of each mechanical system showing all connected points with reference to their associated controller. “Typicals” will be allowed where appropriate. Wiring diagrams detailing interconnecting devices such as fan starters, freezestats, smoke detectors, relays, etc., shall be provided for each system. Written narratives for all sequences shall be included. Any deviations from the original design shall be highlighted. A “Bill of Materials” list shall be provided for each system indicating part numbers, descriptions, manufacturer, and quantities of each component utilized.

3. Submittal data shall contain manufacturer's data sheets on all hardware and software products required by the specification and sequences. Valve, damper, and airflow station schedules shall indicate size, type, configuration, capacity,

maximum pressure rating, pressure drop, maximum differential pressure shut-off capabilities, and name and location of all equipment served.

4. Software submittals shall contain narrative descriptions of sequences of operation, program listings, point lists, and a complete description of the graphics, reports, trends, alarms and configuration to be furnished with the Webserver software. Provide complete information on user programming (commands, sequences, etc.). Information shall be bound or in a three ring binder with an index and tabs.

5. Submit six (6) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor shall check all documents for accuracy prior to submitting.

6. The Engineer will make corrections, if required, and return to the Contractor. The Contractor shall then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

7. No work may begin on any segment of the project until submittals have been successfully reviewed for conformity with the design intent of the project.

8. Identification labels and tags, including database for equipment, valves, panels, and devices (Division 23 & 26).

9. Proposed O&M table of contents.

10. O&M Manuals

11. Start-up and acceptance plan, narratives, test forms, and report containing all completed forms, tests, and report of the required successful completion of the 30 day performance test.

12. Subcontractor's Project Completion Certificate.

K. System Startup and Acceptance Testing

1. Each point in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS shall be tested against the appropriate sequence of operation. Successful completion of the system test shall constitute the beginning of the warranty period. A written report shall be submitted (with copy to the Owner's Representative) indicating that the installed system functions in accordance with the plans and specifications.

2. The BAS Contractor shall submit their acceptance testing plan, pre-functional performance test forms and narratives, and functional performance test forms and narratives. Unless a commissioning agent has been contracted the responsibility to facilitate the commissioning process, the BAS Contractor shall be responsible for coordinating the attendees needed to demonstrate the sequence of operation performance to the Owner. The controls system will not

be accepted without the prior acceptance of the submitted documents noted herein.

3. The BAS Contractor shall test and set in operating condition all equipment and systems. For major equipment such as chillers, boilers, and air handling units, this shall be done in the presence of the equipment manufacturer's representatives, as applicable, and the Owner and Architect's representatives. Coordinate with all required attendees.

4. The BAS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The BAS Contractor shall have a trained technician available on request during the balancing of the systems. The BAS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract.

L. Training

1. The BAS Contractor shall provide on-site training to the Owner's representative and maintenance personnel using the BAS acceptance testing documents.

2. On-site training shall include a minimum of 40 hours of hands-on instruction geared toward the operation and maintenance of the systems. Prior to training, the necessary lesson plans, training documents, handouts, etc. shall be provided with the curriculum outline, which shall include as a minimum:

a. System Overview.

b. Webserver usage, programming, graphics, alarms, notifications, etc.

c. System Software and Operation.

d. System Access.

e. Software features overview.

f. Changing set points and other attributes.

g. Scheduling.

h. Editing programmed variables.

i. Displaying and editing color graphics.

j. Running reports and trending.

k. Application programming.

l. Operational sequences including start-up, shutdown, adjusting and balancing.

m. Equipment maintenance.

M. Warranty

1. The BAS Contractor shall warrant the entire system (parts and labor) for 18 months after successful system acceptance testing is accepted by Owner's Representative. Beneficial use by the Owner may be an alternative method to begin the warrantee period (providing there is a minimum of 12 months left after successful system acceptance testing and system acceptance by Owner's Representative). During the warranty period, the BAS Contractor shall be responsible for all software and hardware upgrades and revisions during normal workday schedule, and within 48 hours of notification if solution cannot be resolved via the remote or web-site connection, to provide and maintain complete and workable building control systems.

2. Updates to the manufacturer's software shall be provided at no charge during the warranty period.

N. System Architecture

1. The Building Automation System (BAS) shall consist of Building Network Control Units (BNCU) and associated Input/Output Unit Modules (I/O, as applicable), Custom Application Controllers (CAC), Application Specific Controllers (ASC), and Webserver. The BAS shall provide control, alarm detection, scheduling, reporting and information management for the entire facility. The BAS shall have the capability to accommodate integration of and to other building sub-systems (fire alarm, security, card access, lighting, etc.) as indicated on the drawings and detailed in the specifications.

2. Level 1 Network Description (BAS Network):

   a. Level 1, the main backbone of the system, shall be an Ethernet (ISO/IEC 8802-3) LAN/WAN. Building Network Control Units and Webserver shall connect directly to this network without the need for Gateway devices.

3. Level 2 Network Description (Field Bus Level)

   a. Level 2 of the system shall consist of one or more field buses managed by the Building Network Control Units. The Level-2 field buses may consist of one or more of the following types:

      1) An RS-485 proprietary field bus (or "machine bus") that supports up to 32 Input/Output Units (I/O) directly connected to a Building Network Control Unit. The I/O modules may be mounted within the BNCU or remotely mounted via a single twisted, shielded pair of wires.

      2) An RS-485 proprietary token-passing bus that supports a minimum 120 Custom Application Controllers or Application Specific Controllers.

3) ANSI/ATA 878.1 Arcnet: Field bus utilizes RS-485 signaling. Both Custom Application Controllers and Application Specific Controllers may reside on this network bus (minimum of 60 devices).

4) Master-Slave/Token Passing (ANSI/ASHRAE Standard 135-2001, BACnet): Field bus utilizes RS-485 signaling. Both Custom Application Controllers and Application Specific Controllers may reside on this network bus (minimum of 60 devices).

5) EIA-709.1, LonTalk: Field bus utilizing LonTalk FTT-10a network protocol over twisted pair wiring. Both Custom Application Controllers and Application Specific Controllers may reside on this network bus (minimum of 60 devices).

O. BAS Configuration

1. The BAS shall be capable of being segmented, through software, into multiple local area networks (LANs) distributed over a wide area network (WAN), sharing a single Webserver (10/100 megabits/sec Ethernet). This enables Webservers to manage a single LAN (or building), and/or the entire system with all devices being assured of being updated by and sharing the most current database.

2. All BNCUs and Webserver shall be capable of residing directly on the Owner's Ethernet TCP/IP LAN/WAN with no required gateways. Furthermore, the BNCU's, Webserver shall be capable of using standard, commercially available, "off-the-shelf" Ethernet infrastructure components such as routers, switches and hubs. With this design the Owner may utilize the investment of an existing or new enterprise network or structured cabling system. This also allows the option of the maintenance of the LAN/WAN to be performed by the Owner's Information Systems department as all devices shall utilize standard TCP/IP components.

P. Support For Open Systems Protocols

1. The BAS design shall include solutions for the integration of the following "open systems" protocols: ANSI/ASHRAE 135-2001 BACnet, EIA-709.1 LonTalk™, Modbus, OPC Client/Server, and digital data communication to third party microprocessors such as any equipment manufacturer's controllers and variable frequency drives (VFDs).

a. BACnet: The BAS shall, as a minimum, support the BACnet Interoperable Building Blocks (BIBBS) for Read (Initiate) and Write (Execute) Services as defined in the Data Sharing BIBBS as follows:

DS-RP-A, B
DS-RPM-A, B
DS-WP-A, B

DS-WPM-A, B

b. LonTalk: The BAS shall support LonTalk communications using FTT-10 transceivers. All communications shall follow LonMark standards utilizing approved Standard Network Variable Types (SNVTs) and Standard Configuration Paramenter Types (SCPTs). LonMark components which do not have a standard applicable profile must comply with LonMark standards, and be provided with a XIF file for self-documentation.

2. The system shall also provide the ability to program custom ASCII communication drivers, residing in the BNCU, for communication to third party systems and devices. These drivers shall provide real time monitoring and control of the third party systems.

Q. Webserver Functionality

1. The BAS system on the Ethernet TCP/IP Internet and/or the Owner's Intranet (coordinate availability with the Owner's IT group) shall be setup as a seamless Webserver. The Webserver function shall be either built into the BAS hardware or be a separate fully integrated solid state Webserver hardware device. All user entered information (web pages, security, etc.) shall be stored in non-volatile memory. System operational information and clock functions shall be battery-backed or backed up automatically to another device for a minimum of 72 hours.

2. The Webserver shall have the ability to automatically obtain an IP (Internet Protocol) address using DHCP. Use of static IP addressing shall also be supported. The Webserver shall have the ability to store HTML code and "serve" pages to a web browser. This provides the ability for any computing device utilizing a TCP/IP Ethernet connection and capable of running a standard Internet browser (Microsoft Internet Explorer™, Netscape Navigator™, etc.) to access real-time data from the entire BAS. No additional software shall have to be installed on the client PC for normal operation of the system. An unlimited number of users shall be able to access the Webserver. A minimum of 15 users (expandable) shall be able to utilize this device at the same time.

3. Graphics (for all systems) and text-based web pages shall be constructed using standard HTML code. The interface shall allow the user to choose any of the standard text or graphics-based HTML editors for page creation. It shall also allow the operator to generate custom graphical pages and forms.

4. The Webserver interface shall be capable of password security, including validation of the requesting PC's IP address. All communication with the Webserver shall be encrypted using 128 bit Secure Socket Layer (SSL) technology. The Webserver interface shall allow the sharing of data or information between any controller, or process or network interface (BACnet, LonTalk and TCP/IP) that the BAS has knowledge of, regardless of where the point is connected on the BAS network or where it is acquired from.

5. Operators with proper security shall be able to override set points, operation schedules, and equipment operation. These changes shall be made graphically within the web browser. A log of system alarms and events shall be able to be viewed from the web browser. Operators with proper security shall be able to acknowledge alarms. System trends shall be able to be selected and viewed. Trends shall be shown graphically with the proper axis scaling automatically selected. Operators with proper access shall be able to configure the webserver using their web browser.

6. To simplify graphic image space allocation, HTML graphic images, if desired, may be stored on any shared network device. The BAS Webserver shall have the ability to acquire any necessary graphics using standard pathing syntax within the HTML code mounted within the BAS Webserver. Real-time values shall be updated automatically at least once every 30 seconds (with the option to switch to manual updates from the remote computer).

R. Building Network Control Units (BNCU)

1. General: Provide Level 1 Building Network Control Units to provide the performance specified in Part 1 of this Section. Each of these panels shall meet the following requirements.

   a. The Building Automation System shall be composed of one or more independent, stand-alone, microprocessor based BNCUs to manage the global strategies required by this project.

   b. The BNCUs shall have sufficient memory to support its operating system, database, a minimum of 3 days of buffer (for trending data), and programming requirements with 50% spare capacity.

   c. The BNCUs shall provide communications ports for connection of the Portable Computer and Portable Operators Terminal.

   d. The operating system of the BNCUs shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.

   e. All BNCUs shall have battery-backed real time clocks.

   f. Data shall be shared between all BNCUs.

   g. Each BNCU shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:

      1) Assume a predetermined failure mode.

      2) Generate an alarm notification.

2. Communications: Each Building Network Control Unit shall reside on the same Level 1 inter-network as the Webserver. The network shall be on ISO 8802-3 (Ethernet) and support the Internet Protocol (IP). This network shall be provided

by the BAS Subcontractor and shall communicate with the Owner's network as defined by the Owner's IT department. Each BNCU shall also perform routing to a network of Level 2 Custom Application and Application Specific Controllers.

3. Environment: Controller hardware shall be suitable for the anticipated ambient conditions. Controllers used in conditioned ambient shall be mounted in an enclosure, and shall be rated for operation at 32 F to 120 F.

4. Serviceability: Provide diagnostic LEDs for power, communications, and processor. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.

5. Memory: The Controllers shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.

6. Immunity to Power and Noise: Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shut-down below 80% nominal voltage. The Controllers shall contain surge protection and not require any external AC power signal conditioning.

7. BNCU Operator Display: Controller (at least one in each location) shall include an operator display allowing the user to perform basic daily operations tasks on the building automation system. At a minimum this operator display shall:

    a. Be installed on the building controller or on the adjacent wall and require no additional power source.

    b. Consist of either a one-quarter VGA touch screen with 320 X 240-pixel resolution with adjustable brightness and the contrast or a minimum 2 line by 40 character LCD display with keypad.

    c. Be capable of having the same unique user identification and passwords as the associated controller to limit access to the system and operator functions.

    d. Display the current state of any input/output point and equipment controller (CAC or ASC) on the network.

    e. Give the operator the ability to override the current state of any output point or HVAC equipment controller (CAC or ASC) on the network.

    f. Allow the operator to modify the start and stop times of any time-of-day schedule within the system.

    g. Provide a visual indication that a system alarm exists.

    h. Provide the ability to view and acknowledge alarms that are annunciated at that BNCU.

    i. Allow the operator to view custom graphical displays with dynamic status information.

j. Automatically update displayed system information every 10 seconds.

S. Custom Application Controllers (CAC)

1. General: Provide Level 2 Custom Application Controllers to provide the performance specified in Part 1 of this Section. Each of these panels shall meet the following requirements.

a. The Building Automation System shall be composed of one or more independent, stand-alone, microprocessor based CACs to manage the local strategies required by this project.

b. The CACs shall provide communications ports for connection of the Portable Computer and Portable Operators Terminal.

c. The CACs shall have sufficient memory to support its operating system, database, a minimum of 3 days of buffer (for trending data), and programming requirements with 50% spare capacity.

d. All CACs shall have battery-backed real time clocks.

e. The operating system of the CACs shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.

f. Each CAC shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:

1) Assume a predetermined failure mode.

2) Generate an alarm notification.

2. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.

a. Controllers used in conditioned ambient shall be mounted in NEMA 1 type enclosures, and shall be rated for operation at 32 F to 120 F.

b. Controllers used outdoors and/or in wet ambients shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -30 F to 150 F.

3. CAC Operator Display: A local operator display (similar to that specified for BNCUs) shall be provided on at least one CAC or BNCU at each control panel location. The operator display shall be provided for interrogating and editing data. A system security password shall be available to prevent unauthorized use of the keypad and display.

4. Serviceability: Provide diagnostic LEDs for power, communications, and processor. All low voltage wiring connections shall be made such that the controller electronics can be removed and/or replaced without disconnection of field termination wiring.

5. Memory: The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.

6. Immunity to Power and Noise: Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. The Controllers shall contain surge protection and not require any external AC power signal conditioning.

T. Application Specific Controllers (ASC)

1. General: Provide Level 2 ASCs as required for this project. ASCs are microprocessor-based DDC controllers dedicated to control a specific piece of equipment. They shall be fully user programmable, initially set up to provide the specified sequences. Applications are limited to small HVAC equipment such as unit ventilators, cabinet unit heaters, etc.

   a. Each ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.

      1) Unit ventilator terminal unit controllers shall include damper actuators with minimum torque of 35 in-lb, with override for manual positioning during start-up and servicing. Velocity sensors shall have an accuracy of +/- 3% of full range.

   b. Each ASC shall contain sufficient I/O capacity (at least 1 spare point of each type), memory (at least 50% spare), and programming flexibility to control the target system and allow for future changes in programs remotely through the front end.

   c. The ASCs shall provide communications ports for connection of the Portable Computer and/or Portable Operators Terminal.

2. Environment: The hardware shall be suitable for the anticipated ambient conditions.

   a. Controllers used in conditioned ambients shall be mounted in NEMA 1 type rated enclosures. Controllers located where they will not be disturbed by building activity (such as above ceiling grid), may be provided with plenum-rated enclosures and non-enclosed wiring connections for plenum cabling. Exception: Use NEMA 1 enclosures and provide conduit for all wiring for systems that control any outdoor air dampers, or connect to the fire management or smoke control systems. All ambient controllers shall be rated for operation at 32 F to 120 F.

3. ASC operator display: ASC Operator Display: A local operator display (similar to that specified for BNCUs) shall be provided on at least one ASC or BNCU at each control panel location. The operator display shall be provided for interrogating and editing data. A system security password shall be available to prevent unauthorized use of the keypad and display.

4. Serviceability: Provide diagnostic LEDs for power and communications. All wiring connections shall be clearly labeled and made to be field removable.

5. Memory: ASCs shall maintain all BIOS and programming information in the event of a power loss for at least 90 days.

6. Immunity to Power and Noise: Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%.

7. Transformer: Power supply for the ASCs must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type with all wiring by the BAS Subcontractor.

U. Communications

1. This project shall comprise of an Ethernet network for communications between Building Network Control Units and Webserver.

2. The BAS Subcontractor shall provide all communication media, connectors, repeaters, hubs, and routers necessary for the controls system inter-network.

3. Remote operator interface via Webserver shall allow for communication with any and all controllers on this network.

4. Communications services over the inter-network shall result in operator interface and value passing that is transparent to the inter-network architecture as follows:

   a. Connection of an operator interface device to any one controller on the inter-network will allow the operator to interface with all other controllers as if that interface were directly connected to the other controllers. Data, status information, reports, system software, custom programs, etc., for all controllers shall be available for viewing and editing from any one controller on the inter-network.

   b. All database values (i.e., points, software variable, custom program variables) of any one controller shall be readable by any other controller on the inter-network. This value passing shall be automatically performed by a controller when a reference to a point name not located in that controller is entered into the controller's database. An operator/installer shall not be required to set up any communications services to perform inter-network value passing.

5. The time clocks in all controllers shall be automatically synchronized daily and automatically corrected for daylight savings time and leap years.

V. Input/Output Interface (I/O)

1. Hard-wired inputs and outputs may tie into the system through Building, Custom, or Application Specific Controllers.

2. All input points and output points shall be protected such that shorting of the point to itself, another point, or ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage will cause no damage to the controller. Provide a minimum of 15% spare I/O points of each type for BNCUs and CACs.

3. Binary (digital) inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 ma to be compatible with commonly available control devices.

4. Pulse accumulation input points. This type of point shall conform to all the requirements of Binary Input points, and also accept up to 2 pulses per second for pulse accumulation, and shall be protected against effects of contact bounce and noise.

5. Analog inputs shall allow the monitoring of low voltage (0-10 Vdc), current (4-20 ma), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with, and field configurable to commonly available sensing devices.

6. Binary (digital) outputs shall provide for on/off operation, or a pulsed low voltage signal for pulse width modulation control. Binary outputs on custom and building controllers shall have 3-position (on/off/auto) override switches and status lights. Outputs shall be selectable for either normally open or normally closed operation. The position of the override switches shall be monitored and any point in override shall be highlighted as such in all graphics.

7. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0-10 Vdc or a 4-20 ma signal as required to provide proper control of the output device. Analog outputs on building or custom controllers shall have status lights, a 2-position (auto/manual) switch, and manually adjustable potentiometer for manual override. The position of the override switches shall be monitored and any point in override shall be highlighted as such in all graphics.

W. Portable Service Tool

1. Provide portable proprietary (or laptop) service tool to communicate directly to all controllers. If a laptop is required, the laptop software shall enable users to monitor both instantaneous and historical point data, modify control parameters, and enable/disable any point or program in any controller on the network. Provide all required hardware/software. The service tool (or laptop) shall be used by the balancing Contractor and then turned over to the Owner.

2. The laptop or service tool shall be able to connect to any Ethernet controller or standalone controller via a dedicated service port. From this single connection, the user shall be able to communicate with any other controller on the LAN.

3. The laptop or service tool shall limit operator access by passwords. The service tool must support, at a minimum, the following password-protected user types: Administrator, Modify Parameters, View Only.

4. The laptop or service tool software shall include built-in menus for viewing points by controller, enabling, disabling and viewing programs, configuring controllers, and communicating to other controllers on the network.

X. System Software

1. General Description: The software architecture must be object-oriented in design, a true 32-bit application suite utilizing Microsoft's OLE, COM, DCOM and ODBC technologies. These technologies make it easy to fully utilize the power of the operating system to share, among applications (and therefore to the users of those applications), the wealth of data available from the BAS. The functions shall include monitoring and programming of all DDC controllers. Monitoring consists of alarming, reporting, graphic displays, long term data storage, automatic data collection, and operator-initiated control actions such as schedule and set point adjustments. Programming of controllers shall be capable of being done either off-line or on-line. All information shall be available in graphic or text displays. Graphic displays shall feature visual effects to enhance the presentation of the data, to alert operators of problems, and to facilitate location of information throughout the DDC system. All operator functions shall be selectable through a mouse.

2. System Database: The files server database engine must be Microsoft SQL Server, or another ODBC-compliant, relational database program. This ODBC (Open Database Connectivity)-compliant database engine allows for an Owner to utilize "their" choice of database and due to its "open" architecture, allows an Owner to write custom applications and/or reports which communicate directly with the database avoiding data transfer routines to update other applications. The system database shall contain all point configurations and programs in each of the controllers that have been assigned to the network. In addition, the database will contain all files including color graphic, alarm reports, text reports, historical data logs, schedules, and polling records.

3. User Interface: The BAS software shall allow the creation of a custom, browser-style interface linked to the user that has logged into the software. This interface shall support the creation of "hot-spots" that the user may link to view/edit any object in the system or run any object editor or configuration tool contained in the software. Furthermore, this interface must be able to be configured to become a user's "PC Desktop" – with all the links that a user needs to run other applications. This, along with the Windows user security capabilities, will enable a system administrator to setup workstation accounts that not only limit the capabilities of the user within the BAS software but may also limit what a user can do on the PC and/or LAN/WAN.

4. User Security: The software shall be designed so that each user of the software can have a unique username and password. This username/password combination shall be linked to a set of capabilities within the software, set by and editable only by, a system administrator. The sets of capabilities shall range from View only, Acknowledge alarms, Enable/disable and change values, Program, and Administer. The system shall allow the above capabilities to be applied independently to each and every class of object in the system. The

system must allow a minimum of 250 users to be configured per workstation. There shall be an inactivity timer adjustable in software that automatically logs off the current operator after the timer has expired.

5. Configuration Interface: The software shall use a familiar Windows Explorer™-style interface for an operator or programmer to view and/or edit any object (controller, point, alarm, report, schedule, etc.) in the entire system. In addition, this interface shall present a "network map" of all controllers and their associated points, programs, graphics, alarms, and reports in an easy to understand structure. All object names shall be alphanumeric and use Windows long filename conventions. Object names shall not be required to be unique throughout the system. This allows consistency in point naming. For example, each ASC can have an input called Space Temperature and a set point called CFM Setpoint. The ASC name shall be unique such as VAV for LAB101. Systems requiring unique object names throughout the system will not be acceptable.

    a. The configuration interface shall include support for template objects. These template objects shall be used as building blocks for the creation of the BAS database. The types of template objects supported shall include all data point types (input, output, string variables, set points, etc.), alarm algorithms, alarm notification objects, reports, graphics displays, schedules, and programs. Groups of template object types shall be able to be set up as template subsystems and systems. The template system shall prompt for data entry if necessary. The template system shall maintain a link to all "child" objects created by each template. If a user wishes to make a change to a template object, the software shall ask the user if he/she wants to update all of child objects with the change. This template system shall facilitate configuration and programming consistency and afford the user a fast and simple method to make global changes to the BAS.

6. Color Graphic Displays: The system shall allow for the creation of user defined, color graphic displays for the viewing of mechanical systems and building schematics. These graphics shall contain point information from the database including any attributes associated with the point (engineering units, etc.). In addition operators shall be able to command equipment or change set points from a graphic through the use of the mouse. Requirements of the color graphic subsystem include:

    a. SVGA, bit-mapped displays. The user shall have the ability to import AutoCAD generated picture files as background displays. As a minimum graphics shall include: all mechanical equipment including each individual air handling unit, fan, etc.; systems of equipment including steam systems; air handling systems (H&V, unit ventilators, associated fans, control dampers, etc.); floor plans showing equipment locations and visual indication of any rooms in alarm, with point and click selection of any room's system.

b. A built-in library of objects such as dampers, fans, buttons, knobs, gauges, ad graphs which can be "dropped" on a graphic through the use of a software configuration "wizard". Objects shall be set up so that it is easy to visually see the state of the object (such as fan on or off). These objects shall enable operators to interact with the graphic displays in a manner that mimics their mechanical equivalents found on field installed control panels. Using the mouse, operators shall be able to adjust set points, start or stop equipment, modify PID loop parameters, or change schedules.

c. Status changes or alarm conditions must be able to be highlighted by objects changing screen location, size, color, text, blinking or changing from one display to another.

d. Graphic panel objects shall be able to be configured with multiple "tabbed" pages allowing an operator to quickly view individual graphics of equipment, which make up a subsystem or system.

e. Ability to link graphic displays through user defined objects, alarm testing, or the result of a mathematical expression. Operators must be able to change from one graphic to another by selecting an object with a mouse - no menus will be required.

7. On-Line Help and Training: Provide a context sensitive, on line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. Provide an interactive tutorial CD, which will act as on-line training/help for the systems operator.

8. Automatic Monitoring: The software shall allow for the automatic collection of data and reports from any controller through either a hardwire or modem communication link. The frequency of data collection shall be completely user-configurable.

9. Alarm Management: The software shall be capable of accepting alarms directly from controllers, or generating alarms based on evaluation of data in controllers and comparing to limits or conditional equations configured through the software. Any alarm (regardless of its origination) will be integrated into the overall alarm management system and will appear in all standard alarm reports, be available for operator acknowledgment, and have the option for displaying graphics, or reports.

a. Alarm management features shall include:

1) A minimum of 20 alarm notification levels. Each notification level will establish a unique set of parameters for controlling alarm display, acknowledgment, keyboard annunciation, alarm printout and record keeping.

2) Automatic logging in the database of the alarm message, point name, point value, connected controller, timestamp, username

and time of acknowledgement, username and time of alarm silence (soft acknowledgement)

3) Automatic printing of the alarm information or alarm report to an alarm printer or report printer.

4) Playing an audible beep or audio (wav) file on alarm initiation or return to normal.

5) Sending an email, alphanumeric page, or phone call (by text to speech technology) to anyone listed in an email account address list on either the initial occurrence of an alarm and/or if the alarm is repeated because an operator has not acknowledged the alarm within a user-configurable timeframe. The ability to utilize email, phone and alphanumeric paging of alarms shall be a standard feature of the software integrated with the operating system's mail application interface (MAPI).

b. Individual alarms shall be able to be re-routed to a user or users at user-specified times and dates. For example, a critical high temp alarm can be configured to be routed to a Facilities Dept. user during normal working hours (7am-6pm, Mon-Fri) and to a Central Alarming user at all other times.

c. An active alarm viewer shall be included which can be customized for each user or user type to hide or display any alarm attributes.

d. The font type and color, and background color for each alarm notification level as seen in the active alarm viewer shall be customizable to allow easy identification of certain alarm types or alarm states.

e. The active alarm viewer can be configured such that an operator must type in text in an alarm entry and/or pick from a drop-down list of user actions for certain alarms. This ensures accountability (audit trail) for the response to critical alarms.

10. Custom Report Generation: The software shall contain a built-in custom report generator, featuring word processing tools for the creation of custom reports. These custom reports shall be able to be set up to automatically run or be generated on demand. Each user shall be able to associate reports with any word processing or spreadsheet program loaded on the machine. When the report is displayed, it will automatically spawn the associated report editor such as MS Word™, MS Excel™, or Lotus 123™.

a. Reports can be of any length and contain any point attributes from any controller on the network.

b. The report generator shall have access to the user programming language in order to perform mathematical calculations inside the body of the report, control the display output of the report, or prompt the user for additional information needed by the report.

c. It shall be possible to run other executable programs whenever a report is initiated.

d. Report Generator activity can be tied to the alarm management system, so that any of the configured reports can be displayed in response to an alarm condition.

e. Standard Reports: The following standard system reports shall be provided for this project. These reports shall be readily customized to the project by the Owner.

1) Points in each controller.

2) Points in alarm

3) Disabled points

4) Overridden points

5) Operator activity report

6) Alarm history log.

7) Program listing by controller with status.

8) Network status of each controller.

9) ASHRAE Guideline 22-2008 Report: Provide a daily report that shows the operating condition of each chiller as required by ASHRAE Guideline 22.

11. Spreadsheet-style reports: The software shall allow the simple configuration of row/column (spreadsheet-style) reports on any class of object in the system. These reports shall be user-configurable and shall be able to extract live (controller) data and/or data from the database. The user shall be able to set up each report to display in any text font, color and background color. In addition the report shall be able to be configured to filter data, sort data and highlight data which meets user-defined criteria.

12. Dynamic Graphical Charting: The operator shall be able to select system values to be charted in real time. A minimum of three values at one time can be selected for each chart. The type of chart (bar, line, 3-D, etc.) shall be user selectable.

13. HTML Reporting: The above reports shall be able to be run to an HTML template file. This feature will create an HTML “results” file in the directory of the HTML template. This directory can be shared with other computer users, which will allow those users with access to the directory to “point” their web browser at the file and view the report.

14. Clock Synchronization: The real time clocks in all building control panels shall be synchronized on command of an operator. The system shall also be able to automatically synchronize all system clocks; daily from any operator designated

device in the system. The system shall automatically adjust for daylight savings and standard time if applicable and for leap years.

15. Scheduling

    a. It shall be possible to configure and download schedules for any of the controllers on the network.

    b. Time of day schedules shall be in a calendar style and shall be programmable for a minimum of one year in advance. Each standard day of the week and user-defined day types shall be able to be associated with a color so that when the schedule is viewed it is very easy, at-a-glance, to determine the schedule for a particular day even from the yearly view. To change the schedule for a particular day, a user shall simply click on the day and then click on the day type.

    c. Each schedule will appear on the screen viewable as the entire year, monthly, week and day. A simple mouse click shall allow switching between views. It shall also be possible to scroll from one month to the next and view or alter any of the schedule times.

    d. Schedules will be assigned to specific controllers and stored in their local RAM memory. Any changes made at the workstation will be automatically updated to the corresponding schedule in the controller.

16. Programmer's Environment: The programmer's environment will include access to a superset of the same programming language supported in the controllers. Here the programmer will be able to configure application software off-line (if desired) for custom program development, write global control programs, system reports, wide area networking data collection routines, and custom alarm management software. On the same screen as the program editor, the programming environment shall include dockable debug and watch bars for program debugging and viewing updated values and point attributes during programming. In addition a wizard tool shall be available for loading programs from a library file in the program editor.

17. Saving/Reloading: The software shall have an application to save and restore field controller memory files. This application shall not be limited to saving and reloading an entire controller – it must also be able to save/reload individual objects in the controller. This allows off-line debugging of control programs, for example, and then reloading of just the modified information.

18. Data Logging (Trends and Histories): The software shall have the capability to easily configure groups of data points with trend and history logs and display the trend log data. A group of data points shall be created by drag-and-drop method of the points into a folder. The trend and history log data shall be displayed through a simply menu selection. This data shall be able to be saved to file and/or printed. The operator shall be able to define a custom trend and history log for any data in the system. This definition shall include interval, start-time, and stop-time. As a minimum, any point may be recorded at user selected intervals of 1, 5, 15, 30, and 60 minutes as well as once a shift (8 hours), once a

day, once a week, once a month, or for change of value. Trend and history data shall be capable of being selected as either instantaneous at the time of recording or averaged between time intervals. All trends and histories shall start based on the hour. Each trend and history shall accommodate up to a minimum of 64 system objects. The system operator with proper password shall be able to determine how many samples are stored. Trend and history data shall be sampled and stored on the Building Controller and be archived on the hard disk monthly. BAS shall archive histories for a minimum of 18 months and shall prompt operator each January to archive each calendar year's data on a CD. Trend and history data shall be able to be viewed and printed from the operator interface software. Trends and histories shall be viewable in a text-based format and graphically. They shall also be storable in a tab delimited ASCII format for use by other industry standard word processing and spreadsheet packages. BAS Contractor shall provide setup of custom histories as required for the listed reports.

19. Audit Trail: The software shall automatically log and timestamp every operation that a user performs from logging on and off to changing a point value, modifying a program, enabling/disabling an object, viewing a graphic display, running a report, modifying a schedule, etc.

20. Custom Application Programming: Provide the tools to create, modify, and debug custom application programming. The operator shall be able to create, edit, and download custom programs at the same time that all other system applications are operating. The system shall be fully operable while custom routines are edited, compiled, and downloaded. The programming language shall have the following features:

    a. The language shall be English language oriented and be based on the syntax of programming languages such as BASIC. It shall allow for free form or fill in the blank programming. Alternatively, the programming language can be graphically-based using function blocks as long as blocks are available that directly provide the functions listed below, and that custom or compound function blocks can be created.

    b. A full screen character editor/programming environment shall be provided. The editor shall be cursor/mouse-driven and allow the user to insert, add, modify, and delete code from the custom programming. It shall also incorporate word processing features such as cut/paste and find/replace.

    c. The programming language shall allow independently executing program modules to be developed. Each module shall be able to independently enable and disable other modules.

    d. The editor/programming environment shall have a debugging/simulation capability that allows the user to step through the program and to observe any intermediate values and or results. The debugger shall also provide error messages for syntax and execution errors.

e. The programming language shall support conditional statements (IF/THEN/ELSE/ELSE-IF) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

f. The programming language shall support floating point arithmetic using the following operators: +, -, /, x, square root, and xy. The following mathematical functions shall also be provided: natural log, log, absolute value, and minimum/maximum value from a list of values.

g. The programming language shall have pre-defined variables that represent clock time, day of the week, and date. Variables that provide interval timing shall also be available. The language shall allow for computations using these values.

h. The programming language shall have ability to pre-defined variables representing the status and results of the System Software, and shall be able to enable, disable, and change the values of objects in the system.

21. Maintenance Management: The system shall monitor equipment status and generate maintenance messages based upon user designated run time, starts, and/or calendar date limits.

22. PID Control: A PID (proportional-integral-derivative) algorithm with direct or reverse action and anti-wind-up shall be supplied. The algorithm shall calculate a time-varying analog value used to position an output or stage a series of outputs. The controlled variable, set point, and PID gains shall be user-selectable with an option for auto-tuning. The set point shall optionally be chosen to be a reset schedule.

23. Staggered Start: This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts shall be user-selectable.

24. Anti-Short Cycling: All binary (digital) output points shall be protected from short cycling. This feature shall allow minimum on-time and off-time to be selected.

Y. DDC Sensors and Point Hardware

1. Temperature Sensors

a. All temperature devices shall use precision thermistors or RTDs accurate to +/- 1 degree F over a range of –30 to 230 degrees F. Space temperature sensors shall be accurate to +/- 0.5 degrees F over a range of 40 to 100 degrees F. Outdoor air temperature sensors shall be accurate to +/- 0.5 degrees F over a range of -20 to 110 degrees F.

b. Standard space sensors shall be available in an off white enclosure for mounting on a standard electrical box. Temperature sensor may be

combined with humidity or carbon dioxide sensor in one housing providing it meets the specifications listed above.

c. Where manual overrides are required, the sensor housing shall feature both an optional means for adjusting the space temperature set point, as well as a push button for selecting after hours operation.

d. Where a local display is specified, the sensor shall incorporate either an LED or LCD display for viewing the space temperature, set point and other operator selectable parameters. Using built in buttons, operator shall be able to adjust set points directly from the sensor.

e. Duct temperature sensors shall incorporate a thermistor bead or RTD embedded at the tip of a stainless steel tube. Probe style duct sensors are useable in air handling applications where the AHU or duct area is less than 12 square feet. Tube shall be long enough so that the sensor is at least 1/3 of the way into the air stream.

f. Averaging sensors shall be employed in AHU's or ducts that are 12 square feet and larger. The averaging sensor tube must contain at least one thermistor or RTD for every 3 square feet of AHU or duct area. Sensors shall be accurate to +/- 0.5 F over their normal operating temperature range +/- a 20- degree margin. Example, for a heating/cooling air-handling unit that normally varies between 55 and 100 degrees F, the sensor shall have the stated accuracy over a range of 35 to 120 degrees F.

g. Outside Air Temperature Sensors: Utilize precision thermistor or RTD-type units. Sensors shall be designed to withstand the environmental conditions to which they will be exposed. Sensor enclosure shall allow for adequate air flow over the sensing element. Housing shall be NEMA-3R construction as a minimum.

2. Electric Thermostats

a. Provide low temperature thermostats (freezestats) as indicated on drawings. Low reading freezestats shall register alarm and be wired to shut down the associated fan system when temperature along any 1' of element falls below set point. Manual reset shall be required. Provide 1' of element for every square foot of coil face area. Minimum adjustable range shall be 34 to 46 degrees F with an initial set point of 38 degrees F, unless listed otherwise on the drawings.

3. Humidity Sensors

a. Humidity devices shall be thin film polymer type accurate to +/- 2% at full scale for space and +/- 2% for duct and outside air applications. Suppliers shall be able to demonstrate that accuracy is NIST traceable. Acceptable manufacturers include Vaisala, General Eastern or Staefa.

b. Provide a hand held field calibration tool that both reads the output of the sensor and contains a reference sensor for ongoing calibration.

4. Pressure Sensors

   a. Air pressure measurements in ranges up to 0 to 10" water column will be accurate to +/- 1% of range using a solid-state sensing element. Select the smallest range applicable to the use of the sensor. Sensors shall be bi-directional for room pressure monitoring. Acceptable manufacturers include Ashcroft Inc., Modus Instruments, Setra and Mamac.

   b. Differential pressure measurements of liquids or steam shall be accurate to +/- 0.5% of range. Housings shall be NEMA 4 rated.

5. Current Devices: Current devices shall be used to monitor fans, pumps, motors and electrical loads. Current devices shall be available in solid and split core models, and offer either a digital (switch for on-off status of constant speed equipment) or an analog (sensor for status of VFD driven equipment) signal to the automation system. Current switches shall be capable of differentiating between free-wheeling (belt breakage) and normal motor load. Acceptable manufacturers are Veris, Siemens, or approved equal.

6. Airflow Measuring Stations

   a. Minimum Outdoor Air

      1) Provide either thermal dispersion velocity meters using bio-medical grade self heated thermistor sensors with glass encapsulated thermistor temperature sensors or stainless steel outside reference sensor and inlet airflow sensor capable of measuring pressure drop across a fixed resistance down to 50 FPM.

      2) The flow and pressure drop sensors shall operate over a range of 200 to 2000 feet/min with a total system accuracy of ± 5% of reading. Below this velocity range the unit may be less accurate as long as a repeatable signal is given down to 50 FPM. Installed accuracy shall be percent of reading and demonstrated at both maximum and minimum airflow rates for each measurement location. Coordinate size and location of sensor with AHU manufacturer and mechanical Contractor to design for a velocity at maximum air-flow between 1800 – 2000 FPM to provide a minimum 9 to 1 turn-down. If this can't be easily accomplished, an alternate, acceptable method is to provide minimum and maximum outdoor air intakes, both with airflow monitors, and to modify the control sequence (and submittal) to indicated the staling of the OA intakes to get the 9-1 turn-down.

      3) The electronic module shall be microprocessor-based with a alphanumeric LCD Display. The module shall operate on 24VAC, with an optional 120VAC. The output and input signals shall be field selectable and linear with field adjustable scales and shall include 0-5VDC, 0-10VDC, 4-20mA, BACnet, or LonTalk.

4) Furnish Ebtron GTD116-Pc, Ebtron Air – IQ/GTx-PC (integrated with TAMCO Damper), Air Monitor Volu-flo/OAM or approved equal.

b. Supply Air

1) Provide either thermal dispersion velocity meters using bio-medical grade self heated glass encapsulated thermistor sensors with thermistor temperature sensors or anodized aluminum pitot airflow traverse probes.

2) The flow stations shall operate over a range of 400 to 4000 feet/min with and accuracy of ± 3% of reading. Installed accuracy shall be percent of reading and demonstrated at both maximum and minimum airflow rates for each measurement location.

3) The output signal shall be field selectable and linear with field adjustable scales and Shall include 0-5VDC, 0-10VDC, 4-20mA, BACnet, or LonTalk.

4) Furnish Ebtron GTA116-Pc, Air Monitor DPT 2500-plus or approved equal.

7. Carbon Dioxide Sensors

a. Provide wall and duct mounted non-dispersive infrared type carbon dioxide sensors where indicated on drawings. Sensors shall have a field selectable 4 to 20 mA or 0 to 10 VDC linearized output signal over a 0-2000 ppm range (set point will normally be between 600 and 1200 ppm). Power requirement shall be 24 VAC or 24 VDC. Units shall operate in an environment of at least –20°F to 120°F temperature range and 0 to 95% RH. Accuracy shall be +/- 5% of reading or +/- 75 ppm, whichever is greater. Repeatability shall be +/- 20 ppm. Annual drift shall not exceed 75 ppm. Response time shall not exceed 2 minutes. Enclosure shall be an attractive high impact plastic case. Sensors, providing they meet these specifications, shall be as manufactured by R.E. Technologies, Vaisala, Vulcain, Engelhard, Texas Instruments, Enmet Canada Limited, ToxAlert, AirTest, MSA, or approved equal.

Z. Control Valves and Actuators

1. Provide automatic control valves suitable for the specified controlled media (steam). Provide valves that mate and match the material of the connected piping. Equip control valves with the actuators of required input power type and control signal type to accurately position the flow control element and provide sufficient force to achieve no more than the leakage listed in the HVAC valve specification section. Valves shall be globe, butterfly (open-closed only), high performance butterfly (open-closed or modulating with Cv at 2/3 open), or characterized ball as listed for the system served and of construction listed in the Division 23 HVAC valve specification for the system's fluid and

temperature/pressure limits and listed herein. Valves shall be manufactured by one of the listed manufacturers (in the HVAC valve specification) or, providing they meet all specified requirements, Belimo, Bray, Delta P Valve, Griswold, Bell & Gossett, Fisher, Honeywell, Johnson, Macon, or Siemens/Staefa.

2. Control valves shall meet the heating loads and flows specified, operate against the normal expected differential pressure without any shortening of life, and close-off against the maximum differential pressure condition for the application with a 25% safety factor. Valves should be sized to operate accurately and with stability from 10 to 100% of the maximum design flow. Two-position (open/close) valves shall be full line sized. Unless specified elsewhere, the maximum pressure drop for modulating steam control valves shall be 50% of the inlet pressure (7.5 psi for a 15 psig steam system) providing the required equipment inlet pressure is met.

3. Trim material shall be stainless steel for all steam applications.

4. Valve actuators shall be electronic direct coupled over the shaft, enabling it to be mounted directly to the valve shaft without the need for connecting linkage. Actuators shall have electronic overload circuitry to prevent damage. Actuators shall have visual position indicators. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Spring shall be capable of easy field change from normally open to normally closed. Actuators shall have an external manual gear release (above 60 in-lb torque, provide manual crank) to allow manual positioning of the valve when the actuator is not powered. Modulating actuators shall be positive positioning and respond to a 2 to 10 VDC or 4 to 20 mA operating range. Actuators on all valves 3" and larger shall provide a position feedback signal indicating valve position wired to the BAS and indicated on the graphics. Outdoor mounted actuators shall have NEMA 4 enclosure and shall have same voltage heaters to prevent condensation. Indoor actuators near (within 4 feet) of outdoor air streams shall have NEMA 2 enclosures. Actuators shall be sized for the maximum flow and differential pressure available (such as shut-off head of the associated pump or maximum steam pressure) plus a minimum 25% safety factor. Submit sizing calculations with the shop drawings. Actuators shall be as manufactured by Belimo, Bray, Johnson, Siemens, or approved equal.

AA. Control Dampers and Actuators

1. Automatic dampers, furnished by the Building Automation Contractor shall be low leakage and include all required linkages, supports, actuators, switches, etc. Dampers are to be installed by the HVAC Contractor under the supervision of the BAS Contractor. All blank-off plates and conversions necessary to install smaller than duct size dampers are the responsibility of the Sheet Metal Contractor. Control dampers shall be designed for operation in a temperature range of -25^{o}F and 180^{o}F. Smoke dampers shall be UL 555S rated.

2. Damper blade width shall not exceed six inches unless otherwise noted on drawings. Blade and frame seals shall be replaceable extruded silicone, EDPM, or PVC coated polyester (for low velocity dampers only) on blade edges, TPE or

stainless steel compression at jambs. Seals and linkages shall provide tight closing, ultra low leakage dampers. Damper blades shall be insulated.

3. Dampers installed on fan discharges shall be oriented such the blades are perpendicular to the fan shaft, this will minimize pressure drop due to uneven airflow from the fan. Unless otherwise noted, provide opposed blade dampers for modulating applications and parallel blade for two-position control. Dampers, providing they meet the requirements of these specifications, shall be as manufactured by Ruskin, Arrow, TAMCO (T. A. Morrison), American Warming and Ventilating (AWV), Vent Products, Greenheck, or Johnson Controls. Note that not all manufacturers may make all types of dampers. Model numbers shown are used to indicate the minimum acceptable quality for each type of damper.

4. Dampers used within 4 feet of outdoor wall louvers, all penthouse/gooseneck intakes or reliefs, and in aluminum duct systems, shall be low leakage insulated aluminum type. Other dampers used in galvanized steel duct systems shall be either galvanized steel, or aluminum. Dampers for use in stainless steel duct systems shall be either stainless steel or baked herisite coated aluminum (with no steel or galvanized steel parts).

5. Low pressure control dampers (on up to 2" pressure class ductwork) shall be flat blade or airfoil type designed for a minimum of 2.5" differential pressure (all sizes) and up to 2,000 fpm face velocity. These are designated as low pressure dampers. Maximum size of modules for large dampers shall be 4' x 4' (size could be pressure limited) with an AMCA certified leakage rate not exceeding 3.0 (4.0 for smoke dampers) cfm/sf at 1" w.g. static pressure differential for all sizes. Where larger dampers are needed (either dimension), incorporate mullion supports (same material as damper frame) designed to prevent failure or deformation of the damper assembly up to a differential pressure of 4" w.g. Maximum pressure drop of a fully open 2' x 2' damper at 1,500 fpm shall not exceed 0.08".

6. Aluminum Dampers:

   a. Low Pressure Dampers: Frames and single thickness or airfoil blades shall be constructed of not less than 0.080" thick extruded aluminum, type 6063-T5 with minimum 4" deep frame. Linkage hardware shall be installed in frame side and be constructed of aluminum and corrosion resistant, zinc & nickel-plated steel (stainless steel for use in stainless steel duct systems). Coordinate with manufacturers for inclusion of thrust collars and other special requirements where vertical blades are required (such as fan discharges). Aluminum low pressure control dampers shall be equal to Greenheck model VCD-40 or 43 or Ruskin Type CD50.

7. Damper actuators shall be electronic direct coupled over the shaft, enabling it to be mounted directly to the damper shaft with a "V" shaped toothed cradle (to minimize slippage) without the need for connecting linkage. Actuators shall have electronic overload circuitry to prevent damage. Actuators shall have position indicator. For power-failure/safety applications, an internal mechanical,

spring return mechanism shall be built into the actuator housing. Spring shall be capable of easy field change from normally open to normally closed. Actuators shall have an external manual gear release (above 60 in-lb torque, provide manual crank) to allow manual positioning of the damper when the actuator is not powered. Modulating actuators shall accept a 0 to 10 VDC or 0 to 20 mA control input and provide a 2 to 10 VDC or 4 to 20 mA operating range. All actuators on dampers larger than 2 square feet shall provide a position feedback signal (such as 2 to 10 VDC) indicating damper position, wired to the BAS and indicated on the graphics.

8. Actuators for dampers mounted in up to 2" pressure class shall be sized for a minimum 2,500 fpm velocity and 2" differential pressure with a minimum 15% safety factor. Actuator for dampers mounted in higher pressure class ductwork shall be sized for 4,000 fpm velocity and a differential pressure equal to the duct design pressure with a minimum 15% safety factor. Show actuator sizing calculations on submittals. Actuators shall be as manufactured by Belimo, Johnson, Siemens, or approved equal. Actuators for smoke dampers shall meet UL 555S requirements.

BB. Contractor Responsibilities

1. General: Installation of the building automation system shall be performed by this Contractor or his Subcontractor(s). However, all installation shall be under the personal supervision of the Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a Subcontractor.

2. Access to Site: Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the Owner or the Owner's Representative.

3. Code Compliance: All wiring shall be installed in accordance with the more stringent of all applicable electrical codes, equipment manufacturer's recommendations, and wiring specifications in Division 16.

4. Cleanup: At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract. Clean the exposed surfaces of tubing, hangers, and other exposed metal of grease, plaster, or other foreign materials.

CC. Wiring, Conduit and Cable

1. All wire will be copper and meet the minimum wire size and insulation class listed below:

Wire Class	Wire Size	Isolation Class
Power	12 Gauge	600 Volt
Class One	14 Gauge Std.	600 Volt
Class Two	18 Gauge Std.	300 Volt

Class Three	18 Gauge Std.	300 volt
Communications	Per Mfr.	Per Mfr.

2. Power and Class One wiring may be run in the same conduit. Class Two and Three wiring and communications wiring may be run in the same conduit.

3. Where different wiring classes terminate within the same enclosure, maintain clearances and install barriers per the National Electric Code.

4. Where wiring is required to be installed in conduit, EMT shall be used unless indicated otherwise on the Drawings or as required by Division 16 specifications. Conduit shall be minimum 1/2 inch galvanized EMT. Set screw fittings are acceptable for dry interior locations. Watertight compression fittings shall be used for exterior locations and interior locations subject to moisture. Provide conduit seal-off fitting where exterior conduits enter the building or between areas of high temperature/moisture differential.

5. Flexible metallic conduit (max. 3 feet) shall be used for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment. Liquid-tight flexible conduit shall be use in exterior locations and interior locations subject to moisture.

6. Junction boxes shall be provided at all cable splices, equipment termination, and transitions from EMT to flexible conduit. Interior dry location J-boxes shall be galvanized pressed steel, nominal four-inch square with blank cover. Exterior and damp location JH-boxes shall be cast alloy FS boxes with threaded hubs and gasketed covers.

7. Where the space above the ceiling is a supply or return air plenum, the wiring shall be plenum rated. Teflon wiring can be run without conduit above suspended ceilings. EXCEPTION: Any wire run in suspended ceilings that is used to control outside air dampers or to connect the system to the fire management or smoke control systems shall be in conduit.

8. Coaxial cable shall conform to RG62 or RG59 rating. Provide plenum rated coaxial cable when running in return air plenums.

9. Ethernet 10/100 Base –T network wiring shall be equivalent to Owner's premise wiring or, as a minimum, Category 5e or 6 cabling up to 300' maximum run.

10. Fiber optic cable shall be used for runs over 300' and shall include the following sizes; 50/125, 62.5/125 or 100/140.

11. Only glass fiber is acceptable, no plastic.

12. Fiber optic cable shall only be installed and terminated by an experienced Contractor. The BAS Contractor shall submit to the Engineer the name of the intended Contractor of the fiber optic cable with his submittal documents.

DD. Hardware Installation

1. Installation Practices for Wiring

a. All controllers are to be mounted vertically and per the manufacturer's installation documentation.

b. The 120VAC power wiring to each Ethernet or Webserver controller shall be a dedicated run, with a separate breaker. Each run shall include a separate hot, neutral and ground wire. The ground wire shall terminate at the breaker panel ground. This circuit shall not feed any other circuit or device.

c. A true earth ground must be available in the building. Do not use a corroded or galvanized pipe, or structural steel.

d. Wires shall be attached to the building proper at regular intervals such that wiring does not droop. Wires shall not to be affixed to or supported by pipes, conduit, ducts, etc.

e. Conduit in finished areas, shall be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction. Exception; metallic surface raceway may be used in finished areas on masonry walls. All surface raceway in finished areas must be color matched to the existing finish within the limitations of standard manufactured colors.

f. Conduit, in non-finished areas where possible, shall be concealed in ceiling cavity spaces, plenums, furred spaces, and wall construction. Exposed conduit will run parallel to or at right angles to the building structure.

g. Wires shall be kept a minimum of three (3) inches from all piping.

h. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.

i. Wire shall not be allowed to run across telephone equipment areas.

2. Installation Practices for Field Devices

a. Well-mounted sensors shall include thermal conducting compound within the well to insure good heat transfer to the sensor.

b. Actuators shall be firmly mounted to give positive movement and linkage shall be adjusted to give smooth continuous movement throughout 100 percent of the stroke.

c. Relay outputs shall include transient suppression across all coils. Suppression devices shall limit transients to 150% of the rated coil voltage.

d. For duct static pressure sensors, the high pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low pressure port shall be left open to the plenum area at the point that the high pressure port is tapped into the ductwork.

3. Enclosures

a. For all I/O requiring field interface devices, these devices where practical shall be mounted in field interface panels (FIP). The Contractor shall provide an enclosure, which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.

b. FIPs shall contain power supplies for sensors, interface relays and contactors, and safety circuits.

c. FIP enclosures shall be of steel construction with baked enamel finish, NEMA 1 rated with hinged doors and keyed locks. The enclosures shall be sized for twenty percent spare mounting space. All locks will be keyed identically.

d. All wiring to and from the FIP shall be to labeled screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts within the FIP is prohibited.

e. All outside mounted enclosures shall meet the NEMA-4 rating.

f. The wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.

4. Identification

a. Identify all control wires with labeling tape or sleeves using words, letters, and/or numbers that can be exactly cross-referenced with as-built drawings.

b. All I/O field devices inside field interface panels (FIP) shall be clearly labeled.

c. Junction box covers shall be marked to indicate that they are a part of the BAS system.

d. All enclosures (including controllers), all I/O field devices (except space sensors), all control valves and actuators, all routers and other field devices that are not mounted within FIP's shall be identified as follows:

1) Identification shall be with bakelite nameplates. The lettering shall be in white against a black or blue background, be keyed to the as built drawings, and indicate that the device is a control device.

5. Location

a. The location of sensors shall be per mechanical and architectural drawings. Coordinate with installing Contractor to provide appropriate straight upstream and/or downstream runs for accurate readings of mixed temperatures or flows.

b. Space humidity, carbon dioxide or temperature sensors shall be mounted away from machinery generating heat, direct light and diffuser air streams.

c. Outdoor air temperature sensors shall be mounted on the north building face directly in the outside air. Install outdoor temperature and humidity sensors with solar radiation/precipitation shields to minimize the effects of heat radiated from the building or sunlight and from rain.

d. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

EE. Software Installation

1. General

a. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software or other third party software necessary for successful operation of the system.

b. The Contractor shall cooperate with the balancing Contractor and set-up Global Override Commands as required to expedite balancing of air handling systems. Overrides (to open valves) shall be set-up for each system by floor and/or wing so that the total amount of flow can easily be set to equal the desired flow of the central equipment.

2. Database Configuration: The Contractor shall provide all labor to configure those portions of the database that are required by all systems and their respective sequence of operation.

3. Color Graphics: Unless otherwise directed by the Owner, the Contractor shall provide color graphic displays for each system and floor plan. Due to limitations on monitor size, some systems may need to be divided into multiple graphics. Provide hot links to all associated graphics for easy switching. For each system or floor plan, the display shall contain the associated points identified in the sequence and submitted point list and allow for set point changes. Color shall be used to highlight conditions that are out of range or in alarm.

4. Reports: The Contractor shall configure a report for each system as well as overall energy usage and demand reports. As built software documentation shall include the following as a minimum:

a. Descriptive point lists.

b. Application program listing.

c. Application programs with comments.

d. Printouts of all reports.

e. Alarm list.

f. Printouts of all graphics.

FF. System Startup and Acceptance Testing

1. Cooperate and coordinate with all trade Contractors in the start-up of all BAS controlled and monitored equipment, as well as during the testing, balancing, and acceptance of the systems. Work with the balancing Contractor to verify readings from the BAS agree with field measurements (such as VAV box flows) and that final set points for items such as differential pressure sensors (for VFD control) are not too high or too low for all downstream components to reach design flow.

2. Point to Point Checkout: Each I/O device (both field mounted and located in field interface panels and firefighters override panels (FOP)) shall be inspected and verified for proper installation and functionality (such as fan status and valve positioning). A pre-functional performance test checkout sheet itemizing each device shall be filled out, dated and approved by the Project Manager and submitted (with copy to the Owner's Representative).

3. Controller and Webserver Checkout: A field checkout of all controllers and the Webserver, modem, etc. shall be conducted to verify proper operation of both hardware and software. A pre-functional performance test checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted (with copy to the Owner's Representative) before the completion of the project.

4. System Acceptance Testing

    a. All application software shall be verified and compared against the specified sequences of operation in both normal and failure modes. Control loops shall be exercised by inducing a set point shift of at least 10% and observing whether the system successfully returns the process variable to set point. Record all test results and attach to the Functional Performance Test Results Sheets and submit (with copy to Owner's Representative).

    b. Test each alarm in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations [existing operator's workstation,] Webserver, Webserver users, or printers, and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit Functional Performance Test Results Sheets (with copy to the Owner's Representative).

    c. Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, that the control systems readings (flows, temperatures, etc,) match field readings, and that any special features work as intended. Submit Functional Performance Test Results Sheets (with copy to the Owner's Representative).

    d. Perform an operational test of each third party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface

involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information. Submit Functional Performance Test Results Sheets (with copy to the Owner's Representative).

e. Perform an operational test of the Webserver by testing all graphics and systems (including alarm acknowledgement) from remote locations. Submit Functional Performance Test Results Sheets (with copy to the Owner's Representative).

f. After the above tests have been completed and the system has demonstrated to function as specified, a 30-day performance test period shall begin. If all systems perform as specified throughout the test period, requiring only routine maintenance, submit Functional Performance Test Results Sheets for each system (with copy to the Owner's Representative) and the BAS system shall be accepted. If any system fails during the test, and cannot be fully corrected within 8-hours, the Owner may request that the performance test be repeated and delay acceptance until all systems pass.

GG. Sequences of Operation: Sequences of operation shall be as shown on drawings. If any items are not shown, include BAS manufacturer's best standard sequences.

HH. Final Documentation: Upon completion of work and prior to request for Certificate of Occupancy, Contractor shall issue a certificate stating that work has been installed generally consistent with construction documents and tested per the specifications. All submittals, test reports, as-builts and O&M manuals are to be provided for engineer's review, prior to request for engineer's completion certificates. In addition, and also prior to request for completion certificates, all punch list items must be completed to the satisfaction of the engineer. The Contractor must verify that all sequences of operations and controls have been incorporated and all systems and equipment are working per the sequences of operations. A blank Contractor's certificate form can be furnished by RDK Engineers upon request.

PART 3 - EXECUTION

3.1 DEMOLITION

A. The existing facility will continue to operate during all phases of the demolition work and subsequent construction. No interruption of the systems will be permitted without prior approval of the Owner's Representative.

B. Submit proposed methods and sequence of operations for the selective demolition work to the Owner's Representative for review prior to the start of the work.

C. Perform all demolition while ensuring minimum interference with adjacent occupied areas.

D. Where sections of a system are to be removed and the system serves other areas of the building that are outside the scope of the work, perform the following:

1. Coordinate the temporary shutdown of the system with the Owner's representative.

2. Install supports in the remaining active sections of the system as required by the removal of nearby supports associated with the demolition.

3. Isolate the system.

4. Cap the remaining system section, leaving the remainder of the system active.

E. Provide temporary shoring or bracing during the demolition work to prevent movement, settlement, or collapse of the system or adjacent systems due to the work.

F. Promptly repair any damage caused to adjacent facilities or areas that are designated to remain at no additional cost to the Owner.

G. Equipment:

1. Coordinate with the Contractor and Subcontractors to provide disconnection prior to equipment removal.

2. Remove equipment by unfastening at the supports or attachments. Then remove the attachments from the building, leaving no component of the original installation.

3. The Owner shall choose to take possession of the equipment or not. If the Owner chooses not to take possession of the equipment, the Subcontractor shall remove the equipment and dispose of the equipment in accordance with Paragraph H specified below.

4. Exercise care with equipment that is to be relocated or turned over to the Owner, examine the equipment before removal in the presence of the Owner's representative to determine its condition. Make a record of any marks, etc. by a photograph or videotape acknowledged by the Owner's representative.

5. Install relocated equipment to ensure no damage.

6. Equipment to be turned over to the Owner: Deliver to an on-site location designated by the Owner, and obtain acknowledgment of receipt in good condition.

H. All equipment, etc., not turned over to the Owner shall be put into the General Contractor's dumpsters; become the property of the General Contractor, and shall be removed from the site by the General Contractor. For equipment containing any refrigerant, it shall be reclaimed for recycling. Any hazardous materials such as mercury from thermometers or thermostats; or lead shall be properly disposed of, following EPA guidelines.

3.2 GENERAL

A. Install all items specified under PART 2 - PRODUCTS, according to the manufacturer's requirements and best quality recommendations, shop drawings, the details as shown on the Drawings and as specified in this specification section.

B. Install all work so that parts requiring inspection, replacements, maintenance and repair shall be readily accessible. Minor deviations from the Drawings may be made to accomplish this, but any substantial change shall not be made without prior written approval from the Owner.

C. Support of equipment on studs or other means, and the placing or building of the supporting slab, pad, pier, stand, grating, or other "to the equipment", is prohibited.

D. All welding done under this section shall be performed by experienced welders in a neat and workmanlike manner. All welding done on piping, pressure vessels and structural steel under this Section shall be performed only by persons who are currently qualified in accordance with ANSI Code B31.9 and B31.1 for Pressure Piping and certified by the AWS, ASME or an approved independent testing laboratory, and each such welder shall present certificate attesting his/her qualifications to the Architect's representative whenever requested to do so on the job.

E. All pipe welding shall be oxyacetylene or electric arc. High test welding rods suitable for the material to be welded shall be used throughout. All special fittings shall be carefully laid out and joints shall accurately match intersections. Care shall be exercised to prevent the occurrence of protruded weld metal into the pipe. All welds shall be of sound metal free from laps, cold shots, gas pockets, oxide inclusions and similar defects.

F. All necessary precautions shall be taken to prevent fire or damage occurring as the result of welding operations.

G. Care shall be taken when working on the roof. Protect the roof from damage.

3.3 IDENTIFICATION

A. General

1. All piping, ductwork, equipment, panels, and valves furnished and/or installed under this Section of the Specifications shall be marked for ease of identification.

2. Marking shall be done using self-adhering (screw or rivets for equipment) labels applied to clean, smooth surfaces. All lettering shall have sharply contrasting background for ease of identification. Colors shall be in accordance with ANSI A13.1 Standards. Samples of stickers together with color schedules shall be submitted for approval.

B. Ductwork

1. Ductwork marking shall be prominently mounted on all ductwork. Marking spacing shall be every 20 feet, at all changes in direction and on both sides of wall penetrations. For ductwork in shafts, marking shall be at each floor.

2. Ductwork markers shall indicate the direction of airflow with ductwork designation (supply, exhaust, return) and which system (i.e. AHU-1, EF-1, etc.) it is connected to.

C. Pipe Identification

1. Provide color-coded pipe identification markers on all piping in the building installed under this Section. Pipe markers shall be heavy plastic faced cloth labels with heat resistant backing, "Set Mark" by Seton Nameplate Corporation, Zipper Tubing Co., or equal by the W. H. Brady Company or approved equal.

2. Provide each pipe with markers indicating the service, size (in inches), and arrow markers to indicate the direction(s) of flow.

3. Piping mains shall be labeled at 20 foot intervals and on entrance and exit from the Mechanical Room, adjacent to each valve and at both sides of wall penetrations. This work shall be done after finish painting has been completed.

4. The following color coding shall be used with names in black letters on backgrounds indicated:

SCHEDULE OF PIPING IDENTIFICATION		
Service	**Legend**	**Background Color**
Steam	S (xx)	Yellow (note: xx=psig of steam system)
Steam condensate	C (xx)	Yellow (note: xx= psig of steam system)

5. In general, a 2" high legend shall be used for pipe lines 4" diameter and larger, and a 3/4" high legend shall be used for pipe lines 3" diameter and smaller.

6. All markers shall be OSHA approved.

D. Equipment Identification (by Unit Manufacturer)

1. Equipment marking shall be prominently located and securely attached with screws or rivets (no adhesives or cements are permitted) on the normally visible side of the equipment.

2. Equipment identification designations shall be taken from equipment callouts as shown on drawings and coordinated with the Owner's facility group to assure designations match up with Owner's maintenance management system identification database.

3. Provide on the label (or on a prominently located second label) all required routine maintenance action (per manufacturer). Label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product.

E. Valve Tags

1. All valves on pipes of every description shall have numbering tags. The valve numbers shall correspond with numbers indicated for valves and controls on two-printed Valve Lists prepared using electronic database by the HVAC Subcontractor. These printed lists shall state the numbers and locations of each valve and control and the section, fixture or equipment which it controls, and other necessary information, such as requiring the opening or closing of another valve when one valve is to be opened or closed.

2. Provide flow diagrams showing all valves. Use the Valve List for callouts of all valves on the flow diagrams, prepared in a form to meet the approval of the Architect. Include this info in the operating and maintenance (O&M) manuals, and, for all mechanical rooms, provide the information laminated, mounted and framed under glass at the direction of the Owner. All valve interior diameters shall be shown in the O&M manuals and on the final Record Drawings.

3. Valve tags shall have neat circular black and white laminated fibre-engraved white showing through tags of at least 1 ½" in diameter, attached with a brass hook to each valve stem. Stamp on these valves tags in letters, as large as practical, the number of the valve and the service such as indicated on the "Valve List". The numbers on each service shall be consecutive. All valves on tanks and pumps shall be numbered by 3" black and white laminated fibre-engraved white showing through discs with white numbers 2" secured to stem of valves by means of brass hooks or small solid link brass chain.

3.4 PIPING

A. General

1. Piping shall be cut accurately to measurements established at the jobsite, shall be installed without cold springing, and shall properly clear windows, doors and other openings and electrical gear. Cutting or other weakening of the building structure to facilitate piping installation will not be permitted. Piping shall be free of burrs, oil, grease, and other foreign matter. Piping shall be installed to permit free expansion and contraction without damaging building structure, pipe, joints, or hangers. Changes in direction shall be made with fittings. Vent pipes shall be carried through the roof and shall be properly flashed.

2. Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. A waterproofing clamping flange shall be installed as indicated. Sleeves shall not be installed in structural members except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its specified wall, floor, or roof, and shall be cut flush with each surface, except that sleeves through floors and roofs shall extend above the top surface at least 6 inches for proper flashing or finishing. Membrane clamping rings shall be provided where membranes are penetrated. Unless otherwise indicated or required by the sealing system, sleeves shall be sized to provide a minimum clearance of 1/4 inch between bare pipe and sleeves or between jacket over insulation and sleeves. Sleeves in bearing walls, waterproofing membrane floors, and wet areas shall be galvanized steel pipe. Sleeves in nonbearing walls, floors, or ceilings may be galvanized steel pipe or galvanized sheet metal with lock-type longitudinal seam. Except in pipe chases or interior walls, the annular space between pipe and sleeve or between jacket over insulation and sleeve in non-fire rated walls, partitions, and floors shall be sealed as indicated and specified. Metal jackets shall be provided over insulation passing through exterior walls, fire walls, fire partitions, floors, or roofs, shall not be thinner than 0.006 inch thick aluminum, if corrugated, and 0.16 inch thick aluminum, if smooth, and shall be secured with aluminum or stainless steel bands not less than

3/8 inch wide and not more than 8 inches apart. When penetrating roofs, before fitting the metal jacket into place, a 1/2-inch wide strip of sealant shall be run vertically along the inside of the longitudinal joint of the metal jacket from a point below the backup material to a minimum height of 36 inches above the roof.

3. If the pipe turns from vertical to horizontal, the sealant strip shall be run to a point just beyond the first elbow. When penetrating waterproofing membrane for floors, the metal jacket shall extend from a point below the backup material to a minimum distance of 2 inches above the flashing. For other areas, the metal jacket shall extend from a point below the backup material to a point 12 inches above floor; or when passing through walls above grade, jacket shall extend at least 4 inches beyond each side of the wall.

4. Pipes Passing through Waterproofing Membranes: In addition to the pipe sleeves referred to above, pipes passing through roof or floor waterproofing membranes shall be provided with a 16 ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall set over the roof or floor membrane in a troweled coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches above the roof or floor. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Pipes passing through roof or floor waterproofing membrane shall be installed through a galvanized steel sleeve. The annular space between pipe and sleeve or conduit and sleeve shall be sealed by a modular mechanical-type sealing assembly (equal to Link-Seal). The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe/conduit and sleeve with corrosion protected carbon steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide a water-tight seal between the pipe/conduit and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe/conduit and sleeve involved. The Contractor shall provide sleeves of the proper diameters and gauge.

B. Steam Piping

1. Unless otherwise indicated, horizontal steam piping shall pitch down in direction of flow with a grade of not less than 1 inch in 20 feet, and steam condensate piping shall pitch down in direction of flow with a grade of not less than 1 inch in 10 feet. Open ends of pipelines and equipment shall be properly capped or plugged during installation to keep dirt or other foreign materials out of the systems. Pipe not otherwise specified shall be uncoated.

2. Unless otherwise specified or shown, connections to equipment shall be made with malleable-iron unions or flanges for steel pipe 2 inches or less in diameter and with flanges for pipe 2-1/2 inches or more in diameter. Reducing fittings shall be used for changes in pipe sizes. In horizontal steam pipes, reducing fittings shall be the eccentric type to keep the pipes flat on bottom (FOB).

3. Pipe joints between sections of pipe shall be as listed in the Part 2 Piping and Fittings section in the Schedules for Piping and Fittings tables. Exceptions are pipe and fittings installed in inaccessible conduits or trenches beneath concrete floor slabs or in difficult to access locations such as shafts which shall be welded. Some joint types or materials listed may have lower pressure and/or temperature limits and Contractor shall ensure they are only used where those limits will NOT be exceeded. Grooved mechanical joints shall not be used.

4. Welded joints shall be fusion welded in accordance with ASME B31.1 for steam boiler external piping over 15 psig, all steam and condensate piping over 150 psig or 366 degrees F, and all water piping over 160 psig, any other piping where B31.1 is required. All other piping shall be welded in accordance with ASME B31.9 unless otherwise stated. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be acceptable. Branch connections may be made with either welding tees or forged branch outlet fittings, either being acceptable without size limitation. Branch outlet fittings, where used, shall be forged, flared for improvement flow where attached to the run, reinforced against external strains, and designed to withstand full pipe bursting strength.

   a. Beveling: Field and shop bevels shall be in accordance with the recognized standards and shall be done by mechanical means or flame cutting. Where beveling is done by flame cutting, surfaces shall be cleaned of scale and oxidation before welding.

   b. Alignment: Before welding, the component parts to be welded shall be aligned so that no strain is placed on the weld when finally positioned. Height shall be so aligned that no part of the pipe wall is offset by more than 20 percent of the wall thickness. Flanges and branches shall be set true. This alignment shall be preserved during the welding operation. If tack welds are used, welds shall be of the same quality and made by the same procedure as the completed weld; otherwise, tack welds shall be removed during the final welding operation.

   c. Erection: Where the temperature of the component parts being welded reaches 32 degrees F or lower, the material shall be heated to within 100 degrees F of the system's maximum design temperature for a distance of 3 feet on each side of the weld before welding, and the weld shall be finished before the materials cool to within 200 degrees F of the maximum design temperature.

   d. Defective Welding: Defective welds shall be removed and replaced. Repairing of defective welds shall be in accordance with the applicable standard: ASME B31.9 or B31.1.

   e. Electrodes: After filler metal has been removed from its original package it shall be protected or stored so that its characteristics or welding properties are not affected. Electrode material shall be as required for the pipe material. Electrodes that have been wetted or that have lost any of their coating shall not be used.

5. Flanges and unions shall be faced true, and made square and tight. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1/16 inch thickness, full-face or self-centering flat ring type. The Gaskets shall be rated for the maximum pressure with at least a 100 psi safety factor and for the maximum temperature with a 50 degree F safety factor. contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR). Union or flange joints shall be provided in each line immediately preceding the connection to each piece of equipment or material requiring maintenance such as coils, control valves, and other similar items.

6. Threaded joints can be used in systems that will not exceed 450 degrees F and shall be made with tapered threads properly cut and shall be made perfectly tight with a 500 degree F rated non-hardening, non-toxic, self-lubricating, heavy duty pipe thread paste equal to TFT™ Pipe Thread Sealant w/PFTE (as manufactured by Anti-Seize Technology) applied to the male threads only, and in no case to the fittings.

3.5 FIRESTOPPING INSTALLATION

A. Install firestopping assembly at locations shown and as specified in accordance with UL FRD systems or FM P7825 designs, and as recommended by manufacturer. Do not cover or enclose firestopped areas until approved by the Owner's Representative.

B. Completely fill openings around penetrating items with firestopping material to prevent spread of fire in the following locations:

1. Around duct, cable, conduit, piping, and their supports that penetrate fire-rated above grade floor slabs, interior partitions, and exterior walls.

2. Around openings and penetrations through fire-rated ceiling assemblies.

3. Around penetration of vertical fire-rated service shafts.

4. Around openings and penetrations through fire-rated enclosures.

5. Other locations indicated.

6. At all air barrier penetrations as defined in the State's Energy Code.

C. Completely fill voids flush with the surface; the depth of material shall be in accordance with UL FRD or FM P7825. Firestopping for filling voids in floors in which smallest dimension of a void is 4 inches or more shall support the floor design load or be protected by a permanent barrier. Damaged, disrupted, or removed firestoppings shall be replaced with new firestoppings as specified in this section.

D. Insulated Pipes and Ducts: Cut and remove thermal insulation where pipes or ducts pass through firestoppings. Replace thermal insulation with a material having equal thermal insulating characteristics and equal firestopping characteristics.

3.6 CONNECTIONS TO EQUIPMENT

A. Supply and return connections shall be provided by the Contractor unless otherwise indicated. Valves and traps shall be installed in accordance with the manufacturer's recommendations. Unless otherwise indicated, the size of the supply and return pipes to each piece of equipment shall be not smaller than the connections on the equipment. No bushed connections shall be permitted. Change in sizes shall be made with reducers or increasers only.

3.7 BRANCH CONNECTIONS

A. Branches shall pitch up or down as indicated, unless otherwise specified. Connection shall be made to insure unrestricted circulation, eliminate air pockets, and permit drainage of the system.

3.8 RISERS

A. The location of risers is approximate. Exact locations of the risers shall be as approved. Steam supply risers shall terminate in a dirt pocket and shall be dripped through a trap to the return line.

3.9 SUPPORTS

A. Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. All piping subjected to vertical movement when operating temperatures exceed ambient temperatures, shall be supported by variable spring hangers and supports or by constant support hangers.

B. Piping and attached valves shall be supported and braced to resist seismic loads as specified under the SEISMIC PROTECTION FOR MECHANICAL, ELECTRICAL EQUIPMENT section. Structural steel required for reinforcement to properly support piping, headers, and equipment, but not shown, shall be provided under this section. Material used for supports shall be as specified under the STRUCTURAL STEEL section.

1. Structural steel brackets required to support piping, headers, and equipment, but not shown, shall be provided under this section. Material and installation shall be as specified under the STRUCTURAL STEEL section. Pipe hanger loads suspended from steel joist panel points shall not exceed 50 pounds. Loads exceeding 50 pounds shall be suspended from panel points.

2. Multiple pipe runs on a common base member shall be supported by clamps where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for any individual pipe in the multiple pipe run.

C. Pipe hangers, inserts and supports shall conform to MSS SP-58 and MSS SP-69, except as specified as follows:

1. Types 5, 12, and 26 shall not be used.

2. Type 3 shall not be used on insulated pipe which has a vapor barrier. Type 3 may be used on insulated pipe that does not have a vapor barrier if clamped directly to the pipe and if the clamp bottom does not extend through the insulation and the top clamp attachment does not contact the insulation during pipe movement.

3. Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for Type 18 inserts.

4. Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and have both locknuts and retaining devices, furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.

5. Type 20 attachments used on angles and channels shall be furnished with an added malleable iron heel plate or adapter.

6. Type 24 may be used only on trapeze hanger systems or on fabricated frames.

7. Where Type 39 saddle or Type 40 shield are permitted for a particular pipe attachment application, the Type 39 saddle shall be used on all pipe 4 inches and larger.

8. Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves.

9. Vertical pipe shall be supported at each floor, except at slab-on-grade, and at intervals of not more than 15 feet, except that pipe shall be supported not more than 8 feet from end of risers, and at vent terminations.

10. Type 35 guides using steel, reinforced PTFE or graphite slides shall be provided where required to allow longitudinal pipe movement. Lateral restraints shall be provided as required. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions and bearing loads encountered. Where steel slides do not require provision for restraint or lateral movement, an alternate guide method may be used. On piping 4 inches and larger, a Type 39 saddle may be welded to the pipe and freely rest on a steel plate. On piping under 4 inches, a Type 40 protection shield may be attached to the pipe or insulation and freely rest on a steel slide plate. Where there are high system temperatures and welding to piping is not desirable, then the Type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 4 inches, or by an amount adequate for the insulation, whichever is greater.

11. Except for Type 3, pipe hangers on horizontal insulated pipe shall be the size of the outside diameter of the insulation.

D. Piping in trenches shall be supported as indicated on drawings and as required by the manufacturer.

E. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or covered, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe sleeves or to extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep-type escutcheons shall be used. Escutcheons shall be chromium-plated iron or chromium-plated brass, either one-piece or split pattern, held in place by internal spring tension or setscrew.

3.10 STRAINERS

A. Provide a full size strainer on the inlet side of each modulating automatic control valve over 1”, and elsewhere as shown on the Drawings and details.

B. Each strainer shall be provided with a full size blow down valve located 6-12" below the strainer. Blow down connection shall be as the low point of the strainer.

C. Horizontal strainers in steam piping shall be rotated horizontally to avoid having a low point where condensate can collect. If this is not practical, provide a removable steam trap assembly for the strainer’s blow down connection.

D. Strainer shall have stainless steel screens with maximum 1/8” perforations (for pumps). Minimum perforations shall be 3/32”.

3.11 VALVES AND EQUIPMENT ACCESSORIES

A. Valves shall be of the type and construction specified for the service and installed at the locations shown or specified, and where required for the proper functioning of the system as directed. Valves shall be installed with their stems horizontal to or above the main body of the valve. Valves used with ferrous piping shall have threaded or flanged ends and threaded or sweat-type connections for copper tubing. Non-flanged valves shall have unions for ease of maintenance.

B. A thermometer well (or Pete’s plug) shall be provided in each return line for each circuit in multicircuit systems.

C. All branches from main piping (including mains that serve different wings or buildings) shall be provided with isolation valves.

D. Air vents shall be installed where indicated, and on all high points and piping offsets where air can collect or pocket.

1. Steam air vents shall be a quick-acting thermostatic valve that continuously removes air. Valve shall be constructed of corrosion-resisting metal, and be designed to withstand the maximum piping system pressure, and shall automatically close tight to prevent escape of steam and condensate. Vent shall be provided with a manual isolation valve. A vent shall be provided at all locations shown on drawings.

3.12 HYDROSTATIC TESTS

A. Prior to flushing and cleaning and before the application of any insulation, hydrostatic tests shall be made in accordance with applicable ASME requirements. Coordinate with

Owner's Representative for witnessing of tests. Test reports shall be submitted to the Engineer and Owner's Representative The systems shall be proved tight for four (4) hour tests (with no loss in pressure) under gauge pressures of 1-1/2 times the working pressure specified, but not less than the following:

1. Low-pressure steam and condensate lines 50 psi

B. Retesting: If any deficiencies are revealed during test, such deficiencies shall be corrected and the tests reconducted at no additional costs to the Owner.

3.13 PIPING SYSTEM, CLEANING AND FLUSHING

A. Supply all materials, labor and power required for cleaning and flushing. Cleaning shall be started only after all piping has been successfully hydrostatically tested and all systems have been completely connected up.

B. Piping Cleaning and Flushing

1. Exercise every precaution to avoid introducing foreign matter such as welding beads and slag or dirt into the piping system. All completed welds shall be hammered to loosen debris. All piping, valves and fittings shall be internally cleaned of oil, grease or dirt, prior to assembly into system by use of wire brush and swab.

2. All cleaning and flushing work shall be coordinated with and supervised by the Water Treatment Sub Subcontractor for chemicals and procedures to be followed. See the Water Treatment Section of these Specifications.

3. Following the successful testing of the piping systems, they shall be cleaned under the supervision of the Water Treatment Sub Subcontractor.

4. Before submitting piping systems for acceptance, all strainers shall be inspected and thoroughly cleaned.

5. Cleaning shall be started only after all piping has been hydrostatically tested and all systems have been completely connected up.

6. Provide means of circulating water throughout system for period of 8 hours. At the end of circulation, remove and clean all strainer baskets and blow off all low points.

3.14 DUCTWORK

A. Installation shall be according to the standards referenced in PART 2 for the system. Duct supports for sheet metal ductwork shall be according to THE SMACNA HVAC DUCT CONSTRUCTION STANDARDS, 2ND ED., 1995, unless otherwise specified. Friction beam clamps indicated in THE SMACNA HVAC DUCT CONSTRUCTION STANDARDS, 2ND ED., 1995 shall not be used. Risers on high velocity ducts shall be anchored in the center of the vertical run to allow ends of riser to move due to thermal expansion. Supports on the risers shall allow free vertical movement of the duct. Supports shall be attached only to structural framing members and concrete slabs. Supports shall not be anchored to metal decking unless a means is provided and

approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided. Where C-clamps are used, retainer clips shall be provided.

B. Kitchen Exhaust Ductwork

1. Ducts conveying smoke and grease laden vapors shall conform to requirements of NFPA 96 and the International Mechanical Code. Seams, joints, penetrations, and duct-to-hood collar connections shall have a liquid tight continuous external weld. Provide cleanouts at all changes in direction and at 10 foot intervals on straight duct runs. Duct material shall be as specified. Duct construction shall include external perimeter angle iron welded joint reinforcement on 24 inch centers; continuously welded companion angle bolted flanged joints; pitched to drain at low points; welded pipe coupling-plug drains at low points; welded fire protection and detergent cleaning penetration; steel framed, stud bolted, and flexible ceramic cloth gasketed cleaning access provisions where specified and/or indicated.

2. Vertical and horizontal interior installations shall have proper fire resistant cover or enclosure, spacing from combustible surfaces, etc. as defined by NFPA, see insulation specification.

3. Provide continuously welded joints and seams. Ducts shall be pitched to drain at hoods and low point drain connections, if any are indicated. Surface finish shall match hoods.

4. Dishwasher Exhaust Duct: Pitch ductwork toward dishwasher.

C. Power Roof Ventilator Mounting: Foamed 1/2 inch thick, closed-cell, flexible elastomer insulation shall cover width of roof curb mounting flange. Where wood nailers are used, holes shall be pre-drilled for fasteners.

D. Power Transmission Components Adjustment: V-belts and sheaves shall be tested for proper alignment and tension prior to operation and after 72 hours of operation at final speed. Belts on drive side shall be uniformly loaded, not bouncing. Alignment of direct driven couplings shall be to within 50 percent of manufacturer's maximum allowable range of misalignment.

3.15 AIR SYSTEMS BALANCING

A. General Requirements

1. The Contractor shall select AABC MN-1, NEBB-01, SMACNA-07 or ASHRAE 111 as the standard for providing testing, adjusting and balancing (TAB) of air systems. The selected standard shall be used throughout the project. Testing, adjusting, and balancing shall be accomplished by a firm certified for testing and balancing by Associated Air Balance Council (AABC), Testing, Adjusting, and Balancing Bureau (TABB), National Environmental Balancing Bureau (NEBB), or National Balancing Institute (NBI).

B. Prior to testing, adjusting, and balancing, the Contractor shall verify that the systems have been installed and are operating as specified. Approved detail drawings and all

other data required for each system and/or component to be tested shall be attached to system flow diagram documentation.

C. The Contractor shall verify that all balancing devices required during the field coordination phase and confirm during the construction phase that they are properly installed to permit testing, adjusting and balancing and that all duct leakage tests have been completed prior to testing, adjusting and balancing. The Owner's Representative shall be notified in writing of all equipment, components, or balancing devices, that are damaged, incorrectly installed, or missing, as well as any design deficiencies that will prevent proper testing, adjusting, and balancing. Testing, adjusting, and balancing shall not commence until approved by the Owner's Representative. Instrumentation accuracy shall be in accordance with the standard selected in this paragraph.

1. The HVAC Subcontractor as a part of his contract shall provide all materials, labor and service of all Subcontractors for fulfillment of air and water balancing of all systems. The TAB Sub Subcontractor shall inform the HVAC Subcontractor of all requirements ahead of time.

2. Provide additional sheaves and belts required to reach design CFM levels.

3. In addition to the procedures outlined in this specification section, the procedures used for air, hydronic and temperature balancing shall also be in conformance with the "Procedural Standards for Testing, Adjusting, Balancing of Environmental System", seventh (2005) edition published by the National Environmental Balancing Bureau, the "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", fifth edition published by the Associated Air Balance Council or the Practical Standards and Procedures published by Testing, Adjusting, and Balancing Bureau or the National Balancing Institute.

4. A copy of the standards must be maintained on site by the Balancing Subcontractor at all times. The test report forms shall comply with the formats listed in these standards.

D. Instrument Accuracy Requirements

1. All instrumentation shall be checked for accuracy before beginning testing, adjusting and balancing procedures. Instrument accuracy shall be in accordance with the standard selected in paragraph A. General Requirements, immediately above. Checks may be carried out against similar equipment maintained specifically for checking purposes or by the manufacturer or a recognized testing facility. All instrumentation used for testing shall be calibrated within 6 months of use. Pitot tubes and U-tube manometers do not require checking. In no case shall the instrumentation accuracy be less than specified by the instrument manufacturer. Any instrument falling out of calibration during the process of balancing and testing shall be recalibrated or removed from the site and replaced by a properly calibrated instrument. No instruments shall be allowed to remain on-site that are not in calibration.

E. Integral with the TAB standard followed, the TAB Contractor shall submit in the submittal phase the following documents:

1. Qualification data shall be submitted, 60 days prior to testing and balancing operations. The test and balance firm shall be certified by the Associated Air Balance Council (AABC), the National Environmental Balancing Bureau (NEBB), Testing, Adjusting, and Balancing Bureau (TABB), or the National Balancing Institute (NBI). The lead balancing technician shall be qualified by AABC, NEBB or NBI and his qualification data shall include past experience on at least five similar projects. Provide proof of certification

2. TAB Plan and preliminary timeline.

3. Individual system one-line flow diagrams with pertinent data (i.e., static pressure, velocities, CFM, etc.) indicated on the applicable flow diagram for all components. Diagrams shall be made for each individual air and hydronic system.

4. Six (6) copies of a preliminary TAB report, 30 days before balancing commences. The report shall be organized by specific systems and shall clearly identify each item of equipment to be tested, adjusted, and balanced. The appropriate test procedures and measurements to be taken for each item of equipment shall be listed. Instrument calibration records shall be provided on forms shown in AABC MN-1 or SMACNA-07. Manufacturer's specified accuracy shall be shown. The report shall include floor plan drawings showing all dimensions of ductwork, piping and their related measurement locations and types of measurements to be made. All related data necessary for testing, balancing, and adjusting, including fan curves, actual and nameplate speeds, voltage and amp draw (each leg) shall be included. A system readiness checklist, similar to that shown in SMACNA-07, shall be included. The report shall contain a listing of the deficiencies of all systems to be tested, adjusted and balanced and the corrective action taken. The report shall contain a schedule for the final testing and balancing.

5. Six 6 copies of the final TAB report on forms shown in AABC MN-1, SMACNA-07, or equivalent forms from NEBB or NBI, within 2 weeks after completion of the test and balance operation. Data shall be in a hard bound cover identifying the project name, location, date of submittal, name of Contractor, and a general title indicating the specific area and type of work, and shall be signed by a registered professional engineer, employed by the test and balance firm, who has a minimum of 2 years experience in testing, adjusting and balancing work. The final report shall include a summary of the preliminary report describing test methods, test results, and major corrective actions taken. The report shall include as-tested floor plans showing all measurement locations and types of measurements made. The air handling unit data shall include a static pressure profile diagram, and pitot tube traverses where possible. Air distribution data shall include coded drawings which show the exact location of each air outlet. Data for heating coils, shall include heat balance calculations.

6. All instruments that are recalibrated and brought back onto the jobsite after being found to be out of calibration shall have recalibration records submitted on forms shown in AABC MN-1 or SMACNA-07.

F. The facility shall be essentially complete with final ceiling, walls, windows, doors and partitions in place. Doors and windows surrounding each area to be balanced shall be closed during testing and balancing operations. Air systems shall be complete and operable with balancing dampers, ducting, diffusers, returns, flow control boxes and control components in place. Exhaust fans and any hoods shall be operational. All measurements and adjustments shall be made using procedures described in standard selected in paragraph GENERAL REQUIREMENTS. Air motion and distribution from air terminals shall be as shown. All data including deficiencies encountered and corrective action taken shall be recorded. If a system cannot be adjusted to meet the design requirements, the Contractor shall promptly notify the Owner's Representative in writing.

G. Air Systems: Each system shall be adjusted until all flow quantities (supply, return, exhaust/relief, and outdoor air) are within plus 10% and minus 5%. Dampers shall be checked for tight shutoff. Air leakage around dampers shall be verified. Face and bypass dampers shall be set for air flow through coils. Fire dampers shall be open. Fans shall be checked for correct direction of rotation and proper speed shall be verified. Fire dampers shall be tested at system design air flow to ensure proper closure in accordance with NFPA 90A and manufacturer's instructions prior to building occupancy.

1. Filters: Clean filters shall be installed at the beginning of the testing, adjusting, and balancing effort. For constant volume air handling units (no VFD), simulate the filters as ½ dirty by adding pressure drop (by temporarily adding cheese cloth or by other means). If the added P.D. is not listed in the schedules, confirm what to use with the engineer. For variable volume air handling units, simulate the filters as dirty (by temporarily adding cheese cloth or by other means). If the dirty P.D. is not listed in the schedules, confirm what to use with the engineer.

2. General Balancing Methods: In addition to the requirements for specific systems, flows in supply, exhaust and return air systems shall be balanced using the methods in standard selected in paragraph GENERAL REQUIREMENTS. Throttling losses shall be limited. Air flow adjustments shall be made by first adjusting the fan speed to meet the design flow conditions. Fan speed adjustment may not be required for fan motors which are less than 746 W, (one horsepower,) or if throttling results in no greater than an additional 5% of the kw draw above that required if the fan speed were adjusted. If the excess draw causes the motor to enter its service factor, fan speed shall be reduced accordingly. Flows and pressures shall be checked in all main risers and supply ducts at all supply, exhaust and return fan discharges. All flows shall be recorded before and after each adjustment.

3. Specific Systems All special or additional procedures for testing and balancing shall be in accordance with the applicable requirements of the standard selected in paragraph GENERAL REQUIREMENTS.

a. Balancing of differential airflow: For areas such as kitchens, in addition to balancing the individual supply, return and exhaust airflows, the pressurization air (positive or negative) shall also be maintained as shown on drawings (air in less air out) for each room.

H. Steam Coil Balancing: Where multiple coils are served by common steam control valves, adjust the globe balancing valves for equal flow to each coil. For coils, verify this by equalizing the temperature profile of the leaving air so that the maximum variation is more than ± 10ºF from average over the coil's face area. Measure a minimum of one temperature point per square foot of coil.

I. Marking of Setting: Following final acceptance of certified reports by the Owner's Representative, the setting of all HVAC adjustment devices including valves, splitters, and dampers shall be permanently marked by the testing and balancing engineer so that adjustment can be restored if disturbed at any time.

J. Marking of Test Ports: The testing and balancing engineer shall permanently and legibly mark and identify the location points of the duct test ports. If the ductwork has exterior insulation, these markings shall be made on the exterior side of the ductwork insulation. All penetrations through ductwork and ductwork insulation shall be properly sealed to prevent air leakage or loss of vapor barrier.

K. Control Systems: Testing, adjusting, and balancing of the systems shall be coordinated with the control system installation. Work with the BAS Contractor for all balancing items shown on the control sequences such as airflow at air monitoring stations, outdoor airflow, and optimized setpoints for remote differential pressure sensors/transmitters (DPT) used for control of VFD's. Setpoint for DPT's shall be optimized to the lowest pressure required to provide design flow to all downstream terminal units with at least one unit's balancing device between 95% - 100% open on any of the terminal units on the pumping system. Where Pressure Independent Automatic Control Valves (PIACV) or self adjusting flow limiting valves (Griswold type) are used, optimize DPT setpoints such that the valve's pressure drop is no more than 50% above the lowest pressure in the valve's control range (typically 5 to 6 PSID for PIACVs or 2 PSID for flow limiting valves). All control components shall be verified to be properly installed and operating as specified before proceeding with testing, adjusting, and balancing. Verification shall be in accordance with AABC MN-1.

1. Adjustment of the temperature controls shall be coordinated by the person in charge of the balancing and adjusting and shall be performed coincidental therewith. In conjunction with the Controls Contractor simulate a complete cycle of operation for each system.

3.16 BASES AND SUPPORTS

A. In addition to supports and hangers as mentioned in the MISCELLANEOUS METALS section, provide all bases and supports not part of the building structure, of required size, type, and strength, as approved by the Architect, for all equipment and materials furnished by him. All equipment, bases and supports shall be adequately anchored to the building structure to prevent shifting of position under operating conditions.

B. All concrete foundations and all concrete supports will be provided by the General Contractor. The HVAC Subcontractor shall furnish shop drawings and templates for all concrete foundations and supports for setting all required hanger and foundation bolts and other appurtenances necessary for the proper installation of his equipment. All concrete work shall be shown in detail on the shop drawings prepared by the HVAC Subcontractor, and be submitted to the Architect, showing the complete details of all

foundations, including the necessary concrete and steel work and vibration isolation devices.

3.17 WATERPROOFING

A. Pipes passing through slabs shall have the sleeve extended ¼" above floors of finished spaces and 2" above floors of mechanical equipment rooms. The space between the pipe and sleeve shall be sealed with interlinking seals equal to Link-Seal.

B. Ducts through slabs shall have the sleeve extended ¼" above floors of finished spaces and 2" above floors of mechanical equipment rooms. The space between the pipe and sleeve shall be caulked with lead wool. The top shall be sealed with lead and the bottom shall be sealed with monolastic caulking compound.

3.18 MISCELLANEOUS IRON AND STEEL

A. All work shall be cut, assembled, welded and finished by skilled mechanics. Welds shall be ground smooth. Stands, brackets, and framework shall be properly sized and firmly constructed.

B. Measurements shall be taken on the job and worked out to suit adjoining and connecting work. All work shall be by experienced metal working mechanics. Members shall be straight and true and accurately fitted. Scale, rust, and burrs shall be removed. Welded joints shall be ground smooth where exposed. Drilling, cutting and fitting shall be done as required to properly install the work and accommodate the work of other trades as directed by them.

C. Members shall be generally welded, except that bolting may be used for field assembly where welding would be impractical.

D. All shop fabricated iron and steel work shall be cleaned and dried and given a shop coat of paint on all surfaces and in all openings and crevices.

3.19 PLACING IN SERVICE

A. At the completion of performance tests and following approval of test result, recheck all equipment to see that each item is adequately lubricated and functioning correctly.

B. Furnish upon completion of all work, certificates of inspections from the manufacturers stating that authorized factory engineers have inspected and tested the operation of their respective equipment and found same to be in satisfactory operating conditions.

3.20 CLEANING AND ADJUSTING

A. During the progress of the work, clean up and remove all oil, grease, and other debris caused by the work performed under this Section.

B. At the conclusion of the project, clean and repair all areas and finishes as installed or affected by this installation of work under this Section.

C. Pipes shall be cleaned free of scale and thoroughly flushed of all foreign matter. A temporary bypass shall be provided for all water coils to prevent flushing water from

passing through coils. Strainers and valves shall be thoroughly cleaned. Prior to testing and balancing, air shall be removed from all water systems by operating the air vents. Temporary measures, such as piping the overflow from vents to a collecting vessel shall be taken to avoid water damage during the venting process. Air vents shall be plugged or capped after the system has been vented.

D. Equipment shall be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided for all fans that are operated during construction, and new filters shall be installed after all construction dirt has been removed from the building. System shall be maintained in this clean condition until final acceptance. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

E. Variable frequency drives (VFD) shall be adjusted and set-up to lock out any frequencies that cause a resonance or vibration. To test for this, slowly increase and decrease the speed between minimum and maximum while noting all frequencies that cause problems.

3.21 OPERATING AND MAINTENANCE INSTRUCTIONS

A. All operating equipment installed under this section shall be placed in operation and shall function continuously in an operating test for a period of one week without shutdown due to mechanical failure or necessity of adjustment. Prior to scheduling the Project Final Inspection and after completion of all installation and running adjustments, the HVAC Subcontractor shall perform all work required to place the equipment in complete operating condition to meet all requirements under this Specification.

B. During this running test period, the HVAC Subcontractor shall deliver to the designated representative of the Owner, through the Architect, six complete sets of operating, service and replacement data for all equipment which will require operating maintenance or replacement and one copy of this literature shall be available during the instruction of the operating personnel while the other is checked for completeness by the Architect.

3.22 TRAINING

A. Conduct a training course for the maintenance and operating staff. The training shall start after the system is functionally complete but before the final acceptance tests. The training shall include all of the items contained in the operating and maintenance instructions as well as demonstrations of routine maintenance operations. The Owner’s Representative shall be given at least two weeks advance notice of such training.

B. During all working hours of the one week operating test, the HVAC Subcontractor's instruction personnel shall be available for and provide thorough and detailed training to the Owner's operating and maintenance personnel in operation, maintenance and adjustment of all equipment installed. The instructions shall be videotaped by the Subcontractor. The master tape and one (1) copy shall be turned over to the Owner not more than 10 days following the completion of the training.

C. Give sufficient notice to the designated operating personnel of the Owner in advance of this period. Upon completion of instruction, obtain from such representatives written verification on that which the above mentioned instruction has been performed, such verification to be forwarded to the Architect.

D. Provide instruction time of 16 hours for systems and an additional 16 hours for ATC.

END OF SECTION

TABLE OF CONTENTS

Table of Contents

SECTION 260000

ELECTRICAL

(FILED SUB-BID REQUIRED)

PART 1 - GENERAL 3

1.1 FILED SUB BID 3
1.2 GENERAL PROVISIONS 4
1.3 SCOPE OF WORK 4
1.4 RELATED WORK 5
1.5 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION 6
1.6 PRODUCTS INSTALLED AND WIRED, BUT NOT FURNISHED UNDER THIS SECTION 6
1.7 DEFINITIONS 7
1.8 CODES, REFERENCES AND PERMITS 7
1.9 GENERAL REQUIREMENTS 8
1.10 MATERIAL AND EQUIPMENT STANDARDS 8
1.11 SUBMITTALS 9
1.12 OPERATION AND MAINTENANCE DATA 12
1.13 RECORD DRAWINGS 14
1.14 WARRANTIES 14
1.15 COORDINATION 15
1.16 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS 16
1.17 INSPECTION OF SITE CONDITIONS 16
1.18 SURVEY AND MEASUREMENTS 16
1.19 DELIVERY, STORAGE AND HANDLING 16
1.20 PROTECTION OF WORK AND PROPERTY 17
1.21 SUPERVISION 17
1.22 SAFETY PRECAUTIONS 17
1.23 SCHEDULE 17
1.24 HOISTING, SCAFFOLDING AND PLANKING 17
1.25 CUTTING AND PATCHING 17
1.26 SLEEVES, INSERTS AND ANCHOR BOLTS 18
1.27 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS 18

1.28 HAZARDOUS MATERIALS 19
1.29 ACCESSIBILITY 19
1.30 SEISMIC RESTRAINT REQUIREMENTS 19
1.31 PROJECT CLOSEOUT 20
PART 2 - PRODUCTS 23
2.1 NOT USED 23
2.2 IDENTIFICATION 23
2.3 RACEWAYS AND CONDUIT 23
2.4 WIRE AND CABLE (600V) 24
2.5 WIRING DEVICES AND PLATES 26
2.6 OUTLET BOXES 27
2.7 JUNCTION AND PULL BOXES 28
2.8 SAFETY DISCONNECT SWITCHES 29
2.9 MOTOR STARTERS 29
2.10 PANELBOARDS 30
2.11 LIGHTING FIXTURES 32
2.12 FIRE ALARM – ADDRESSABLE WITH VOICE EVACUATION 33
2.13 VARIABLE FREQUENCY DRIVES 39
PART 3 - EXECUTION 44
3.1 DEMOLITION 44
3.2 IDENTIFICATION 45
3.3 RACEWAYS AND CONDUIT 46
3.4 WIRE AND CABLE (600V) 49
3.5 WIRING DEVICES AND PLATES 50
3.6 OUTLET BOXES 51
3.7 JUNCTION AND PULL BOXES 51
3.8 SAFETY DISCONNECT SWITCHES 51
3.9 MOTOR STARTERS 52
3.10 PANELBOARDS 52
3.11 LIGHTING FIXTURES 53
3.12 FIRE ALARM 54
3.13 VARIABLE FREQUENCY DRIVES 58
3.14 BASIC ACCEPTANCE TESTS 60

SECTION 260000

ELECTRICAL

(FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 FILED SUB BID

A. Time, Manner, and Requirements for Submitting Sub-Bid: The work of this Section is stipulated as a Filed Sub-Bid under the General Bid Form. Sub-Bids for the work of this Section shall be for the complete work and filed in a sealed envelope in strict compliance with and before the date and time stated in the Invitation for Bid and Instructions to Bidders. The following information shall appear in the upper left hand of the envelope:

Name of Bidder:

Name of Project: Repairs to Somerville High School Auditorium, Kitchen and Cafeteria

Section Number and Name of Sub-trade: #####, XXXXXX

B. Form of Sub-Bid: The Sub-Bid for the work of this Section shall be made on the Form of Sub-Bid, a copy for the use of Sub-Bidders in submitting Sub-Bids is included in the Bid Package.

C. Bid Deposit: A Bid Deposit equal to five percent of the value of the Bid must be submitted with the Sub-Bid. The value of the Bid includes Add Alternates. The Bid Deposit may be in the form of a bid bond, cash, or a certified check on, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to The City of Somerville, Massachusetts.

D. Sub-Sub-Bid Requirements:

1. Sub-bidders attention is directed to Mass. GL Chapter 149, Section 44F as amended which provides in part as follows:

a. Each sub-bidder shall list in Paragraph E of the "Form for Sub-Bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which (the section of the Specifications for that sub-trade) required such listing; provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name in said Paragraph E for any such class of work or part thereof and perform that work with persons on his own payroll, if such sub-bidder, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work or part thereof with persons on his own payroll and is qualified to do so. This Section requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

Classes of Work	Section Number
(1) Telecommunications	270000

(2) Security 280000

(3) Audiovisual 274000

E. Reference to Drawings: Work to be performed is shown on Drawings numbered:

ELECTRICAL

E000 Electrical Legend, Notes and Abbreviations

E100 Electrical Overall Plans

ED201 Electrical First Floor Demo Plan

ED202 Electrical Second Floor Demo Plan

ED203 Electrical Third Floor Demo Plan

E201 Electrical Lighting First Floor New Plan

E202 Electrical Lighting Second Floor New Plan

E203 Electrical Lighting Third Floor New Plan

E301 Electrical Power First Floor New Plan

E302 Electrical Power Second Floor New Plan

E303 Electrical Power Third Floor New Plan

E401 Electrical Fire Alarm First Floor New Plan

E402 Electrical Fire Alarm Second Floor New Plan

E403 Electrical Fire Alarm Third Floor New Plan

E500 Electrical Schedules

1.2 GENERAL PROVISIONS

A. The GENERAL REQUIREMENTS, DIVISION 1, and BIDDING AND CONTRACT REQUIREMENTS, DIVISION 0, are hereby made a part of this Specification Section.

B. Examine all Drawings and all Sections of the Specifications and requirements and provisions affecting the work of this Section.

1.3 SCOPE OF WORK

A. This project includes the replacement of electrical and mechanical systems in the Auditorium and kitchen area.

B. Refer to the specific requirements for this project included in the “Narrative Report for Compliance with the Energy Conservation Section of the Massachusetts State Building Code (780CMR) – Approval and Acceptance” and the “Narrative Report for Compliance with the Fire Protection and Life Safety Systems Section of the Massachusetts State Building Code (780CMR) – Fire Protection Construction Documents”, which shall be considered part of these specifications. Include all associated testing and certifications necessary for compliance and any required remedial actions and retest due to failure.

C. The work under this Section shall include the furnishing of all materials, labor, equipment and supplies and the performance of all operations to provide complete working systems, in general, to include the following items:

1. Identification
2. Raceways and Conduit
3. Wire and Cable (600V)
4. Wiring Devices and Plates
5. Outlet Boxes
6. Junction Boxes, Pull Boxes and Wireways
7. Safety Disconnect Switches
8. Panelboards
9. Fuses
10. Lamps and Light Fixtures
11. Lighting Control System
12. Variable Frequency Drives
13. Fire Alarm System
14. Fire Alarm System Modifications / Additions
15. Battery Powered Emergency Lighting System
16. Motor Starters
17. Telecommunications and Data Raceway and Outlet System
18. Lighting Contactors, Relays and Time Switches
19. Dimming Systems
20. Sleeving
21. Fire Seal and Fireproof Sealant
22. Supervision and Approval
23. Electrical Connections to HVAC and Plumbing Equipment, Kitchen Equipment, and other Equipment provided under other Sections or by Owner.
24. Relocation of existing electrical components that interfere with new construction and removal and disposal of obsolete components.
25. Testing
26. Operating and maintenance instructions and manuals
27. Shop drawings
28. Record (as-built) drawings

D. Work of this Section is generally shown on the Electrical Drawings.

1.4 RELATED WORK

A. Principal classes of Work related to the Work of this Section are listed in the Specification Table of Contents, and are specified to be performed under the indicated Sections of the Specifications. Refer to the indicated Sections for description of the

extent and nature of the indicated Work, and for coordination with related trades. This listing may not include all related Work items. It is the responsibility of the Contractor to coordinate and schedule the Work of this Section with that of all other trades.

B. The following work is not included in this section and will be provided under other sections:

1. Furnishing and installation of motors.
2. Structural supports necessary to distribute loading from equipment to roof or floor except as specified.
3. Temporary light, power, water, heat, gas and sanitary facilities for use during construction and testing. Refer to Division 1, General Conditions.
4. Telephone system, wire, cable, equipment and instruments.
5. Automatic Temperature Control and Direct Digital Communication wiring except as noted on Drawings.
6. Flashing of roof and wall penetrations.
7. Painting, except as specified herein.

1.5 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION

A. Furnish the following items for installation under other sections and provide wiring and connections as required:

1. Duct mounted smoke detectors for installation under Section 15500. Lengths of sampling tubes shall be coordinated with Sheetmetal Contractor. Control wiring for fan shut-down shall be provided under Section 15900.
2. Access panels and doors for installation by the General Contractor.
   a. Furnish access panels for installation in walls, ceiling and floors at locations to permit access for adjustment, removal, replacement and servicing of all concealed equipment, valves and materials installed under this Section of the specifications.
   b. Access panels will be installed under the Section of the related trades of the finished surfaces in which they are located.
   c. Access panels shall be located in closets, storage rooms and/or other non-public areas if possible, positioned so that the equipment can be easily reached, and the size shall be sufficient for this purpose (min. 16" x 16"). When access panels are required in corridors, lobby or other habitable areas, they will be located as directed by the Owner’s Representative.
   d. Access panels shall be prime painted, keyed alike and provided with cylinder lock and two keys for each panel. Units shall be manufactured by Milcor, Inland Steel, Miami Carey or approved equal. Required fire resistance of walls and ceilings shall be maintained.

1.6 PRODUCTS INSTALLED AND WIRED, BUT NOT FURNISHED UNDER THIS SECTION

A. Install and provide wiring connections for the following items furnished under other sections:

1. Motorized projection screen controllers.
2. Line voltage fan speed controllers.

1.7 DEFINITIONS

A. As used in this Section, the following items are understood to have the following meaning:

1. "**Contractor or Subcontractor** ", unless otherwise qualified, shall mean the installer of the work specified under this Section.
2. **"Furnish"** shall mean purchase and deliver to the project site, complete with every necessary appurtenance.
3. **"Install"** shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting and proper operation at the proper location in the project.
4. **"Provide"** shall mean "Furnish" and "Install".
5. **"Work"** shall mean all labor, materials, equipment, apparatus, controls, accessories and all other items required for a proper and complete installation.
6. **"Concealed"** shall mean hidden from sight in chases, furred-in spaces, shafts, hung ceilings, embedded in construction or in a crawl space. Areas to be concealed as part of tenant alterations to the building shall also be considered in this definition.
7. **"Exposed"** shall mean not installed underground or concealed as defined above.
8. **"Furnished by Others"** shall mean materials or equipment purchased under other sections of the general contract and installed by this section of the specifications by this trade Contractor .
9. **"Owners Representative"** shall be the party responsible to make decisions regarding all contractual obligations in reference to the Scope of Work for the Owner.
10. **"Date of Substantial Completion"** shall indicate the date where the work has been formally accepted as evidenced by completed final punch list or where the work has reached the stage that the Owner obtains beneficial use and commences utilization of the installed systems for business or occupancy purposes. The GENERAL REQUIREMENTS, DIVISION 1, shall supersede this definition where specifically defined.

1.8 CODES, REFERENCES AND PERMITS

A. Materials, installation of systems and equipment provided under this section shall be done in strict accordance with the Department of Public Safety, Department of Environmental Protection, State Building Code and any other Codes and Regulations having jurisdiction including but not limited to:

1. All Applicable NFPA Standards
2. National Electrical Code (NEC).
3. Occupational Safety and Health Administration (OSHA)

4. State and Local Building Codes

5. Underwriters' Laboratories, Inc (UL)

B. Unless otherwise specified or indicated, materials, workmanship and equipment performance shall conform with the latest governing edition of the following standards, codes, specifications, requirements, and regulations, except when more rigid requirements are specified or are required by applicable codes but not limited to:

1. American National Standards Institute (ANSI)

2. American Society of Mechanical Engineers (ASME).

3. American Society of Testing and Materials (ASTM)

4. Certified Ballast Manufacturers (CME)

5. Illuminating Engineering Society (IES)

6. Institute of Electrical and Electronics Engineers (IEEE)

7. Insulated Cable Engineers Association (ICEA)

8. National Electrical Contractors Association (NECA)

9. National Electric Manufacturers Association (NEMA)

10. Thermal Insulation Manufacturers Association (TIMA)

C. Codes, laws and standards provide a basis for the minimum installation criteria acceptable. The drawings and specifications illustrate the scope required for this project, which may exceed minimum codes, laws and standards.

D. Give all notices, file all plans, obtain all permits and licenses, and obtain all necessary approvals from authorities having jurisdiction. Deliver all certificates of inspection to the authorities having jurisdiction. No work shall be covered before examination and approval by the Owner’s Representative, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work to conform to requirements, satisfactory to Owner’s Representative, and without extra cost to the Owner. If work is covered before inspection and approval, this Contractor shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.9 GENERAL REQUIREMENTS

A. Nameplates

1. Each major component of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment.

B. Equipment Guards

1. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts so located that any person may come in close proximity thereto shall be completely enclosed or guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be guarded or covered with insulation of type specified for service.

1.10 MATERIAL AND EQUIPMENT STANDARDS

A. Where equipment or materials are specified with the name of a manufacturer, such specification shall be deemed to be used for the purpose of establishing a standard for that particular item. No equipment or material shall be used unless previously approved by the Owner's Representative.

B. Substitutions may be offered for review provided the material, equipment or process offered for consideration is equal in every respect to that indicated or specified. The request for each substitution must be accompanied by complete specifications together with drawings or samples to properly appraise the materials, equipment or process. The Contractor shall highlight and list all applicable specification requirements which the substituted material deviates from.

C. If a substitution of materials or equipment in whole or in part is made, this Contractor shall bear the cost of any changes necessitated by any other trade as a result of said substitution.

D. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers as approved.

1.11 SUBMITTALS

A. Conform to the requirements of Division 1, General Conditions, for schedule and form of all submittals unless specifically noted otherwise in this section. Coordinate this submittal with submittals for all other finishes. Shop drawings and design layouts shall be prepared by licensed installing Contractor s and shall note the name(s), license number(s) and license expiration date(s) of the Contractor (s) installing electrical systems.

B. Definitions:

1. Shop Drawings are information prepared by the Contractor to illustrate portions of the work in more detail than indicated in the Contract Documents.

2. Acceptable Manufacturers: The mechanical design for each product is based on the single manufacturer listed in the schedule or shown on the drawings. In Part 2 of the specifications, certain Alternate Manufacturers are listed as being acceptable. In addition, the MATERIAL AND EQUIPMENT STANDARDS paragraph potentially allows for substitutions as being acceptable. These are acceptable only if, as a minimum, they:

a. Meet all performance criteria listed in the schedules and outlined in the specifications. For example, to be acceptable, an emergency generator must deliver equal kW / kVA at equal or greater efficiency using equal or less fuel as the emergency generator listed in the schedules.

b. Fit within the available space it was designed for, including space for maintenance and component removal, with no modification to either the space or the product. Clearances to walls, ceilings, and other equipment will be at least equal to those shown on the design drawings. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Engineer has determined that the manufacturer's products will fit within the available space – this determination is solely the responsibility of the Contractor .

c. For rooftop mounted equipment and equipment mounted in areas where structural matters are a concern, the products must have a weight no greater than the product listed in the schedules or specifications.

d. Products must adhere to all architectural considerations including, but not limited to; being of the same color as the product scheduled or specified, fitting within the architectural enclosures and details, and for lighting – being the same size and of the same physical appearance as scheduled or specified products.

C. Submittal Procedures, Format and Requirements

1. Review submittal packages for compliance with Contract Documents and then submit to Owner's Representative for review. Submit enough sets of shop drawings such that, after review, two sets will be kept by the reviewer, with only the remaining sets returned with reviewer's marks and comments.

2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:

   a. Title

   b. Equipment number

   c. Name and location of project

   d. Names of Owner, Engineer and Seller

   e. Names of manufacturers, suppliers, vendors, etc.

   f. Date of submittal

   g. Whether original submittal or resubmitted

3. Shop Drawings showing manufacturer's product data shall contain detailed dimensional drawings (minimum ¼" – 1' scale) including plans and sections (where physical clearance could be an issue). Provide larger scale details as necessary.

4. Submit accurate and complete description of materials of construction, manufacturer's published performance characteristics, sizes, weights, capacity ratings (performance data, alone, is not acceptable), electrical requirements, starting characteristics, wiring diagrams, and acoustical performance for complete assemblies. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.

5. Provide Shop Drawings showing details of piping connections to all equipment. If connection details are not submitted and connections are found to be installed incorrectly, this Contractor shall reinstall them within the original contract price.

6. Provide complete data for all auxiliary services and utilities required by submitted equipment. This shall include fuel, cooling and exhaust requirements and points of connections.

7. Provide a complete description of all controls and instrumentation required including electrical power connection drawing for all components and

interconnection wiring to starters, detailed information on starters, control diagrams, termination diagrams, and all control interfaces with a central control system.

8. Provide installation and erection information including; lifting requirements, and any special rigging or installation requirements for all equipment.

9. The Owner's Representative shall approve all materials before commitment for materials is made.

D. Product Data: Submit complete manufacturer's product description and technical information including:

1. Panelboards

2. Lamps and Light Fixtures and associated Utility Rebate Forms

3. Motor Starters

4. Variable Frequency Drives and associated Utility Rebate Forms

5. Battery Powered Emergency Lighting System

6. Fire Alarm System

7. Fire Alarm System Modifications/Additions

8. Lighting Control System

9. Lighting Contactors, Relays and Time Switches

10. Dimming Systems

E. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.

1. Access panel shop drawings shall be submitted to the Construction Supervisor for approval.

2. Do not submit multiple product information in a single bound manual.

3. Three-ring binders shall not be accepted.

F. Deviations:

1. Concerning deviations other than substitutions, proposed deviations from Contract Documents shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the deviation to the attention of the Owner's Representative.

2. Without letters flagging the deviation to the Owner's Representative, it is possible that the Engineer may not notice such deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Owner's Representative, the Seller shall hold the Engineers, his consultants and the Owner harmless for any and all adverse consequences resulting from the deviations being implemented. This shall apply regardless of whether the Engineer has reviewed or approved shop drawings containing the deviation, and will be strictly enforced.

3. Approval of proposed deviations, if any, will be made at discretion of Engineer.

G. Schedule: Incorporate shop drawing review period into construction schedule so that Work is not delayed. This Contractor shall assume full responsibility for delays caused by not incorporating the following shop drawing review time requirements into his project schedule. Allow at least 10 working days, exclusive of transmittal time, for review each time shop drawing is submitted or resubmitted.

H. Responsibility

1. Intent of Submittal review is to check for capacity, rating, and certain construction features. The Contractor shall ensure that work meets requirements of Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with approved submittals to extent that they agree with Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of Contract Documents. The Engineer's noting of some errors while overlooking others will not excuse the Contractor from proceeding in error. Contract Documents requirements are not limited, waived nor superseded in any way by review.

2. Inform Contractor, manufacturers, suppliers, etc. of scope and limited nature of review process and enforce compliance with contract documents.

I. In the event that the Contractor fails to provide Shop Drawings for any of the products specified herein:

1. The Contractor shall furnish and install all materials and equipment herein specified in complete accordance with these Specifications.

2. If the Contractor furnishes and installs material and/or equipment that is not in complete accordance with these Specifications, he shall be responsible for the removal of this material and/or equipment. He shall also be responsible for the replacement of this material and/or equipment with material and/or equipment that is in complete accordance with these Specifications, at the direction of the Owner’s Representative.

3. Removal and replacement of materials and/or equipment that is not in complete compliance with these Specifications shall be done at no extra cost to the Owner.

4. Removal and replacement of materials and/or equipment that is not in complete compliance with these Specifications shall not be allowed as a basis for a claim of delay of completion of the Work.

J. Mark dimensions and values in units to match those specified.

K. Submit Material Safety Data Sheets (MSD) on each applicable product with submittal.

1.12 OPERATION AND MAINTENANCE DATA

A. Commence preparation of the Operating and Maintenance (O&M) manuals immediately upon receipt of “Approved” or “Approved as Noted” shop drawings and submit each section within one month. The final submission shall be no later than two months prior to the projected date of Substantial Completion of the Project.

B. Submit O&M table of contents in the submittal phase. O&M manuals shall be built as submittals are accepted and shall include the individual equipment manufacturer's data retrieval sheet, as per Attachment A in Part IV for input into the Owner's Maintenance Management System. Form shall be provided and completed electronically.

C. Each O&M document shall include the manufacturer's web address for equipment specific O&M information for Internet access by the Owner.

D. The manual shall consist of three (3) sets of manuals and include three (3) sets of CDs, which shall contain the scanned content of the entire manual. The manual shall highlight the actual equipment used and not be a master catalog of all similar products of the manufacturer. The manual shall be submitted for review prior to creation of the CDs.

E. The Manual shall contain the following:

1. Operations Manual

   a. Systems description including all relevant information needed for day-to-day operations and management including start-up and shut-down instructions.

   b. Wiring diagrams, schematics, logic diagrams and sequence of operations that accurately depict the controls system.

   c. Depiction of each interface screen where programmable logic and visual displays are provided. Descriptors shall be provided to define displayed data, alarms, etc.

   d. A single sheet (for ease of removal) of all access codes and passwords necessary to access all levels of control and programming.

   e. Trouble shooting guide defining common alarms/problems with possible cause and effect.

2. Maintenance Manual

   a. Define all maintenance activities required to ensure system operation within manufacturers specified parameters. Provide table of all required activities plotted vs. interval with adequate fill-in-space for "activity completion date" and "comments". Where multiple instrument readings are required, provide data sheet formatted to accommodate activity.

   b. Define recommended spare parts inventory with part numbers and source defined for ordering by the Owner. Identify lead time on all parts, source location and cost.

   c. Provide copy of all warranty information with associated date of substantial completion (commencement of warranty) and end date of coverage. Define all components/subsystems specifically included and excluded.

   d. Provide all information as listed on the Facility Support Services data sheet as per Attachment A in Part IV for input into the Owner's Maintenance Management System. Form shall be provided and completed electronically.

F. Provide O&M manuals for each of the following:

1. Fire Alarm System
2. Variable Frequency Drives
3. Lighting Control System
4. Dimming Systems

1.13 RECORD DRAWINGS

A. Refer to DIVISION 1, General Conditions, for record drawings and procedures to be provided under this section, unless specifically noted otherwise in this section.

B. Record Drawings (red-line drawings) will be updated by this Contractor daily for review with the monthly requisition. The record drawing shall be an accurate depiction of the systems as completed, including dimensions (vertical/horizontal) of concealed components off fixed building elements.

C. The Electrical Foreman shall maintain complete and separate set of prints of Contract Drawings at job site at all times and shall record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design.

D. At completion of work the Electrical Contractor shall prepare a complete set of record drawings on AutoCAD showing all systems as actually installed. The Architectural background AutoCAD files will be made available for the Contractor's copying, at his expense, to serve as backgrounds for the drawings. The Electrical Contractor shall transfer changes from field drawings onto AutoCAD drawings and submit copy of files and three sets of prints to Owner's Representative for comments as to compliance with this section. CADD layering as established by the A&E design team shall be maintained with any and all changes done by the Contractor.

E. The Architect and Engineer are not granting to the Contractor any ownership or property interest in the CADD Drawings by the delivery of the CADD Disks to the Contractor. The Contractor's rights to use the CADD disks and the CADD Drawings are limited to use for the sole purpose of assisting in the Contractor's performance of its contractual obligations under its contract with respect to the Project. The Architect and Engineer are granting no further rights. Any reuse or other use by the Contractor will be at the Contractor's sole risk and without liability to the Architect and Engineer. The Contractor hereby waives and releases any losses, claims, damages, liabilities of any nature whatsoever, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor. The Contractor, to the maximum extent permitted by law, hereby agrees to indemnify, defend and hold the Architect and Engineer harmless from all loses, claims, damages, liabilities, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor.

F. Record Drawings, shall show "as-built" condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and model numbers of final equipment installation.

G. The Electrical Contractor shall submit the record set for approval by the engineer a minimum of four weeks prior to seeking the permanent certificate of occupancy.

1.14 WARRANTIES

A. Submit manufacturer's standard replacement warranties for material and equipment furnished under this Section. Such warranties shall be in addition to and not in lieu of all liabilities which the manufacturer and the Electrical Contractor may have by law or by provisions of the Contract Documents.

B. All materials, equipment and work furnished under this Section shall be guaranteed against all defects in materials and workmanship for a minimum period of one-year (1) commencing with the Date of Substantial Completion. Where individual equipment sections specify longer warranties, provide the longer warranty. Any failure due to defective material, equipment or workmanship which may develop, shall be corrected at no expense to the Owner including all damage to areas, materials and other systems resulting from such failures.

C. Guarantee that all elements of each system meet the specified performance requirements as set forth herein or as indicated on the Drawings.

D. Upon receipt of notice from the Owner of the failure of any part of the systems during the warranty period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.

1.15 COORDINATION

A. Refer to Division 1, General Conditions, for coordination requirements applicable to this section, unless specifically noted otherwise in this section.

B. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as required.

C. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections. Any conflicts shall be referred immediately to the Owner’s Representative for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Owner’s Representative's satisfaction at no expense to the Owner.

D. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section may interfere with work of other sections, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 3/8" scale or larger working drawings and sections, clearly showing how the work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.

E. Keep fully informed as to the shape, size and position of all openings required for all apparatus, conduit, cable, sleeves, etc., and give information in advance to allow construction of required openings. Furnish all sleeves, pockets, supports and incidentals, and coordinate with the General Contractor for the proper setting of same.

F. All distribution systems which require pitch or slope such as condensate drains and water piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, ducts, lights and apparatus and install work to avoid interferences.

G. Make reasonable modifications in the work as required by structural interferences, or by interference with work of other trades, or for proper execution of the work without extra charge.

1.16 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. It is the intention of the Specifications and Drawings to call for complete, finished work, tested and ready for continuous operation. Any apparatus, appliance, material or work not shown on the Drawings, but mentioned in the Specifications or vice-versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be provided by this Contractor without additional expense to the Owner.

B. The Drawings are generally diagrammatic. The locations of all items that are not definitely fixed by dimensions are approximate only. The exact locations must be determined at the project and shall have the approval of the Owner's Representative before being installed. This Contractor shall follow Drawings, including his shop drawings, in laying out work and shall check the Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions. Where space conditions appear inadequate, notify the Owner's Representative before proceeding with the installation. This Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

C. Any requests for information (RFI) for resolving an apparent conflict or unclarity, or a request for additional detail, shall include a sketch or equivalent description of Contractor's proposed solution.

D. Size of conduits, cable trays, raceways and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the true intent and purpose of the Drawings, all necessary parts to make complete approved working systems ready for use, shall be furnished without extra charge. All work shall be installed in an approved workmanlike manner.

1.17 INSPECTION OF SITE CONDITIONS

A. Prior to submission of bid, visit the site and review the related construction documents to determine the conditions under which the Work has to be performed and send a report, in writing, to the Owner's Representative, noting any conditions which might adversely affect the Work of this Section of the Specifications.

1.18 SURVEY AND MEASUREMENTS

A. Base all required measurements, horizontal and vertical, from referenced points established WITH the Owner's Representative. The Electrical Contractor shall be responsible for correctly laying out the Work required under this Section of the Specifications.

B. In the event of discrepancy between actual measurements and those indicated, notify the Owner's Representative in writing and do not proceed with the related work until instructions have been issued.

1.19 DELIVERY, STORAGE AND HANDLING

A. No materials shall be delivered or stored on site until corresponding Shop Drawings have been approved.

B. All manufactured materials shall be delivered to the site in original packages or containers bearing the manufacturer's labels and product identification.

C. Protect materials against dampness. Store off floors, under cover and adequately protected from damage.

D. Inspect all equipment and materials, upon receipt at the job site, for damage and conformance to approved shop drawings.

1.20 PROTECTION OF WORK AND PROPERTY

A. This Contractor shall be responsible for the care and protection of all work included under this Section until the completion and final acceptance of this Contract.

B. Protect all equipment and materials from damage from all causes including, but not limited to, fire, vandalism and theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment at no additional cost to the Owner.

C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this Section and make good damage thus caused.

D. Damaged materials are to be removed from the site; no site storage of damaged materials will be allowed.

1.21 SUPERVISION

A. Supply the service of a competent Supervisor with a minimum of 5 years experience in Electrical construction supervision who shall be in charge of the Electrical work at the site.

1.22 SAFETY PRECAUTIONS

A. Life safety and accident prevention shall be a primary consideration. Comply with all of the safety requirements of the Owner and OSHA throughout the entire construction period of the project.

B. Furnish, place and maintain proper guards and any other necessary construction required to secure safety of life and/or property.

1.23 SCHEDULE

A. Construct work in sequence under provisions of Division 1 and as coordinated with the Owner’s Representative.

1.24 HOISTING, SCAFFOLDING AND PLANKING

A. The work to be done under this Section of the Specifications shall include the furnishing, set-up and maintenance of all derricks, hoisting machinery, cranes, helicopters, scaffolds, staging and planking as required for the work.

1.25 CUTTING AND PATCHING

A. Provide all cutting and patching necessary for the proper installation of work to be performed under this Section.

B. All work shall be fully coordinated with all phases of construction, in order to minimize the requirements for cutting and patching.

C. Form all chases or openings for the installation of the work of this Section of the specifications, or cut the same in existing work and see that all sleeves or forms are in the work and properly set in ample time to prevent delays. Be responsible that all such chases, openings, and sleeves are located accurately and are of the proper size and shape and consult with the Owner's Representative and all other trades concerned in reference to this work. Confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the approval of the Owner's Representative.

D. Fit around, close up, repair, patch, and point around the work specified herein to match the existing adjacent surfaces and to the satisfaction of the Owner's Representative.

E. Fill and patch all openings or holes left in the existing structures by the removal of existing equipment which is part of this Section of the Specifications.

F. All of this work shall be carefully done by workmen qualified to do such work and with the proper and smallest tools applicable.

G. Any cost caused by defective or ill-timed work required by this Section of the specifications shall be borne by this Contractor.

H. When, in order to accommodate the work required under this Section of the specifications, finished materials of other trades must be cut or fitted, furnish the necessary drawings and information to the trades whose materials must be cut or fitted.

1.26 SLEEVES, INSERTS AND ANCHOR BOLTS

A. Coordinate with other trades the location of and maintaining in proper positions, sleeves, inserts and anchor bolts to be supplied and/or set in place under this section of the specifications. In the event of incorrectly located preset sleeves, inserts and anchor bolts, etc., all required cutting and patching of finished work shall be done under this section of the specifications.

B. All pipes passing through floors, walls, ceilings or partitions shall be provided with fire stopping to maintain the fire rating of the structure. All penetrations and associated fire stopping shall be installed in accordance with the fire stopping manufacturer's listed installation details. Provide sleeves for all penetrations where required by the listed detail, for the penetration of all mechanical room floors and where specifically required on the drawings.

C. Field drilling (core drilling), when required, shall be performed under this section of the specifications, after receipt of approval by the Owner's Representative.

1. When coring can not be avoided, provide ¼ inch pilot hole prior to coring. When coring through floor or slab, verify location of core on floor below and protect and piping, ductwork, wiring, furniture, personnel, etc., below the location of the core.

1.27 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

A. Provide all supplementary steel, factory fabricated channels and supports required for the proper installation, mounting and support of all Electrical equipment, piping, etc., required by the Specifications.

B. Supplementary steel and factory fabricated channels shall be firmly connected to building construction in a manner approved by the Owner's Representative as shown on the drawings or herein specified.

C. The type and size of the supporting channels and supplementary steel shall be determined by the Contractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.

D. All supplementary steel and factory fabricated channels shall be installed in a neat and workmanlike manner parallel to the walls, floors and ceiling construction. All turns shall be made with 90 degree and 45 degree fittings, as required to suit the construction and installation conditions.

E. All supplementary steel including factory fabricated channels, supports and fittings shall be galvanized steel, aluminum or stainless steel where exposed or subject to rust producing atmosphere. Factory fabricated channels shall be manufactured by Unistrut, H-strut, Powerstrut or approved equal.

1.28 HAZARDOUS MATERIALS

A. Removed batteries shall be recycled by a facility approved by the Owner's Representative. A uniform hazardous waste manifest shall be prepared for all disposals and returned with all applicable signoffs prior to application for final payment.

B. Removed fluorescent and HID lamps shall be recycled by a facility approved by the Owner's Representative. A uniform hazardous waste manifest shall be prepared for all disposals and returned with all applicable signoffs prior to application for final payment.

C. All ballasts in lighting fixtures to be disposed shall be verified to be PCB free. All ballasts manufactured prior to 1979 and not labeled as PCB free shall be considered to contain PCB's. Provide written verification to the Owner's Representative that confirms PCB free waste. Where PCB free waste cannot be verified, ballasts shall be recycled by a facility approved by the Owner's Representative, with PCB components eliminated by a high temperature incineration. A uniform hazardous waste manifest shall be prepared for all disposals and returned with all applicable signoffs prior to application for final payment. All handling shall conform to EPA requirements. Provide breakout cost for this scope.

D. Where it has been identified that asbestos-containing material exists within the scope limits, refer to the Asbestos Abatement specification section for requirements.

1.29 ACCESSIBILITY

A. All work provided under this Section of the Specification shall be installed so that parts requiring periodic inspection, maintenance and repair are accessible. Work of this trade shall not infringe upon clearances required by equipment of other trades, especially code required clearances to electrical gear. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Owner's Representative.

1.30 SEISMIC RESTRAINT REQUIREMENTS

A. Submit working plans and calculations reviewed, signed and stamped by a professional engineer who is registered in the State where the project is located and has specific experience in seismic calculations, certifying that the plans meet all seismic requirements established by authorities having jurisdiction over the project.

B. For each seismic restraint, provide certified calculations to verify adequacy to meet the following design requirements:

1. Ability to accommodate relative seismic displacements of supported item between points of support.

2. Ability to accommodate the required seismic forces.

C. For each respective set of anchor bolts provide calculations to verify adequacy to meet combined seismic-induced sheer and tension forces.

D. For each weldment between structure and item subject to seismic force, provide calculations to verify adequacy.

E. Restraints shall maintain the restrained item in a captive position without short circuiting the vibration isolation.

1.31 PROJECT CLOSEOUT

A. Certificates Of Approval

1. Upon completion of all work, provide certificates of inspections from the following equipment manufacturers stating that the authorized factory representatives have inspected and tested the operation of their respective equipment and found the equipment to be in satisfactory operating condition and installed per the manufacturers installation instructions and requirements.

a. Fire Alarm System

b. Dimming Cabinet

B. Construction Observations By The Engineer

1. The engineer is contracted to make **three (3)** progress site visits during construction, **one (1)** substantial completion (punch list) site visit for determining substantial completion and **one (1)** Final site visit to determine if all work is complete.

2. The Trade Contractors and the General Contractor are required to inspect their own work and make any corrections to the work to comply with the specifications and the contract documents. It is not the responsibility of the engineer to develop lists of incomplete work items.

3. Progress Site Visits

a. The purpose of the progress site visit by the engineer is to observe if the work is proceeding in accordance with the contract documents.

b. The engineer will prepare a field report which will note in general the work completed since the last observation visit, work found not to be in accordance with the contract documents and work not corrected since the previous observation visit.

C. Substantial Completion

1. When the Contractor considers the Work under this Section is substantially complete, the Contractor shall submit written notice, through the General Contractor, with a detailed list of items remaining to be completed or corrected and a schedule of when each remaining work item will be completed. Should the

engineer determine the list of remaining work does not constitute substantial completion the engineer will notify the Architect and/or Owner and he will not make a substantial completion site visit.

2. The following items shall be completed prior to the written request for substantial completion site visit:

   a. Certification of successful operation of all systems.

   b. Training of the Owner's personnel in the operation of the systems.

   c. Record Drawings in accordance with the contract specifications.

   d. Operation and Maintenance manuals.

   e. Testing reports.

   f. Manufacturer's certificates of approvals.

   g. Emergency contact list for reporting of malfunctioning equipment during the warrantee period.

   h. Contractors Project Completion certificate.

3. Should the Engineer, during the substantial completion visit, observe that the Work is substantially complete, s/he will provide a written listing of the observed deficiencies referred herein as the Punch List. The Punch List will provide for a place for the Contractor and general Contractor to sign off and date each item individually indicating that the observed deficiency item has been corrected.

4. Should the Engineer, during the substantial completion site visit, observe that the Work is not substantially complete, s/he will provide, a written list of the major deficiencies and a reason for the work not being considered substantially complete.

5. If the work is found not to be substantially complete then the engineer shall be reimbursed for his time to reobserve the work. A reobservation fee shall be charged to the Contractor through the contractual agreement for any further observations by the engineer.

6. The Contractor shall remedy all deficiencies listed in the punch list within the time frame required by the contract.

D. Engineers Construction Completion Certification

1. Where required by the applicable code, the Engineers Construction Completion Certification will be issued by RDK Engineers when all life safety and health related issues are complete, all required functional tests are complete and all reports are complete. The following is a minimum listing of the required systems to be tested with reports generated indicating they are complete and ready for use:

   a. Emergency and Egress Lighting System

   b. Fire Alarm System

2. There shall be <u>NO</u> outstanding items identified on the punch list for scope within any of these categories.

E. Final Completion

1. The following items shall be submitted prior to the written request for Final completion:
    a. Revised Substantial Completion items to be resubmitted in accordance with the review process comments.
    b. Warranties commencing the date of Substantial completion
    c. Individual Signed and dated Punch List acknowledging completion of all punch list items
2. When the Contractor considers all of the punch list work items complete, the Contractor shall submit written notice through the General Contractor that all Punch List items are complete and resolved and the work is ready for final observation site visit. The signature lines for completion of each punch list item shall be signed by the Contractor indicating the work is complete and signed by the General Contractor indicating s/he has inspected the work and found it to be complete. Should the Engineer find the work to be finally complete and all Punch List items are complete the Engineer will make a recommendation to the Architect or Owner. If the Engineer has found the punch list work to be incomplete during final inspection a written listing of the observed deficiencies will be prepared by the Engineer.
3. If the work is not fully complete then the engineer shall be reimbursed for his time to reobserve the work. A reobservation fee shall be charged to the Contractor through the contractual agreement for any reobservations by the engineer.

F. Re-observation Fees
1. The re-observation fee shall be $1200.00 per visit.

G. Contractor's Project Completion Certificate
1. Upon completion of work and prior to request for Certificate of Occupancy, each Trade Contractor and the General Contractor shall issue a certificate stating that work has been installed generally consistent with construction documents and all applicable codes. RDK Engineers can furnish a blank Contractor's certificate form upon request. The certificate shall certify:
    a. Execution of all work has been in accordance with the approved construction documents.
    b. Execution and control of all methods of construction was in a safe and satisfactory manner in accordance with all applicable local, state and federal statutes and regulations.
2. The certificate shall include the following information:
    a. Project.
    b. Permit Number.
    c. Location.
    d. Construction Documents.
    e. Date on Plans and Specifications submitted for approval and issuance of the Building Permit.

f. Addendum(a) and Revision Dates.

3. The certificate shall be signed by the Contractor and include the following:

a. Signature.

b. Date.

c. Company.

d. License Number.

e. License Expiration Date.

PART 2 - PRODUCTS

2.1 NOT USED

2.2 IDENTIFICATION

A. Nameplates

1. Nameplates shall be laminated black Bakelite with minimum 1/4" high white recessed letters.

2. Nameplates shall be securely attached to the equipment. Utilize mechanical fasteners such as galvanized steel or brass screws for exterior applications. High strength adhesives or cements may be used for interior applications.

3. Equipment panel and valve bar code labels shall be 4" by 2½" and designed to withstand temperatures of -22°F to +392°F. Labels are designed to be resistant to water, acid/solvent, dirt and oil repellant. Labels shall be high tensile Graphiplast® tearing strength as well as scratch resistant and affixed to equipment by cable ties or adhesive clear pouch. Location of label shall be at unit control panel, next to factory nameplate, lower right-hand corner of panel, and/or tie wrapped to localize disconnect at unit. Installation instructions shall be provided with the labels to assure durability (i.e., clean surface prior to adhering adhesive label, leave cable ties loose on outside of equipment to allow freedom of movement due to the elements, etc.) and with adhesive tags not secured when temperatures are below 45°F ambient temperature.

2.3 RACEWAYS AND CONDUIT

A. Rigid Galvanized Steel (RGS) Conduit

1. RGS shall be zinc-coated steel that conforms to ANSI C80.1, UL Specification No. 6 and Federal Specification WW-C-581e by Allied Tube and Conduit, Republic Steel, Wheatland Tube or approved equal.

2. RGS fittings shall be threaded. Split couplings or non-threaded fittings shall not be used.

3. Nipples and Close Nipples shall be RGS, length as noted or as required to conform to field conditions.

B. Intermediate Metal Conduit (IMC)

1. IMC shall be zinc-coated steel that conforms to ANSI C80.6, UL Standard No. 1242 and Federal Specification WW-C-581e by Allied Tube and Conduit, Wheatland Tube or approved equal.

2. IMC fittings shall be threaded.

C. Electrical Metallic Tubing (EMT)

1. EMT shall be zinc-coated steel that conforms to ANSI C80.3, UL Standard No. 797 and Federal Specification WW-C-563 a by Republic Steel, Allied Tube and Conduit or approved equal.

2. EMT fittings shall be

a. zinc plated pressed steel gland and ring compression up to 2" and zinc plated pressed steel double set screw from 2" and up.

D. Miscellaneous Conduit Fittings

1. Elbows shall be standard radius unless noted otherwise. Where Large Radius elbows are specified, provide 48" radius unless noted otherwise.

2. Bushings shall be threaded pressed steel hot dipped galvanized with conduit end stop and integrally molded noncombustible phenolic insulated surface rated for 150^{o}C.

3. Bonding bushings shall be threaded pressed steel hot dipped galvanized with conduit end stop and integrally molded noncombustible phenolic insulated surface rated for 150^{o}C with a lay-in tin plated copper grounding lug.

4. Exposed conduit expansion fittings shall be hot-dipped galvanized malleable iron with external bonding jumper equal to O.Z./Gedney Type EX for RGS or Type TX for EMT (4" maximum expansion).

5. Provide water-tight gland sealing assemblies with pressure bushings equal to OZ/Gedney Type WSK for new cast-in-place installations or Type CSCM for retrofit (core drilling of existing walls) as required for below grade wall and floor penetrations.

E. Flexible Metallic Conduit

1. Liquidtight Metal Conduit shall be UL Listed fabricated from a spiral wound strip of heavy gauge, corrosion resistant, hot dipped galvanized steel equal to Electri-flex Company Type LA. The jacket shall be flame retarded, sunlight resistant PVC extruded over the spiral wrap. Sizes through 1 ¼" shall have an integral copper bonding strip.

2. Liquidtight fittings shall be UL listed zinc plated insulated throat.

3. Flexible metal conduit shall be UL Listed non-jacketed steel fabricated from a spiral wound strip of heavy gauge, corrosion resistant, hot dipped galvanized steel equal to Electri-flex Company Type BR.

F. Wireways shall be minimum 16-gauge steel with all straight runs having hinged spring-latched covers. Finish shall be painted over a corrosion resistant phosphate pretreatment to protect against corrosion. Interior parts shall be smooth and free of sharp edges and burrs. Provide wireway as identified on the drawings for NEMA 1, 3R or 12 service. Wireways shall be equal to Square D and UL Listed.

2.4 WIRE AND CABLE (600V)

A. Provide single-conductor, annealed copper wire and cable with insulation rated for 600 V, of sizes specified and scheduled on Drawings, by General Electric, Southwire,

Okonite or approved equal, for secondary service, feeders, branch and system wiring. Wire sizes shown and specified are American Wire Gauge for copper conductors.

B. The use of aluminum conductors is not allowed.

C. Wire #10 and larger shall be stranded; #12 and smaller shall be solid. Wire and cable shall have THWN-THHN or XHHW insulation for branch circuit and feeder conductors. Type RHWUSE shall be used for all conductors installed in below grade raceways for generator applications only.

D. Conductor Color-coding

1. Branch circuit and feeder conductors shall be color-coded. Conductors #12 and #10 shall be colored with a factory applied solid or striped compound coating (black, red, blue, brown, orange or yellow). Neutrals and equipment grounds shall have solid compound or solid color coating (white, gray and green), except that neutrals with colored stripe shall be used where required by code. Phase conductors #8 and larger with stripes, bands or hash marks shall have background color other than white, green and gray.

2. Alternative field-applied color coding methods may be used for wire #8 or larger, with color code as specified in other sections of this specification. Coloring shall be applied by the use of flame-retardant vinyl tape, equal to 3M Scotch 35.

E. Cable

1. Flexible Metal Clad (MC) cable shall be UL Listed with THHN insulated conductors with an insulated grounding conductor within galvanized steel or aluminum interlocked armor. Connectors shall be provided with lock nut connection to the termination point enclosure.

2. Flexible Metal Clad (MC) cable utilized for Fire Alarm service shall be identified with a factory applied tracer along the entire length.

F. Splices and Terminations

1. Ampacity and temperature rating of splices and connectors shall be equal to or greater than those of associated wires and cables.

2. Make splices in branch circuit or feeder wiring from #12 to #10 with UL-listed, solderless screw on connectors rated 600 V.

3. Make splices in branch circuit or feeder wiring above #10 with UL-listed 90°C, 600V, compression butt splice barrel equal to Burndy YS-L HYLINK.

4. Conductor terminations shall be standard bolt-on lugs with hex screws listed for attachment of copper wire and cable to panelboards, switchboards, disconnect switches and other electrical equipment.

5. Make terminations for stranded conductors on screw terminals with UL Listed 105°C, 600V PVC insulated barrel compression locking fork tongue terminal equal to Burndy TP-LF VINYLUG.

6. Make bus terminations for conductors #6 and larger with UL-listed 90°C, 600V, compression standard barrel length lugs equal to Burndy YA-L for conductor sizes to #4/0. Connectors for cable 250 KCMil and larger shall be with UL-listed 90°C, 600V, compression long barrel length two hole lugs equal to Burndy YA-

2N. Lugs shall be high conductivity seamless copper electro-tin plated for corrosion protection.

G. Wire management shall be provided by self-extinguishing self-locking nylon ties with -65 to 350°F. range for bundling conductors.

H. Cable pulling compounds shall be UL Listed and be suitable for use with the specified cable insulation system. The compound shall reduce the coefficient of friction, while not adding any long term issues to the installation such as premature aging of the insulation system, added flammability or drying in such a manner as to stick the cable in place in the raceway.

2.5 WIRING DEVICES AND PLATES

A. Provide wiring devices by single manufacturer. Catalog designations of Cooper are specified, unless noted otherwise, to establish standards of quality for materials and performance. Colors of devices as specified below are White for standard applications. Refer to the drawings for color requirements that vary from White. Equal products by Leviton, Pass & Seymour or Hubbell will be accepted. Provide published manufacturers cross-reference sheet highlighted with the device specified and that being submitted with all device product data for approval.

B. Wall switches shall be of the totally enclosed tumbler type. Wiring terminals shall be spring loaded terminal screws for back or side wiring. Switches shall be rated 20-ampere 277 volt for use on alternating current only. The yoke shall have a grounding terminal with a green hex head screw. Pilot lights indicated shall consist of red lighted handle, illuminated when the switch is on.

C. Toggle Switches shall be heavy duty, UL listed, specification grade as follows:

1. Single-pole shall be No. 2221W

2. Double-pole shall be No. 2222W

3. Three-way shall be No. 2223W

4. Four-way shall be No. 2224W

D. Miscellaneous Switches:

1. Dimmer switches shall be slide type equal to Lutron Nova with single gang capacity up to 2000 watts. The dimmer shall be selected and sized based upon the attached load and the mounting configuration. All incandescent dimmers shall incorporate an integral torodial choke to eliminate lamp filament buzz and minimize RFI and EMF.

a. Low voltage and fluorescent Nova dimmers shall be selected based upon the fixture type (electronic or magnetic). Submittal shall include lamp fixture data to ensure compatibility.

2. Occupancy Sensors

a. For dual-switching applications, wall mounted passive infrared occupancy sensors shall be equal to Leviton ODSOD-ID-W suitable for use in areas up to 900 SF with adjustable time delays from 30 seconds to 30 minutes, dual circuit relay ambient light override, self adjusting delayed off time, walk-through and manual on features.

b. Provide occupancy sensors equal to Leviton ODS10-ID-W for single switching applications.

c. Multi-technology ceiling mounted occupancy sensors with 1000 SF coverage shall be equal to Leviton OSC10-MOW. Provide with corresponding Leviton OSP Series Power Packs.

d. Occupancy sensors shall be as manufactured by Leviton, Sensorswitch, Hubbell, or approved equal.

3. Provide filled out utility rebate forms with all occupancy sensor submissions for separate application by the Owner.

4. Wall mounted time switches shall be solid state with integral LCD backlit display. Unit shall be white, have user selectable time interval and audio/visual warning at the end of the timing period. Switch shall be equal to Tork SSA100.

E. Receptacles:

1. Receptacles shall be nylon faced with rigid, glass reinforced nylon bodies. Wiring terminals shall be spring loaded terminal screws for back or side wiring. Receptacles shall be rated 20-ampere 125 volt. The yoke shall have a grounding terminal with a green hex head screw.

2. Duplex receptacles shall be UL Federal Specification WC-596 Specification Grade Extra Hard Duty 125V, 20A, 2 pole, 3 wire as follows:

a. General Use shall be No. 5362W (White)

b. General Use single receptacle shall be No. 5361W (White)

c. GFCI Interior shall be No. GF20W (White)

d. GFCI Exterior shall be GF20BK (Black) UL listed Weather Resistant

3. Special purpose outlets shall be provided as indicated on the drawings at the ratings listed on the schedules and notes.

F. Wiring Device Plates:

1. Provide high-impact smooth nylon device plates by the manufacturer of the wiring device for all flush mounted switches and receptacles installed in dry locations and where not subjected to physical abuse. Fastening screws shall be color matched to the plate, plate color and to the device. Ganged plates shall be of one piece construction to accommodate the required number of installed devices. Oversized plates to cover wall finish blemishes adjacent to the device box shall not be used.

2. Provide heavy-duty cast aluminum horizontally mounted weatherproof covers for GFCI receptacles where weatherproof devices are specified equal to Hubbell No. WP26MH. Cover shall be attached to FS box with 4 screws and spring back to the closed position upon removal of the cord set. Fasteners chrome-plated brass.

3. Receptacle device plates for other than 20 amp, 120 V, 2-wire, circuits shall be provided with typed clear plastic label (equal to P-Touch) mounted to the device plate indicating voltage characteristics, panelboard and circuit number of outlet

2.6 OUTLET BOXES

A. Outlet and switch boxes on concealed work shall be at least 4" square, galvanized pressed steel conforming to UL 514A. Where installed in plaster, boxes shall be fitted with galvanized steel plaster covers of required depth to finish flush with finished wall or ceiling. Outlet boxes shall be by Steel City Electric Company, Appleton Electric Company, or approved equal.

B. Outlet boxes installed in masonry walls or in concrete decking shall be UL Listed for the application.

C. Outlet boxes for interior surface mounted locations where RGS is specified where exposed to moisture, at kitchen and cafeteria equipment, adjacent to water or steam connections, and where indicated as weatherproof on Drawings shall be cast malleable iron with an aluminum polymer enamel coating equal to Appleton Type FD. Conduit entries shall be threaded cast hubs. Device covers shall be coated malleable iron with moisture sealing gasket and stainless steel fasteners.

D. Outlet boxes for exterior surface mounting shall be cast aluminum alloy with an aluminum polymer enamel coating equal to Appleton Type FD. Conduit entries shall be threaded cast hubs. Device covers shall be cast aluminum alloy with moisture sealing gasket and stainless steel fasteners.

E. All boxes shall have at least one tapped and threaded grounding hole for connection of a 10-32 grounding screw.

F. Box depth shall accommodate code required volume for the specified installation. Through wall boxes shall not be used.

G. Outlet boxes for various systems including but not limited to fire alarm, paging and master clocks shall be sized as required by the manufacturer. Boxes shall be cast where exposed to physical damage or installed in an exposed exterior location.

H. Floor outlets shall be heavy-wall cast iron bodies with edge frames and floor plates of polished bronze. Boxes shall be watertight and be fully adjustable before and after pouring. Provide insert floor plates with hinged covers for duplex receptacles or for telephone connection as shown on the drawings. Multi-gang boxes shall be provided with internal removable barriers for separation of different voltages. Provide carpet plates where required. Boxes shall be equal to Steel City 840 SC Series.

2.7 JUNCTION AND PULL BOXES

A. Provide galvanized steel junction and pull boxes where indicated and as necessary to facilitate installation. Steel shall be minimum 16 gauge. Junction and pull boxes shall be of code required dimensions. Cover shall be of the same type and thickness material as the box construction.

B. Junction and pull boxes intended for dry interior locations shall be NEMA 1 enclosures with accessible, removable screw-on covers. Covers shall be secured with corrosion-resistant screws with keyhole slots to accommodate easy removal.

C. Junction and pull boxes intended for wet or exterior locations shall be NEMA 3R enclosures with hinged gasketed covers. Interior and exterior shall be finished with a gray enamel powder coat over the galvanized metal. Hinge shall be galvanized steel with stainless steel pin. Covers shall be secured with corrosion-resistant zinc plated lockable pull catches.

D. Custom fabricated medium to large junction and pull boxes shall have internal structural steel bracing welded to form a rigid assembly adequate to maintain alignment and shape in shipment and installation.

2.8 SAFETY DISCONNECT SWITCHES

A. Switches shall be three-pole heavy-duty type rated for 600V in NEMA 1 (interior dry applications) and NEMA 3R (exterior applications) enclosures unless noted otherwise on the drawings. All switches shall be horsepower rated and suitable for service entrance use. Provide with solid neutral where four wire circuits are indicated and with 200% solid neutral where neutrals are sized for 200% full load ampacity.

1. Operating mechanisms shall be quick-make/quick-break. Current-carrying parts shall be high-conductivity copper. Contacts shall be silver-tungsten or plated. Provide positive pressure fuse clips and switch operating mechanism suitable for continuous use at rated capacity without auxiliary springs in current path. Switches shall withstand available fault current or let-through current before operating, without damage or rating change.

2. Terminations shall be suitable for copper or aluminum conductors 60o/75o C rated. Clear shielding shall prevent accidental contact with energized line terminals.

3. The cover shall be mechanically interlocked to prevent access unless the disconnect is in the OFF position. A defeater shall be provided to bypass this interlock. With the door open, an interlock shall be provided to prevent inadvertent closing of the disconnect. Padlocking facilities shall be provided to positively lock the disconnect in the OFF position with from one to three padlocks with the door open or closed.

4. The enclosure shall be given a phosphatizing pretreatment. The paint finish shall be manufacturer's standard color and shall pass 600 hours of corrosion resistance testing per ASTM B 117.

B. Fused switches shall have short circuit ratings no less than 100,000 amperes RMS, with capabilities to 200,000 amperes when used with Class J, L or R fuses at 480V from 400A to 1200A.

C. Manual Motor Starters shall have quick make, quick break toggle mechanisms with allowance for up to 10% field adjustment in nominal overload heater values. Manual Motor Starters shall be NEMA 1 (interior dry applications) and NEMA 3R (exterior applications) enclosed unless noted otherwise on the drawings. Provide Cutler Hammer type MS manual starters for applications up to 1 HP at 240V single phase and type B100 for up to 1 HP at 277V single phase.

2.9 MOTOR STARTERS

A. The Motor Starters shall be 600 volt class NEMA rated suitable for operation on a three-phase, 60-Hertz system. The system operating voltage shall be as indicated on the drawings.

B. Combination Starters

1. Combination starter units shall be full voltage non-reversing, unless shown otherwise, and shall utilize Motor Circuit Protectors. Minimum size shall be NEMA Size 1. Maximum across-the-line starter shall be NEMA size 2 unless

noted otherwise on the Drawings. Starter units shall have three (3) hand reset overload relays, bi-metallic type, ambient compensated. Hand reset shall be by insulated button on outside of starter unit enclosure.

2. Each combination unit shall be rated 100,000 A/C symmetrical at 480V. The HMCP shall provide adjustable magnetic protection and be provided with pin insert to stop magnetic adjustment at 1300% motor nameplate full load current to comply with NEC requirements. All HMCP combination starter units shall have a "tripped" position on the unit disconnect and a push-to-test button on the HMCP. Type HMCP motor circuit protectors shall include transient override feature for motor inrush current.

3. Line starters shall be electrically operated, electrically held, three-pole assemblies with arc extinguishing characteristics and shall have silver-to-silver renewable contacts. They shall have provisions for a total of eight NO or eight NC auxiliary contacts and shall include NO/NC contacts as scheduled on the drawings. Overload relays shall be thermal bimetallic, reset from outside enclosure by insulated button.

4. Provide fused (two primary and one secondary) control power transformer, push to test LED indicating lights (green power available/energized and red/running), Hand-Off-Automatic (HOA) selector switch and two normally open and two normally closed contacts for each starter, unless scheduled otherwise on Drawings. Device panel mounted on the face of the starter shall accommodate a minimum of six oil-tight pilot control devices.

5. An operating mechanism shall be mounted on the primary disconnect of each starter unit. It shall be mechanically interlocked with the unit door to prevent access unless the disconnect is in the OFF position. A defeater shall be provided to bypass this interlock. With the door open, an interlock shall be provided to prevent inadvertent closing of the disconnect. Padlocking facilities shall be provided to positively lock the disconnect in the OFF position with from one to three padlocks with the door open or closed.

C. Manual Motor Starters – Refer to Safety Disconnect Switches

D. Enclosure

1. The type of enclosure shall be in accordance with NEMA Standards for Type 1A with gasketed doors.

1 General; 3R Weatherproof.

2. The enclosure shall be given a phosphatizing pretreatment. The paint finish shall be manufacturer’s standard color and shall pass 600 hours of corrosion resistance testing per ASTM B 117.

E. Motor Starters shall be as manufactured by Cutler-Hammer, General Electric, Siemens or Square D.

2.10 PANELBOARDS

A. General

1. Provide dead-front lighting and power panelboards where shown on drawings and as scheduled.

2. Panelboards shall meet or exceed requirements of NEMA Standard Publication PB-1, and UL-50 and 67. Panelboards shall be UL-listed.

3. Where panelboards are used as service entrance equipment, they shall comply with all NEC and UL requirements for service. The panelboard shall include a UL service entrance label, incoming line isolation barriers and a removable neutral bond to ground for solidly grounded wye systems.

4. Enclosures shall be at least 20 inches wide made of galvanized steel. Gutter space shall be in accordance with NEC requirements for the specified combination of devices and accessories. Fronts shall be reinforced steel with concealed hinges and concealed trim adjusting screws. Trim clamps are unacceptable. Where two section panels are required, bolt boxes together to form one unit. Trim shall be two-piece construction with doors of equal size over each section. Trims shall be cleaned, primed and painted gray ANSI 61.

5. For panelboards up to 400 amps, provide cabinets with flush hinges and combination catch and lock to cover circuit breaker handles. Provide a directory card with a clear plastic cover mounted inside the door. Power and lighting panels shall have heavy-duty, continuous, section vertical-hinged to box section for access to wiring gutters in addition to trim door. All locks shall be keyed alike. Panelboards greater than 400 amps shall be provided with a four-piece front to cover wiring gutter and wiring access areas.

6. Nameplates shall be in accordance with other sections of this specification.

7. The manufacturer shall warrant equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.

8. Panels shall be GE A- Series for 400 A and below unless more than (1) 125 amp or larger branch breaker and/or space is specified. Spectra Power panelboards shall be provided for all applications greater than 400 amps and to accommodate multiple branch breakers greater than 125 amps. Approved equal panelboards by Cutler-Hammer, Siemens or Square D will be considered.

B. Bussing

1. Main bus bars of panels shall be copper, rated to carry at least full rating of the panel as identified on the schedules.

2. Split solid neutral bus, with rated capacity equal to the phase bus, shall be plated and located in main compartment for all incoming neutral cables to be same length. Neutral bus shall be 200% rated where double sized neutrals are indicated and/or where the panel is supplied via a K-rated transformer.

3. Provide separate equipment ground bus for each panelboard. Where an isolated ground is specified, provide an additional isolated ground bus, which shall be insulated from the panel enclosure and equipment ground.

4. Panelboards shall have a short circuit current rating equal to or greater than circuit breaker AIC ratings schedule on the Drawings. Where series ratings are allowed, as per the schedule on the Drawings, a label shall be affixed to the panel stating the conditions of the UL Series rating including:

a. Size and type of upstream device

b. Branch devices that are acceptable

c. UL Series short-circuit rating

5. All lugs shall be UL listed tin-plated aluminum suitable for copper or aluminum cable for sizes indicated on the drawings. Provide oversized lugs to accommodate designed cable sizes or increase gutter space to allow use of solid stud compression lugs where necessary. All terminations shall be suitable for 75 degree C cable.

6. Provide bus connections for future overcurrent devices with suitable insulation and bracing to maintain proper short circuit rating and voltage clearances. All required hardware shall be installed and be in place for ready insertion of future breaker without the need to relocate adjacent units. Future spaces shall accommodate frame sizes up to 50% of the main bus ampacity.

C. Overcurrent Devices

1. Molded case circuit breakers shall be bolt-on devices with thermal and magnetic trip elements in each pole. Multi-pole breakers shall have internal common trip crossbars for simultaneous tripping of each pole. Trip units shall be thermal magnetic unless solid state sensing specifically indicated on the drawings.

2. All breakers shall have handle trip indication and a trip indicator in window of circuit breaker housing.

3. Three pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs.

4. Internal accessories shall be UL Listed for field installation without removing the circuit breaker cover. Internal accessories shall be common to all frame sizes. Shunt trips, undervoltage releases, auxiliary switches, and bell alarms shall be available for all breakers and shall install from the front of the circuit breaker or molded-case switch.

2.11 LIGHTING FIXTURES

A. Provide lighting fixtures, equipment and components where shown on Drawings, as listed in fixture schedules and as specified, wired and assembled. Provide approved aligned canopies, hangers and other appurtenances as required, for a complete and functional system.

B. Refer to the lighting fixture schedule for specific ballast requirement. In general:

1. Fluorescent fixtures shall have electronic ballasts with high power factor, 120V, with sound rating “A” and shall be CBM-certified. Total harmonic distortion rating shall be less than 10%. Ballasts shall be instant start or programmed rapid start for maximum performance and energy savings and have a minimum ballast factor of 0.88. Acceptable ballasts manufacturer are Osram Sylvania Inc., Advance Electric, GE or Universal.

2. Electronic ballasts that operate T-5 and compact fluorescent lamps shall have end-of-lamp-life shut down to protect against lamp over heating.

C. Refer to the lighting fixture schedule for specific lamp type, CRI and color.

1. Tungsten-halogen lamps shall be rated for 130V.

2. Incandescent lamps shall be inside-frosted, extended service.

3. Fluorescent lamps shall have minimum CRI rating of 82.

4. Acceptable lamp manufacturers are: Osram Sylvania Inc., G.E., Philips, or approved equal.

D. Refer to fixture schedule for specific lamp and ballast requirements which may deviate from this specification.

E. Verify ceiling constructions, and provide frames, rings and other accessories suitable for construction encountered.

F. Provide polyester covers to protect fluorescent fixtures with parabolic louvers during construction.

2.12 FIRE ALARM – ADDRESSABLE WITH VOICE EVACUATION

A. General

1. Provide a complete addressable fire detection, alarm and control system with speaker / strobe signaling devices in compliance with all applicable codes and authorities having jurisdiction. The system shall interface with all other building systems for monitoring and control functions as specified.

2. Provide automatic and manual, closed circuit, multiplex fire alarm communications according to the following Specifications and as shown on the Drawings, wired, connected and left in first class operating condition.

3. The system design and installation shall conform to the following standards:

a. All equipment shall be UL listed for its intended purpose.

b. All applicable NFPA standards, including but not limited to: 70, 72, 90A, 92A, and 101.

c. State Building Code.

d. The Americans with Disabilities Act (ADA)

e. All requirements of the Authority Having Jurisdiction (AHJ)

4. The equipment supplier and the Contractor shall demonstrate a minimum 5 years experience in the successful design and installation of addressable fire alarm systems similar in size and scope to that required for this project.

5. System shall operate from 3 wire AC supply with emergency generator backup on failure of normal system and integral standby battery source backup on failure of the emergency generator.

6. The installer and manufacturers warrantee shall be for a minimum period of one (1) year from the date of the final acceptance test approval.

7. Equipment shall be manufactured by EST.

B. Sequence of Operation

1. Refer to the Sequence of Operation Matrix on the plans and the Fire Protection Narrative for the intended system operation.

C. Control

1. General Requirements

   a. The microprocessor-based fire alarm system shall be designed and UL approved for Fire Alarm applications. The system operational characteristics shall be stored in non-volatile EEPROM memory, shall be field programmable and capable of being edited with no factory involvement.

   b. The system shall support analog sensing techniques to monitor individual devices enabling the user to manually or automatically change the sensitivity parameters in accordance with design and application requirements. All inputs shall be subject to multi-level alarm verification. The system shall be capable of displaying status of the sensor by device. The system shall automatically identify any analog sensor which becomes dirty (maintenance alert), prior to false alarming. The system shall automatically conduct a recognized functional check of each sensor a minimum of three times daily. Failure of a sensor shall initiate a Trouble signal.

   c. Standby batteries shall support the system in the event of a loss of primary power for 24 hours of full supervisory operation followed by 15 minutes of alarm. Batteries shall be mounted integral to the FACP.

   d. An integral real time clock will provide time control functions including day of week programming to schedule control of detector sensitivity and alarm functions. The system shall be capable of multiple levels of alarm prioritization, and allow control by event, and may include cross zoning, stepping, and/or logic statement inputs.

   e. Addressable loop wiring (Signaling Line Circuits - SLC) shall be wired in a Class A method. Each circuit shall allow for a minimum of 25% additional devices.

   f. Isolation Modules shall be provided to maintain circuit integrity in the event of an open, short or ground fault. Each addressable loop shall have a minimum of one (1) isolation module for every 20 devices or one (1) per floor; whichever is greater.

   g. Non-addressable loop wiring (Initiating Device Circuits - IDC) shall be wired in a Class A method.

   h. Audible and visual circuits (Notification Appliance Circuits - NAC) shall be wired in a Class A method. Each circuit shall allow for a minimum of 25% additional devices. Provide a minimum of two (2) circuits per floor or area, alternately wiring adjacent notification appliances between circuits.

2. Control Panel

   a. The designated Fire Alarm Control Panel (FACP) and each corresponding network panel shall provide the overall network annunciation and control, system monitoring, testing, and firefighter controls to override automatic actions. Each panel shall monitor all initiating devices, annunciate the alarmed device and its location, notify the local authority, capture elevators, transmit signals to activate smoke

control functions and initiate audio/visual evacuation signaling to all or selective areas of the building. The networked system may consist of up to 10 nodes operating as a peer-to-peer network. Each network panel shall be sized to accommodate a minimum of 250 analog/addressable devices. Network-wide annunciation and control shall be in accordance with true peer-to-peer network operation. Peer-to-peer operation is the ability to perform global annunciation and control on a network-wide basis from any network panel or annunciator.

b. The FACP shall provide the overall system monitoring, testing, display, reporting and firefighter controls to override automatic actions.

c. The FACP shall monitor all initiating devices and respond in accordance with the Sequence of Operation. Each initiating device shall have full analog sensing capabilities. The FACP will identify the exact type and location of every device and maintain operating characteristics stored in on-board EEPROM memory.

d. The FACP shall be enclosed in a locking semi-flush enclosure. All panel initiating and control status indicators shall be visible through a clear Lexan window. Access to the control panel shall be by key. The FACP shall incorporate a primary CPU, complete system power supplies, standby batteries, annunciation and the required switch functions to provide the system operation as specified. The designated panel shall contain the audio amplifiers with associated paging microphone for the voice evacuation system. The main CPU shall have the necessary firmware to provide via software programming the following:

1) Logic statements / Stepping alarm functions
2) Weekday / Holiday schedules
3) Analog sensitivity reporting
4) System sensor maintenance alerts
5) Individual sensor sensitivity adjustments
6) Day / night sensitivity adjustments
7) Alarm verification by point or zone
8) Alarm verification activity report
9) On demand system status printout
10) Normal and silent walk test
11) 1800 event history log and printout

e. All alarm and supervisory information shall be displayed on an 80-character backlit LCD display. The display shall be an integral part of the FACP and shall include a keypad with separate buttons for system status scrolling, alarm acknowledge, trouble acknowledge, reset and system drill. The unit shall have LED indicators for Normal, Alarm, Supervisory, Trouble and Test/Program.

f. Provide matrix switch and LED status panels for zone annunciation, zone disconnect, HVAC override or other related monitoring and control functions, integral to the FACP. These are intended for use by the Fire Department during an event, or by authorized personnel during testing periods. Keypad entered commands for these functions shall not be an acceptable substitute. Alarm LEDs shall be provided by type of device on a per floor and/or zone basis. Programmable two (2) position zone disconnect switches shall be provided on a per floor and/or zone basis with corresponding status LEDs. Placement of a switch in other than the normal condition should initiate a supervisory signal.

3. Remote Cabinets

a. Provide distributed intelligent power supplies to accommodate the power requirements of NAC circuits and audio amplifiers. Power supplies shall communicate with the FACP via data communications, whereby each power supply shall report a loss of AC power, battery fail or ground fault, and each notification appliance circuit served shall be individually monitored for wiring integrity.

b. Provide fire alarm terminal cabinets where necessary. The cabinets shall have a removable hinged cover with lock and high barrier terminal strips with 64 or 128 point capacity mounted to a plywood backboard. Terminal cabinets shall be red and labeled with permanent white lettering

D. Initiating Devices and Accessories

1. Provide addressable detectors as shown on the drawings. Detectors shall be connected to the addressable loop with two wires. All detectors shall incorporate built-in identification for the system to automatically identify various types of sensors. Detectors shall utilize a flashing LED which denotes normal operation, and latched LED which indicates an alarm condition. All common types of analog detectors shall be interchangeable with common twist-lock bases. The standard base shall have a supervised LED output, and optional relay and isolator bases shall be available.

2. Analog sensors shall provide indication to the control panel that a detector requires maintenance, and shall operate in stand-alone mode in the event of an addressable loop communications failure.

3. Analog Photoelectric Smoke Detectors shall be continually monitored to measure any change in their sensitivity because of the environment (dirt, air temperature, humidity, etc.), and shall allow changes in sensitivity levels within the UL approved sensor's range. The photoelectric detector shall consist of a dust resistant, field cleanable photo chamber with microprocessor based solid state electronics.

4. Analog Duct Smoke Detectors shall be continually monitored to measure any change in their sensitivity because of the environment (dirt, air temperature, humidity, etc.), and shall allow changes in sensitivity levels within the UL approved sensor's range. Detector shall be photoelectric in accordance with the ceiling mounted device specified above. Duct detectors shall be supplied with a housing, remote indicator and sampling tubes sized according to duct width. Two programmable form C contact outputs will be provided with each device to

provide the required HVAC control interface functions. Provide low temperature duct smoke detectors rated at -4°F to 158°F operating temperature. For locations as indicated on drawings.

5. Furnish each duct smoke detector with alarm and remote test control station. Test control shall be key actuated two position Test-Normal.

6. Analog Multi-Sensing Detectors shall employ photoelectric, ionization and thermal sensing principles. Sensors shall allow changes in sensitivity levels within the UL approved sensor's range.

7. Analog Thermal detectors shall monitor the ambient temperature from 32 to 158 F, and provide fast response to rapid increases in temperature. Rate of rise detection rate and fixed setpoint shall be panel selectable

8. Manual Pull Stations shall be double action type with screw terminals and an integral toggle switch. The station shall be constructed of red Lexan with white raised letters, and a key reset switch. The station shall have integral addressable electronics and mount to a standard single gang switch box or to a red surface mount box when required.

9. Provide clear Lexan covers over specified pull stations. Cover shall be provided with integral battery operated alarm module, which will emit a loud audible alert when the cover is opened. Covers shall be equal to Stopper or Sentry.

10. Monitor Modules shall be provided to monitor and connect conventional initiating devices onto the addressable loop.

E. Notification Devices and Accessories

1. Primary Notification Appliances shall be flush mounted combination speaker/strobe units. Assembly shall be mounted on red lexan frame, on surface or flush wall/ceiling box. Where box is surface mounted, it shall be red cast aluminum.

2. Visual notification appliances shall be self-synchronizing xenon strobes rated by UL 1971 test criteria and in accordance with the Americans with Disabilities Act and NFPA 72. Visual signals shall have a minimum effective intensity rating of 15 candela(cd) or as otherwise specified on the drawings.

3. Speaker notification appliances shall be UL 1480 multi-tapped Cone or Re-Entrant Speakers. Speaker shall have ¼, ½, 1 or 2 watt settings. The minimum reverberant sound output shall be 85dBA at 10’ at a 1-watt setting. Provide re-entrant units with 2, 4, 8 and 15 watt tap settings in all outdoor, shop or other designated high ambient noise areas.

4. Each audio amplifier or each group of amplifiers shall include one (1) redundant backup amplifier. The system shall automatically switch to the backup amplifier upon failure of any one (1) of the primary amplifiers.

5. Remote Alarm Indicators shall be LED indicators on single gang plastic plates for smoke detectors as indicated on the plans.

6. Control Modules shall be to supervise and control conventional devices (notification circuits, AHUs, door holders, etc.) over the addressable loop.

Control modules shall provide a supervised output rated for 2 amps at 24VDC, and .5 amps at 120VAC.

7. Remote Graphic Annunciator shall incorporate LED indications of alarm and trouble conditions as per the zone schedule. The annunciator shall depict the building layout as represented on the floor plans, and be approved by the Owner, Architect, Engineer and the local authority prior to construction. Where remote system control functions are required, the annunciator shall provide key-enabled Alarm Silence, Trouble Silence, Drill/Test and Reset switches. A voice evacuation interfacing microphone shall be provided at each annunciator location. Zone selection switches shall be provided to send prerecorded or page messages to the entire building or individual floors.

8. Door Holders shall be rated 24VAC/DC magnetic flush, semi-flush, surface and/or floor mounted as indicated on the drawings. Minimum holding force shall be 25 pounds. Body shall be die cast with polished chrome finish. Provide swivel catch with required rod lengths and back plates for secure mounting to door.

F. Submittals

1. The manufacturer shall provide copies of the following documents for review and evaluation in accordance with general requirements of Division 1 and 16:

   a. Point to point wiring diagrams of the entire system including all conductor quantity and sizing, labeling (numerical and color coding) and interconnections. Each initiating device and notification appliance shall be given a unique identification. This identification and visual notification appliance device and audible notification appliance tap settings shall be illustrated on the floor plans and submitted for approval with the wiring diagrams.

   b. Individual device interconnection diagrams. Panel layouts shall indicate module placement and spare capacity allowance for future expansion.

   c. Manufacturers catalog cut sheets of all components and devices.

   d. Battery capacity calculations clearly indicating required and spare capacity.

   e. Power supply capacity calculations including each circuit load, voltage drop and spare capacity.

2. Submission of certification records for qualifications of the technicians performing final connection and testing.

3. Submit written test report in accordance with NFPA72 Chapter 14 for notification of successful completion of each required test and a system Record of Completion in accordance with NFPA72 Section 10.18. Provide floor plan illustrating ambient and alarm sound levels to document notification appliance testing.

4. Submit operations manual detailing all functions and operations of the system. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with UL Standard 864.

5. Submit maintenance manuals and recommended spare parts list required to conform to NFPA maintenance guidelines. Instructions shall include but not be limited to:

   a. Instructions for replacing any components of the system, including internal parts.

   b. Instructions for periodic cleaning and adjustment of equipment with a schedule of these functions.

   c. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.

6. As-built drawings shall include all device addresses, alphanumeric descriptors assigned in the control panel, and final notification appliance tap settings with modified space power supply capacity illustrated.

2.13 VARIABLE FREQUENCY DRIVES

A. General

1. Provide solid state, pulse-wide modulated (PWM) Variable Frequency Drives (VFDs) as scheduled on the drawings for use with standard NEMA Design B induction motors in variable torque applications.

2. The VFDs with all options shall comply with the latest applicable standards of UL 508C, IEEE 519, NEMA and the IBC. VFDs shall be UL Listed and Labeled.

3. The manufacturer shall warrantee the equipment to be free from defects in material and workmanship for 2 years from the date of certified startup.

4. Acceptable manufacturers provided they meet the full requirements of this specification shall be ABB, Allen Bradley, Eaton, GE, Square D, Siemens or Yaskawa.

B. Construction

1. Enclosures:

   a. The housing shall be UL Type 1, NEMA 12, suitable for plenum installation.

   b. Operating environment shall be 32-122 ºF continuous, less than 95% humidity. All circuit boards shall have conformal coatings.

   c. Door interlocked, padlockable disconnect switch that will disconnect all input power from the drive and all internally mounted options. The enclosure must be mechanically interlocked such that the disconnecting device must be in the “Off” position before the enclosure (VFD or bypass if applicable) may be accessed.

2. User Interface

   a. A digital display and keypad shall provide access and monitoring of all VFD functions. The keypad shall include Hand-Off-Auto selections and Manual Speed Control/Override.

b. The keypad shall contain a built-in time clock. The clock shall have a battery back up with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault.

3. Standard Features

a. The VFD shall have a UL listed short circuit current rating of 65,000 amps.

b. The input current rating of the VFD shall be no more than 3% greater than the output current rating. Efficiency shall exceed 97% at 100% and 90% at 50% speed and load. Line side displacement power factor shall exceed 0.96 regardless of speed and load.

c. VFDs for motors in excess of 50 HP shall be 18 pulse with a phase shifting transformer unless the drive has ultra-low harmonic distortion capabilities (less than 3% THD at the VFD terminals).

d. The VFD shall operate with a tolerance for input voltage deviation from +10% to -15% nominal.

e. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds.

f. The VFD shall have internal 3% minimum impedance reactors to reduce the harmonics to the power line and to add protection from AC line transients. Input rectifier shall be protected from line events by MOV surge suppression. Passive input filters shall be sized and provided as required by the VFD manufacturer to ensure THD limitations defined in the Submittal section of this specification are met.

g. All VFD's shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted.

h. Provide dv/dt filtering within the VDF for motor leads that exceed 50 feet in length (may be required by manufacturer for lesser lengths). Line reactors shall be sized to minimize dv/dt and voltage overshoot at the motor terminals.

i. Carrier frequency shall be field adjustable to a minimum of six different settings.

j. The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to set point without tripping or component damage (flying start).

k. The VFD shall have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.

l. Class 10, 20 or 30 (programmable) electronic motor overload protection shall be included.

4. Control

a. The VFD shall provide a programmable loss-of-load (broken belt / broken coupling) Form-C relay output. The drive shall be programmable to signal the loss-of-load condition via a keypad warning, Form-C relay output, and / or over the serial communications bus.

b. The VFD shall include multiple "two zone" PID algorithms that allow the VFD to maintain PID control from two separate feedback signals (4-20mA, 0-10V, and / or serial communications). The two zone control PID algorithm will control motor speed based on a minimum, maximum, or average of the two feedback signals. All of the VFD PID controllers shall include the ability for "two zone" control. If the input reference (4-20mA or 2-10V) is lost, the VFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, Form-C relay output and / or over the serial communication bus.

c. There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications), the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD digital input and allows VFD motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop and the damper shall be commanded to close.

d. The VFD control shall include a programmable time delay for VFD start and a keypad indication that this time delay is active. A Form C relay output provides a contact closure to signal the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates.

e. The VFD shall include a fireman's override input. Upon receipt of a contact closure from the fire / smoke control station, the VFD shall operate in one of two modes: 1) Operate at a programmed predetermined fixed speed ranging from -500Hz (reverse) to 500Hz (forward). 2) Operate in a specific fireman's override PID algorithm that automatically adjusts motor speed based on override set point and feedback. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlocks, and force the motor to run in one of the two modes above.

5. Communications

a. The VFD shall have an RS-422/EIA-485 port. The standard protocols shall be Modbus, Johnson Controls N2, Siemens Building Technologies FLN, and BACnet The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL Listing for BACnet).

b. Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible.

C. Bypass

1. A factory fabricated, wired and tested bypass system consisting of a door interlocked, padlockable circuit breaker, variable frequency drive, input contactor, output contactor, bypass contactor, all UL listed as an assembly shall be provided. Additional bypass accessories shall be as follows:

   a. 120V control power transformer with dual primary and single secondary fused protection.

   b. Drive/Bypass selector switch

   c. Bypass Hand-Off-Automatic selector switch.

   d. Push-to-test LED Red Running and Green Energized/Off pilot lights.

   e. UL Listed Class 10, 20, or 30 (programmable) electronic motor overload protection.

2. The drive panel will include a drive input and output contactor and a drive bypass starter. The drive isolation contactor will allow for removal of line power to the drive while running the motor with line voltage. The contactors will be mechanically and electrically interlocked to prevent operating at the same time. A solid state reduce voltage starter will be supplied for starting the motor in bypass operation mode where the motor exceeds 50 HP.

3. Motor protection from single phase power conditions - the bypass system must be able to detect a single phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single phase input power indication.

4. The bypass system shall NOT depend on the VFD for bypass operation. The bypass system shall be designed for stand alone operation and shall be completely functional in both Hand and Automatic modes even if the VFD has been removed from the system for repair / replacement. Serial communications shall remain functional even with the VFD removed.

5. Serial communications – the bypass shall be capable of being monitored and / or controlled via serial communications. On-board communications protocols shall include ModBus; Johnson Controls N2; Siemens Building Technologies FLN (P1); and BACnet.

6. The bypass control shall include a programmable time delay for bypass start and keypad indication that this time delay is in process. A Form C relay output provides a contact closure to signal the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates at full speed in the bypass mode. The time delay shall be field programmable from 0 – 120 seconds.

7. The bypass shall provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in VFD or Bypass mode. The remote start/stop contact shall operate in VFD and bypass modes. The terminal strip shall allow for independent connection of up to four (4) unique safety inputs.

8. Smoke Control Override Mode – The bypass shall include a dedicated digital input that will transfer the motor from VFD mode to Bypass mode upon receipt of a dry contact closure from the Fire / Smoke Control System. In this mode, the system will ignore low priority safeties and acknowledge high priority safeties as required by UL 864/UUKL. All keypad control, serial communications control, and normal customer start / stop control inputs will be disregarded. This Smoke Control Mode shall be designed to meet the intent of UL864/UUKL.

9. Fireman's Override Mode – the bypass shall include a second, programmable override input which will allow the user to configure the unit to acknowledge some digital inputs, all digital inputs, ignore digital inputs or any combination of the above. This programmability allows the user to program the bypass unit to react in whatever manner the local Authority Having Jurisdiction (AHJ) requires. The Override 2 action may be programmed for "Run-to-Destruction". The user may also force the unit into Override 2 via the serial communications link.

D. Submittals

1. The manufacturer shall provide copies of following documents to the Owner for review and evaluation in accordance with general requirements of Division 1 and Division 16:

   a. Product Data on specified product to include:

      1) Outline dimensions

      2) Point to point power and control wiring diagrams

      3) Schematic wiring diagrams

   b. Detailed component data on specified product including complete list of included options.

   c. Certified trip curves for each overload, overcurrent and short circuit protective device

   d. Certified copies of all Type (Design) and Verification Test Reports

   e. Nameplate list

   f. Short circuit and coordination study shall be submitted with the equipment shop drawings to ensure rating conformity to study conclusions. Submittals made without the study shall be rejected.

g. Compliance calculations illustrating voltage THD is less than 5% at any bus/common coupling point that has more than 100 HP or greater than 50% of the connected load as VFD powered motors. The calculations shall utilize the specific power system in the model/calculation.

h. Seismic certification to illustrate compliance with IBC criteria based upon three axis of motion by a certified test lab.

2. Submit operation and maintenance data based on factory and field-testing, operation and maintenance of specified product.

3. Submit test report confirming acceptance of the VFD installation based upon the Installation inspections and tests outlined in Part 3 of this specification.

PART 3 - EXECUTION

3.1 DEMOLITION

A. General

1. The Electrical Contractor shall visit the site before submitting his bid to familiarize himself with the existing conditions and the extent of the work. No extra compensation will be allowed for work required to be performed or to overcome existing conditions, by failure to visit the site.

2. The Electrical demolition work shall be performed by the Electrical Contractor in cooperation with the other trades and as scheduled and approved by the Owner's Representative.

3. The locations of existing equipment to remain including piping, ductwork, conduits, etc., are shown in an approximate way only. The Contractor shall determine the exact location of all existing equipment before commencing work.

4. Power outages caused by demolition that affect other areas shall be held to a minimum. Shutdowns shall be coordinated with the users and the Owner. Night, weekend and/or Holiday time required to perform electrical demolition work or new electrical work shall be carried as part of the Contract Cost.

B. Scope

1. The architectural drawings illustrate the full extent of the scope of demolition. Disconnect and make safe all electrical equipment identified for removal on the Electrical, HVAC, Plumbing and Fire Protection plans. The electrical scope may extend beyond the area defined by the architectural demolition limits to fully comply with various requirements of these specifications.

2. The electrical demolition plans and details indicate the general scope and are not intended to show all items to be removed or retained. Devices and equipment located on walls and/or ceilings to be removed shall be disconnected and made safe. The Electrical Contractor shall notify the Owner's Representative of any unanticipated hidden conditions encountered during demolition.

3. The Electrical Contractor shall circuit trace and label all existing branch circuits and feeders within the area of demolition scope prior to de-energizing and disconnection. All circuits within panelboards identified for removal shall be

traced and labeled to ensure that no area outside the demolition scope limit is affected.

4. The Electrical Contractor shall identify all branch circuits, feeders and system components, which are to remain within the area of demolition scope. There shall be no interruption of service to any area outside the scope limits without approval from the Owner's Representative. Existing equipment to remain shall be left in a code compliant manner.

5. The Electrical Contractor shall de-energize and remove all conductors and raceways to their points of origin within the area of demolition scope. Items identified for demolition shall not be abandoned in place. Raceways that enter masonry walls and floors shall be cut flush at the surface for patching by others. All circuit breakers associated with the demolition scope shall be de-energized and labeled spare.

6. The Electrical Contractor shall be responsible for the repair of all systems or building components damaged during the execution of the work. Damage shall include but not be limited to destruction or disposal of items intended to remain or to be salvaged.

7. The Electrical Contractor shall temporarily support all items to remain that are affected by the demolition of building structural components (walls, ceilings, etc.). Temporarily supported items shall be permanently supported and installed when finalized structures are in place.

8. The existing fire alarm system shall remain fully functional during the entire demolition and construction period. Reuse of existing fire alarm system raceways shall not be allowed. All required system shutdowns shall be coordinated with and approved by the Owner's Representative and the Authority Having Jurisdiction. Demolition of the existing system shall not commence until the new system has been completely installed, tested and approved by the Authority Having Jurisdiction.

9. All demolition scope associated with low voltage systems including but not limited to telephone, data, security, paging, CCTV, etc. shall be included.

C. Disposal

1. All removed items shall be legally disposed of unless identified for reuse. Refer to Part 1 of this specification for requirements for Hazardous Material disposal.

2. The Owner's Representative shall inspect all retained items prior to placement in the identified storage location by the Electrical Contractor . Selected items will be disposed at no additional cost to the project.

3.2 IDENTIFICATION

A. Nameplates

1. Provide nameplates on all equipment listed in other sections of this specification including but not limited to switchboards, substations, panelboards, transformers, junction and pull boxes, disconnect switches, motor starters and motor control centers, contactors, time clocks, remote control stations, fire alarm panels, smoke detector remote test/alarm stations and fire alarm annunciators.

2. Nameplates shall designate equipment tag number as defined on the drawings, system voltage where applicable, circuit number, device controlled and system function. Refer to typical nameplate detail on the drawings for additional requirements.

3. Submit a complete list of proposed nameplates prior to order to ensure conformance to design criteria. Submittal shall include nomenclature, size and layout of each tag.

4. Code 39 shall be the bar code format unless designated differently by the Owner's facility group. The Contractor shall create the required bar codes and assign numbers based upon input from the Owner's facility group. The Contractors shall create a database of all equipment, panels and valves for Owner's review and approval.

5. Samples of stickers together with color schedules shall be submitted during the submittal phase of this project.

B. Equipment Identification

1. Equipment identification designations shall be taken from equipment schedules and coordinated with the Owner's facility group to assure designations match up with Owner's maintenance management system identification database.

3.3 RACEWAYS AND CONDUIT

A. General

1. Unless specified or shown on Drawings otherwise, install raceways and conduits concealed. Raceways and conduits may be run exposed on unfinished walls and basement ceilings with exposed structure, in mechanical rooms, electric rooms, attics and roof spaces.

2. Run concealed raceways and conduits in as direct lines as possible with minimum number of bends of longest possible radius. Install exposed raceways and conduits parallel to or at right angles to building lines.

3. Raceway and conduit runs shall be mechanically and electrically continuous from supply to outlet. Conduit shall enter and be secured to metallic enclosures with lock nut and bushing inside. Provide additional exterior lock nut for RGS connections. Bushings shall be the bonding type for conduit connections to metallic enclosures with concentric or eccentric knockouts. Lock nuts and bushings will not be required where conduits are screwed into threaded hubs.

4. Size raceways and conduits as required by NEC unless oversized raceways and conduits are shown on the Drawings. Raceways and conduits shall be ¾" minimum.

5. Install conduit systems complete before installation of conductors. Blow through and swab after plaster is finished and dry, and before conductors are installed.

6. Raceways and conduits supports shall be rigidly attached to the building structure utilizing corrosion resistant components suitable for use with the selected raceway or conduit. Refer to the seismic restraint sections of this specification for any additional requirements.

7. Field bending, cutting and threading shall be executed with the proper tools, resulting in bends and shortened conduits and raceways that are equivalent to factory fabricated and purchased components.

8. Provide standoff clips for conduits on exterior and wet location walls.

9. Protect all vertical conduit runs from the entrance of foreign material before installation of conductors and the final closure of the raceway system. All spare conduits (vertical and horizontal runs) shall be sealed with a bushing and appropriate insert to prohibit entrance of debris or vermin. Affix a label that indicates "Spare Conduit to _____" at each seal. Label shall be in accordance with the labeling section of this specification.

B. Rigid Galvanized Steel (RGS) Conduit

1. RGS may be used for all raceway applications outlined for EMT and PVC. RGS shall be used in locations where subject to accidental damage or abuse and for all above grade exterior applications unless other wiring methods are specified on the drawings. All circuit conductors in excess of 600 V shall be installed in RGS.

2. RGS shall not be used in corrosive environments.

3. All RGS fittings shall be threaded. Utilize Erickson couplings where joining two threaded conduits that can not be rotated.

C. Intermediate Metal Conduit (IMC) may be used in any application, with same requirements, where RGS is allowed except for circuits operating at more than 600 V.

D. Electrical Metallic Tubing (EMT)

1. EMT may be used for lighting and receptacle branch circuits, telephone, fire alarm, communications, signal and instrumentation circuits and for control circuits. EMT may be used in masonry walls, above hung ceilings, in equipment rooms, in mechanical and electrical chases and closets, in exposed locations along ceilings or walls above normal traffic level and where not subject to accidental damage or abuse.

2. EMT shall not be used in exposed applications below 8 feet above finished floor or in exterior or damp/wet/corrosive locations. Electrical, telephone and communications closets are considered exempt from this restriction and EMT may be installed below 8' AFF in this application only. EMT shall not be installed underground, in slabs on grade, in exterior locations, in hazardous areas, or for circuits operating at more than 600 V.

E. Miscellaneous Conduit Fittings

1. Expansion/Deflection Fittings: Raceways and conduit buried or secured rigidly on opposite sides of building expansion joints and long runs of exposed conduit subject to expansion and contraction due to variations in temperature shall have expansion fittings. Raceways and conduit shall cross building expansion joints at right angles. Provide separate external copper bonding jumper secured with grounding straps on each end of fitting. Fittings shall safely deflect and/or expand/contract to twice the distance of potential movement.

2. Penetrations of all below grade exterior walls and flooring shall require approval by the Engineer and Architect. Submit proposed penetration points, size

openings and penetration methods to Engineer and Architect. Penetrations shall utilize sealing fittings appropriately sized for the application. Duct bank penetrations are excluded from this requirement.

3. Sealing Fittings shall be installed wherever conduits pass from warm to cold locations to minimize condensation within the conduit. Sealing fittings shall be installed with RGS penetration of the wall and terminate in a suitably sized junction box.

4. Refer to other specification sections for requirements pertaining to sealing for hazardous atmospheres.

F. Flexible Metallic Conduit

1. Provide flexible metallic conduits for connections to electrical equipment and to equipment furnished under other Divisions that are subject to movement, vibration or misalignment and/or where noise transmission must be eliminated or reduced.

2. Flexible metallic conduit shall be liquid-tight under the following conditions:

a. Exterior locations

b. Moisture or humidity-laden atmospheres

c. Environments where seepage or dripping of water, grease, oil or other fluids is possible. All mechanical equipment rooms and kitchens and;

d. Corrosive atmospheres

G. Wireways shall be provided where specifically shown on the drawings or where the group mounting of controllers, disconnects, enclosures, etc warrant the use for elimination of multiple short conduit runs. Wireways shall be provided complete with all required appurtenances necessary to have a totally enclosed system rated for the environment. Wireways shall not be installed in any location where subject to accidental damage or abuse.

1. Raceways and conduit shall not be placed in slabs less than 3” thick.

H. Cable Tray

1. Cable Tray shall be installed to allow for accessibility. Allow a minimum of 12” clear space above and to each side for maintenance and cable installation.

2. Cable tray supports shall consist of metal strut under the tray with threaded rods on each side of the tray to the structure above. Strut shall be rigidly fastened to the threaded rod with nuts at the top and bottom of the strut. Strut finish shall be equivalent to the specified finish of the tray. Supports shall be provided within 24” of each splice plate and shall not exceed 6’0” spacing. Support system shall be rated to carry the full rating of the tray specified when filled. Tray shall be rigidly fastened to the strut system.

3. Cable tray shall not be center hung unless center spine mono-tray is specified on the drawings. Every other support shall provide lateral support for uneven loading.

4. Cable tray shall be seismically braced in accordance with Part 1 requirements.

5. Splice plates shall be the four bolt type. Expansion plates and adjustable splices shall have code sized bonding jumpers on each side of the tray.

6. Hot dip galvanized tray shall be touched up in accordance with ASTM A780 at all cut and drill locations to restore the corrosion resistance of the finish.

7. Through wall penetrations shall utilize EMT sleeves, bonded to the tray at each end. Sleeves shall be fire stopped after installation of cables and conductors.

3.4 WIRE AND CABLE (600V)

A. Homerun designations on the drawings are diagrammatic only. Install branch circuits and feeders from the power source to the attachment point as required for a complete system. Provide slack wire for connections to equipment installed by others. Refer to schedules and risers where specific conductor and associated raceway sizes are not indicated on the floor plans.

B. Connect branch circuit homerun with two or three circuits and common neutral only where specifically shown on the drawings. Circuits with common neutrals shall not be connected to the same phase to ensure cancellation of the return current in the neutral conductor.

C. Install wires and cable in raceways as specified. All conductor sizing is based upon no greater than three current carrying conductors in a conduit. Installation of up to six circuits (no greater than twelve current carrying conductors) in a single conduit will be allowed if the conductor sizing is increased to the required ampacity to accommodate de-rating factors required by the NEC and NFPA 70.

D. The minimum wire size shall be #12 unless #14 specifically allowed on the drawings for wiring of controls. Branch circuits longer than 75' for 120 V from panel to last outlet shall be increased a minimum of one size above that shown on the drawings to minimize voltage drop to less than 2%.

E. Conductors shall be identified at all accessible locations in the following manner:

1. Color code secondary service, feeders and branch circuit conductors as follows:

208/120 Volts	**Phase**
Black	A
Red	B
Blue	C
White	Neutral
Green	Ground

2. Provide nonferrous wire markers, embossed or printed to correspond with the Drawings. Labels shall be permanently marked so that the source of the branch circuit or feeder may be readily identified. Hand written labels are not acceptable. Embossed tag equal to 3M Scotch Code STL-TAG or SCS-TM shall be applied with two miniature cable ties or slipped through both end holes. Heat bonded tag equal to 3M Scotch Code SCS-HB shall be permanently affixed with a heat gun.

F. Cable

1. Flexible Metal Clad (MC) cable may be used in concealed locations for branch circuit wiring.

2. Flexible Armored (AC) cable shall not be used.

3. Flexible Hospital Grade Armored Cable (AC) cable shall not be used.

4. Conductor color code shall comply with identification requirements as indicated in this Section.

G. Splices and Terminations

1. No more than twelve splices of current carrying conductors or six circuits, whichever is greater, shall be allowed in a single enclosure or junction box.

2. Splices and terminations shall be sized to the specified conductor. The insulation shall be cut back with the appropriate tools such that the conductors are not nicked or damaged.

3. The compression tool shall be appropriate for the installation of the provided lug or butt splice to ensure pressure necessary for a proper connection is applied.

4. Terminations shall not be stacked or bent unless specifically listed for the application.

H. Cable Pulling

1. Pull cables that share conduit at same time into completely installed raceway. Conductors shall not be pulled in raceways with existing wiring.

2. Submit cable pulling calculations for engineers approval prior to all mechanically assisted pulls. Attach pull ropes to conductors with basket-weave grips on pulling eyes. Provide means to measure tension during entire pull. Utilize pulling compounds to lessen friction in accordance with the manufacturer's recommendations.

3. mechanically assisted pulls shall utilize equipment specifically designed for the purpose such as ropes, electric wench, pulleys, etc. The use of a motorized vehicle to assist in a cable pull is prohibited.

3.5 WIRING DEVICES AND PLATES

A. Branch circuitry shall be attached to all devices using the attachment screw or utilizing back wiring chambers that utilize screws for compressing the connection on the wire. Quick stab features that do not require a positive screw on attachment for the conductor are not acceptable.

B. Receptacle devices for other than 20 amp, 120 volt, 2-wire, circuits shall be provided with tags indicating voltage characteristics and circuit number of outlet that match the nameplate or engraving required on the faceplate.

C. Remove the interconnecting tab for receptacles identified for ½ switched applications such that the top is switch controlled and the bottom is constantly energized.

D. The drawings specify all dimmer sizes based upon full capacity with no heat removal fins removed for ganged applications. Outlet boxes shall be sized to accommodate the specified dimmer at full rating.

E. All switches/dimmers illustrated together on drawings shall be installed in ganged configuration with single faceplate unless specifically noted otherwise.

F. Provide metal barriers to separate switches where voltage between adjacent switches exceeds 300 volts.

G. Adjust all individual occupancy sensor time delays to 15 minutes and set to “manual on” operation. Sensor sensitivity shall be adjusted for 100% coverage of the associated space and to minimize the false sensing from adjoining areas with doors in their normal position.

3.6 OUTLET BOXES

A. Outlet and switch boxes shall be securely fastened to metal studs with a minimum of two self-tapping screws. Boxes three gang and greater shall be securely fastened to studs on both sides of the box.

B. Fasteners for mounting boxes in damp or wet locations shall be stainless steel.

C. Pressed steel boxes shall not be used for exposed surface mounted locations below 8’0” AFF.

D. Outlet and switch boxes shall not be installed back to back. Stagger box installation to adjacent stud spaces to maintain sound separation between rooms.

E. Floor boxes shall not be used above grade level in concrete decking without the approval of the Structural Engineer and Architect. Floor slab installations shall not degrade the required structural or fire rating integrity of the floor deck.

3.7 JUNCTION AND PULL BOXES

A. Junction box covers shall be accessible. Do not install junction boxes above suspended ceilings except where ceiling is removable or where an access panel is provided.

B. Pull boxes connected to concealed conduits shall be mounted with covers flush with finished wall or ceiling.

C. Pull boxes exposed to rain or in damp/wet locations shall be weatherproof NEMA 3R unless noted otherwise on the drawings.

D. No pull box shall be within 2 feet of another.

E. Provide clamps, grids, cable ties and other non-conductive or combustible appurtenances to secure cables. No cable shall be unsupported for more than 30". Cables shall not touch or be unsupported within 1” of the box cover.

F. Each junction and pull box shall have a suitable laminated plastic nameplate with white cut letters identifying power source, voltage and driven load of the associated branch circuits or feeders.

G. Submit box sizing calculations to confirm all box dimensions are in accordance with code requirements with product data prior to installation.

3.8 SAFETY DISCONNECT SWITCHES

A. Provide safety disconnects as required and indicated on the drawings. Each motor shall be provided with a local disconnecting means in accordance with code requirements.

B. Manual motor starters may be used for 120, 208, 240, or 277V, single-phase motors up to 1 HP. Switches shall disconnect all ungrounded conductors. Overload heating elements shall be properly sized and coordinated for the associated motor in accordance with code and manufactures recommendations.

C. Disconnect switches for all applications with available fault current in excess of 10,000 amperes RMS symmetrical shall be fusible. Fuses shall be Class J, L or R and rejection

clips shall be installed in the fuse holders to prohibit the installation of non-current limiting fuses.

D. Each disconnect switch shall have a suitable laminated plastic nameplate with white cut letters identifying power source, voltage and driven load.

3.9 MOTOR STARTERS

A. Each starter shall have a suitable laminated plastic nameplate with white cut letters identifying power source, voltage and driven load.

B. Overload relay heater ratings shall be properly sized and coordinated for the associated motor in accordance with code and manufacturers recommendations.

C. Field Adjustments

1. The following minimum work shall be performed under the technical direction of the manufacturer's service representative.

a. Verify basic operation of starter from control power source.

b. Follow the manufacturer’s instruction and the contract documents concerning any short circuit device settings, HMCP settings or timing relays. All adjustable settings shall be documented and included in the final O. and M. manual.

3.10 PANELBOARDS

A. Storage

1. Contractor shall store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals. Contractor shall store in a clean, dry space. Cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation.

2. Low voltage panelboards shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Ambient temperature of area will be between -30 ºC and +25 ºC. Indoor locations shall be protected to prevent moisture from entering enclosure.

B. Installation

1. Provide 1/2" spacers for panelboards mounted at exterior walls below grade to establish 1/2" air space behind panel.

2. Inspect installed panelboard(s) for anchoring, alignment, grounding and physical damage. Clean interiors to remove construction debris, dirt and shipping materials.

3. Check tightness of all electrical connections with calibrated torque wrench. Minimum acceptable values are specified in manufacturer's instructions.

4. Adjust all circuit breakers and doors for free mechanical operation as described in manufacturer's instructions.

5. Adjust circuit breaker trip and time delay settings to values determined by the short circuit and coordination study.

6. Directories shall be typed to indicate loads served by each circuit and mounted in a holder behind a clear protective covering.

C. Circuit breakers used as a motor disconnecting means, and not in sight of the motor and the driven machinery location, shall be capable of being locked in the open position.

D. Circuit breakers supplying fire alarm equipment and any others loads noted on the schedules shall be capable of being locked in the ON position. The locking means shall not inhibit the ability of the circuit breaker from performing its protective function.

3.11 LIGHTING FIXTURES

A. Lamps

1. Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.

2. Lamps shall be handled with cotton gloves to avoid finger print markings.

3. Florescent lamps on dimmed circuits shall be “seasoned” by operating for at least 100 hours at full intensity to render lamp impurities inert.

4. Incandescent and tungsten halogen lamps shall not be operated other than for initial testing, before final inspection.

B. Fixtures

1. General

a. Do not install fixtures until work of other trades that may damage fixtures is completed.

b. Where seismic requirements are specified herein, fixtures shall be supported as shown or specified.

c. Handling of reflectors shall be done only with cotton gloves to avoid imprinting fingerprints on reflective surfaces.

2. Accessories

a. Installation and support of fixtures shall as a minimum be in accordance with the NFPA 70 and manufacturer’s recommendations.

b. Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation.

c. Open type fluorescent fixtures with exposed lamps shall have a wire-basket type guard.

3. Suspended and Pendant Fixtures

a. Suspended fixtures shall be provided with adjustable swivel hangers in order to ensure a plumb installation.

b. Single unit suspended fluorescent fixtures shall have twin-stem hangers.

c. Multiple unit or continuous-row fluorescent units shall have a tubing or stem for wiring at one point, and a tubing or rod suspension provided for each length of chassis including one at each end. Maximum distance between adjacent tubing or stems shall be 10 feet.

d. Provide threaded rod to rigidly support the weight of the fixture independently of the ceiling support system. Threaded rod shall be concealed where fixture installed in an area with suspended ceilings. Support luminaries on a minimum of two points (one at each end) to prevent rotation. Threaded rod, pendants or factory supplied fixture accessories (such as rods or chains) 4 feet or longer excluding fixture, shall be braced to limit swinging. Bracing shall be 3 directional, 120 degrees apart.

e. Branch circuitry shall be routed to the outlet box utilizing the wiring methods outlined on the drawings and as described in these specifications. Flexible raceway may be installed to each fixture from an overhead junction where concealed above a ceiling. Fixture to fixture wiring installation is allowed only when fixtures are installed end to end in a continuous run.

4. Ceiling Fixtures

a. Ceiling fixtures shall be coordinated with and suitable for installation in, on, or from the suspended or gypsum wallboard ceiling provided under other sections of these specifications. Provide plaster frames for fixtures recessed in gypsum board or a plaster ceiling. Recessed fixtures shall have adjustable fittings to permit alignment with ceiling panels.

b. Recessed fixtures installed in fire-resistive type of suspended ceiling construction shall have the same fire rating as the ceiling or shall be provided with fireproofing boxes having materials of the same fire rating as the ceiling panels, in conformance with UL-03.

c. Provide safety chain to support the weight of the fixture independently of the ceiling support system. Support luminaries on a minimum of two points (one at each end) to structural support.

5. Support

a. Do not suspend or support lighting fixtures, threaded rod and safety chains from hung ceiling, conduit or duct. Support fixtures with threaded rod and safety chain from structural members only. Provide supplemental steel (factory fabricated channel equal to Unistrut) where required to span structural steel members.

b. Provide supplemental steel below ducts where fixture locations coincide with HVAC duct or mechanical piping runs and access to structure is inhibited.

c. Supplemental steel shall be rigidly supported from structure. Where suspension is required, support supplemental steel with threaded rods to structure. Sizing of all supplemental support components is the responsibility of the Contractor.

3.12 FIRE ALARM

A. Installation

1. All interconnections shall be installed in accordance with the manufacturer's system wiring diagrams.

2. The firm who holds the existing system maintenance contract shall perform final connections, programming, and testing. The Contractor shall carry all costs associated with final connections, programming and testing.

3. The Contractor shall carry all costs associated with disabling connections to the municipal loop during final connections and testing.

4. Provide UL certification of the installation by a UL certified testing company.

5. A dedicated circuit connection for supplying power to each new building fire alarm panel shall be provided. The power supply shall be equipped with a UL listed locking mechanism and identified with a red "FIRE ALARM CIRCUIT CONTROL" label.

6. Labels

   a. All new panels, terminal cabinets and annunciators shall be labeled with the Red plastic nameplates in accordance with other sections of this specification.

   b. New Remote Alarm Indicators and Remote Test and Alarm Stations shall be labeled with the Red plastic nameplates in accordance with other sections of this specification. The label shall indicate the device monitored and associated mechanical equipment tag or room designation where applicable.

   c. All new detectors shall be labeled with assigned address on both the detector housing and the base with a black on clear typed label equal to Kroy 0.375 Industrial UV. The base address shall be legible without removal of the detector. The detector address shall be concealed when placed into the base.

7. Wiring

   a. Wiring for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems.

   b. Wiring for the fire alarm system shall be installed in conduit with limitations as outlined in Section 3.02 of this specification. The use of MC cable shall follow the guidelines provided in Section 3.03 of this specification. Exposed plenum rated wire/cable and/or fire alarm low energy cable will not be accepted.

   c. Minimum wire sizes shall be as follows:

      1) Addressable loop wiring shall utilize minimum #16 AWG.

      2) Notification appliance circuits shall utilize minimum #14 AWG.

      3) Network communications wiring shall be a solid conductor non-shielded #16 twisted pair minimum.

   d. All junction boxes shall be sprayed red and labeled “Fire Alarm”. Conduit couplings shall be spray painted red prior to installation.

e. Connections and splices shall be made using screw terminal blocks. No more than one conductor shall be installed under any screw terminal. The uses of wire nut type connectors are prohibited in the system.

f. All circuit conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be labeled in accordance with the wiring diagram. Labeling and color-coding shall be consistent throughout the conductor run.

g. Wiring within any enclosure shall be readily accessible without removing any component parts.

h. No more than half loudspeaker/strobes or horn/strobes serving any floor or zone shall be connected to same circuit. Adjacent devices shall be alternately wired between circuits.

8. New Panels

a. Panels and assorted components shall be mounted so that no part of the enclosing cabinet is less than 12 inches nor more than 78 inches above the finished floor.

b. All manually operable controls shall be between 36 inches to 42 inches above the finished floor.

9. Detectors

a. Detectors placement shall be in accordance with NFPA 72 requirements and recommendations.

b. Detectors shall be at least 12 inches from any part of any lighting fixture and at least 3 feet from diffusers of air handling systems.

c. Each detector shall be provided with appropriate mounting hardware as required by its mounting location.

d. Detectors, which mount in free space, shall be mounted directly to the end of the stubbed down rigid conduit drop. Conduit drops shall be firmly secured to minimize detector sway. Where length of conduit drop from ceiling or wall surface exceeds 3 feet, sway bracing shall be provided.

e. Smoke detectors shall not be installed until the building has been thoroughly cleaned. Dust covers shall be installed over all smoke detectors until final testing commences. All detectors, which indicate reduced sensitivity due to dirty condition, shall be cleaned prior to commencement of final cleaning.

f. Detectors shall be provided with wire guard cages where subjected to physical abuse, such as in gymnasiums.

10. Notification Appliances

a. Notification appliances shall be mounted in accordance with NFPA 72.

b. Coordinate final quantity, location and power settings of audible notification appliances with ambient sound levels and interior finishes to

comply with minimum & maximum sound pressure level requirements as follows:

1) Total sound pressure level produced by combining ambient with all audible notification appliances operating shall not exceed 110dBA at the minimum hearing distance.

2) An average ambient sound pressure level of 105dBA shall require the use of visible notification appliances.

3) Unless otherwise permitted by NFPA 72, minimum sound pressure level produced by audible notification appliances shall be 15 dBA above the average ambient sound level or 5 dBA above the maximum sound level having a duration of at least 60 seconds., whichever is greater, measured 5-ft above the floor.

11. Modify the system annunciator to indicate the added devices in accordance with the drawings.

B. Testing

1. The Contractor shall notify the Owner's Representative 10 business days before the tests are to be conducted. The tests shall be performed in accordance with the approved test procedures in the presence of the Owner's Representative. The Contractor shall furnish all instruments and personnel required for the tests, including the Contractor who holds the existing system maintenance contract.

2. Preliminary Tests

a. The Contractor shall perform insulation testing (megger), continuity and loop resistance checks on all system conductors to determine that the system is free from grounded, shorted, or open circuits. These tests shall be conducted prior to the installation of fire alarm equipment. Loop resistance measurement shall verify that the loop resistance does not exceed the manufacturers specified limits. Corrections shall be made and the system shall be retested to assure if deficiencies are found.

b. Measure air flow with pressure sensor at each duct smoke detector sampling port, at the lowest design air flow of the duct system. Sampling air flow shall exceed smoke detector manufacturer's requirements.

c. The Contractor shall perform complete functional and operational performance tests. Testing shall include verification that the circuits and components are electrically supervised and operate as intended. Coordinate final testing with the Elevator and HVAC Contractors where applicable to verify function of all control interfaces such as elevator recall and air handler shutdowns.

d. A written report shall be submitted detailing the results of the preliminary tests shall accompany the request for Final Acceptance Test. The written Preliminary Test Report shall be submitted with:

1) Copy of FACP printer output verifying proper operation of each device in alarm or trouble, time stamped throughout the testing process.

2) The Operations and Maintenance Manual for the system.

3) The revised record (as-built) drawings.

e. Reacceptance testing shall be performed in accordance with NFPA 72 14.4.1.2 where applicable (testing of 10% of existing devices not affected by scope of work, etc.).

3. Final Acceptance Test

a. The Fire Alarm System modifications, other systems and equipment associated with the fire alarm system modifications and new accessory equipment shall be tested in accordance with NFPA 72. Verification of system completion shall be documented with a fully executed copy of the Record of Completion per NFPA 72 Figure 10.18.2.1.1. The listed tests in NFPA 72 Table 14.4.2.2 shall be conducted and documented with an executed copy of Figure 14.6.2.4 as well as manufacturer and job specific procedures to verify that the circuits and components are electrically supervised and operate as intended. The test shall include but shall not be limited to the following:

1) Visual inspection of all new wiring connections.

2) Test of each function of new panels.

3) Test of each circuit into which new devices have been added in both trouble and normal modes.

4) Tests of each circuit associated with new alarm initiating device in both normal and trouble conditions. Open the circuits at each alarm-initiating device to test the wiring supervisory feature.

5) Tests of each new control circuit and device.

6) Tests of each circuit associated with new alarm notification appliance. Open the circuit at each notification appliance to test the wiring supervisory feature. Provide copy of FACP printer output verifying proper operation (alarm, trouble, etc.) for each device with time stamp enabled throughout the testing process.

7) Tests of the primary and secondary power supplies of new panels and associated loss of each.

8) Complete operational tests under emergency power supply.

9) Ground fault monitoring circuit function.

10) Measurement of sound pressure levels in all areas within the scope of this project. Provide background and evacuation signal sound levels on the floor plans submitted with device address and tap settings.

3.13 VARIABLE FREQUENCY DRIVES

A. Storage

1. Store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals. Store all VFDs in

a clean, dry space. Cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic.

2. Storage shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Ambient temperature of area will be between -30 ºC and +25 ºC. Indoor locations shall be protected to prevent moisture from entering enclosure. Heat enclosures to prevent condensation where required by the manufacturer.

B. Installation

1. Provide 1/2" spacers for VFDs mounted at exterior walls below grade to establish 1/2" air space behind enclosure.

2. Inspect installed VFDs for anchoring, alignment, grounding and physical damage. Clean interiors to remove construction debris, dirt and shipping materials.

3. Check tightness of all electrical connections with calibrated torque wrench. Minimum acceptable values are specified in manufacturer's instructions.

4. Each VFD shall have laminated plastic nameplates with white cut letters identifying power source, voltage and circuit identified for both inputs and the output. Label each VFD with the arc flash and PPE requirements defined in the power system study.

5. Coordinate the interface of all control devices into the VFD with the controls Contractor responsible for the driven equipment.

C. Start-Up and Testing

1. Provide the services of a qualified factory-trained manufacturer's representative to assist in the installation and start-up of the equipment. The manufacturer's representative shall provide technical direction and assistance in the general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.

2. After installation is complete and normal and emergency power is available, the manufacturer's local dealer shall perform the following:

a. Verify that the equipment has been properly installed.

b. Check all functions for proper operation over the entire expected operating range and any special sequences such as loss of power (momentary and long term), operation from alternative power sources such as standby generation (transfer in and out), operation of the bypass system (if applicable) and sequences for all emergency modes.

c. Verify that all remote monitoring capabilities are fully functional.

d. Adjust the switching frequency to minimize audible motor noise.

e. Perform harmonic measurements to verify compliance to the 5% THD calculation where more than 100HP or 50% of the load at any point in the system is VFD driven. Measurements shall be done with building and systems at or near full load conditions.

3. Provide on-site training to instruct the Owner's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals and emergency service procedures with the trainees.

3.14 BASIC ACCEPTANCE TESTS

A. General Scope

1. This section covers the required field tests and inspections to assess the suitability for initial energization of electrical power distribution equipment and systems. Failed components shall be replaced and retested for no additional cost to the project.

2. The purpose of this specification is to assure that all tested electrical equipment and systems are operational and within applicable standards and manufacturer’s tolerances and that the equipment and systems are installed in accordance with design specifications.

3. All testing shall be performed by the Contractor responsible for the installation of the systems or by an independent testing organization under contract with the Contractor .

4. All equipment utilized for testing shall have a valid calibration sticker. All test reports shall indicate the equipment utilized and its associated calibration due date.

5. Coordinate all required shutdowns with the Owner. Any and all testing required after the Owner has taken occupancy (temporary or permanent) shall be assumed to be conducted during premium time.

6. A written record of all tests and a final report summarizing the findings shall be submitted for approval prior to energizing any electrical power distribution equipment and systems. All equipment shall be left in clean operational condition.

B. Inspection and Test Procedures

The following tests shall be conducted using the noted section of the latest edition of NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment Systems as a reference:

1. Low Voltage Cables - All feeders illustrated on the one line diagram shall be inspected and tested in accordance with the referenced standard. Visually inspect cables for physical damage, color code and proper termination. Check continuity for proper labeling and megger for insulation resistance. Megger test voltage shall be 1000VDC for 1 minute with no values less than 50 megohms. Tabulate readings for each feeder. NETA ATS-7.3

2. Low Voltage, Molded and Insulated Case Circuit Breakers with frame size greater than 225 amperes and/or with adjustable trip units shall be tested and adjustable settings dialed to match the coordination study criteria. Perform an insulation resistance test at 1000VDC (thermal magnetic) or 500VDC (solid state) for 1 minute from pole to pole and pole to ground, resistance values shall not be less than 100 megohms. Perform resistance test across open and closed breaker contacts of each phase. Test trip settings tolerance with primary current injection. Tabulate readings for each breaker. NETA ATS-7.6

END OF SECTION

TABLE OF CONTENTS

SECTION 265561

THEATRICAL LIGHTING AND CONTROL SYSTEM

PART 1 - GENERAL 1

1.1 RELATED DOCUMENTS 1

1.2 SUMMARY 1

1.3 SUBMITTALS 1

1.4 QUALITY ASSURANCE 1

PART 2 - PRODUCTS 2

2.1 MANUFACTURERS 2

2.2 FIXTURES AND DISTRIBUTION EQUIPMENT, GENERAL 2

2.3 FIXTURES 3

2.4 LAMPS 5

2.5 DISTRIBUTION COMPONENTS 5

2.6 LIGHTING CONTROL SYSTEM 7

2.7 FINISHES 20

PART 3 - EXECUTION 20

3.1 INSTALLATION 20

3.2 CONTROL WIRING INSTALLATION 20

3.3 FIELD QUALITY CONTROL 20

3.4 CLEANING AND ADJUSTING 21

3.5 DEMONSTRATION 21

3.6 COMMISSIONING 21

SECTION 265561

THEATRICAL LIGHTING AND CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes equipment for stage lighting systems, including fixtures, lamps, dimmers, controls, and distribution components.

B. Related Sections include the following:

1. Division 11 Section: Portable Theater and Stage Equipment for related on-stage components.

1.3 SUBMITTALS

A. Product Data: For fixtures, lamps, distribution components, and control systems, including dimensions and data on features and components. Include data on ratings and features of devices.

B. Shop Drawings: Detail dimmer racks showing arrangements, characteristics, and circuit assignments of various modules. Include elevation views of front panels indicating devices and controls. Include illustrations and dimensioned drawings.

1. Wiring diagrams: Detail wiring for power and control systems and differentiate between manufacturer- installed and field-installed wiring.

C. Manufacturer Certificates: Signed by the manufacturer certifying that they comply with requirements. Include evidence of manufacturing experience.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

E. Maintenance Data: For fixtures, distribution equipment, software operating manuals, instructional videotapes, and controls are to be included in maintenance manuals specified in Division 1.

F. Record Data: Show connections and circuit and channel assignments.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has installed systems of similar scope and function as the units required for this project.

B. Manufacturer Qualifications: A firm experienced in manufacturing equipment similar to that indicated for this project that maintains technical support service available by toll-free telephone number. Service capability to provide the user with training, parts, and emergency maintenance and repairs support within 48 hours maximum response time.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

D. Comply with NFPA 70.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Dimmer Modules: One of each type and rating.

2. Lamps: 1 for every 10 of each ANSI code, type, and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but not limited to, the following:

1. Lehigh Electric Products Company

B. Other manufacturers wishing to be considered for prior approval must submit the following items a minimum of 10 days prior to the bid date. Approval to bid does not waive the requirement to comply with the equipment specifications listed in this section.

1. A complete bill of material listing all proposed equipment.

2. Catalog sheets detailing the products proposed in 1 above,

3. Description listing any deviations the proposed substitution has as compared with the specified system.

4. Detail any additional costs created by using the alternate equipment in lieu of the specified equipment.

2.2 FIXTURES AND DISTRIBUTION EQUIPMENT, GENERAL

A. Metal Parts: Free from burrs and sharp corners and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support sheet metal to prevent warping and sagging.

C. Fixture Doors and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without the use of tools. Arrange doors, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

D. Pigtail: Factory wired 36-inch (900 mm) long, 3-wire cord and plug connector assembly with cord encased in woven fiberglass or silicone tubing.

E. Plug Connectors: Two-pole, 3-wire, 20-A twist-locking type.

F. Pipe Clamps: Malleable iron and designed for clamping fixtures to 3/4- to 2-inch (20 to 51mm) OD pipe and equipped with a T-bolt to lock alignment. Arrange fixture clamps for horizontal rotation of yoke for aiming.

G. Safety Cables: Heavy duty, flexible steel, 30-inch (760) nominal length, with spring clip at one end and steel ring at other.

H. Lamp Sockets: Relampable without disturbing focus adjustment or alignment.

I. Fixture Ventilation Openings: Baffled against light leaks.

J. Fixture Operating Controls and Handles: Thermally insulated.

K. Lenses: Borosilicate glass in silicone mountings.

L. Color Filter Frame Holder: Attached to front of fixture.

M. Fixture Yoke: Rigid metal arranged for vertical aiming of unit and equipped with T-bolt or hand screw to lock alignment.

2.3 FIXTURES

A. General: Listed under UL 1573.

B. Standard Features: Equip each fixture with pigtail, yoke with pipe clamp, and safety cable for batten mounting, and filter holder.

C. Ellipsoidal Spotlights: Accommodates 575-watt lamps. Unit has framing shutters and pattern slot. Ellipsoidal Spotlight shall include Medium 2-pin socket and tool free relamping.

1. Shutters: Four way locking heavy gauge stainless steel shutters with insulated handles.

2. Die-cast aluminum and sheet metal housing construction.

3. Spring mounted dichroic coated glass reflector.

4. 3600 rotating lens barrel.

5. Color coded crown glass lenses with anti-reflective coating. Lens barrel travels on nylon guides. Includes heat resistant locking knob.

6. Fully adjustable lamps focusing in three axis with two concentric heat resistant knobs. Provide with 575 watt GLA lamp.

7. Provide:

   a. Front Beam: 2 - LE6P19, 8 - LE6P26, and 2 - LE6P36.

D. Fresnel Lens Spotlight: 6-inch lens and 500-watt to 750-watt lamp rating. Housing is welded sheet metal construction with hinged front for relamping. Fresnel Spotlight shall include a Medium prefocus socket.

1. Manual slide focus adjustment from narrow to spot.

2. Alzak reflector.

3. Furnish with 500 watt BTL lamp.

4. Minimum candlepower ratings with a 750-watt BTN lamp:

   a. 16.0-degree field angle spot focus: 92,500

   b. 70.0-degree field angle flood focus: 8,800.

5. Provide:

   a. Stage Electric #1: 10 – LF600

   b. Stage Electric #2: 6 – LF600

E. Par Spotlight: Housing is die cast aluminum construction with axially mounted lamp assembly. Relamping shall not require the use of tools.

1. Fully rotational lens holder to be provided with three insulated finger tabs. Lenses can be interchanged without the use of tools.

2. Furnish with 575 watt GLA lamp.

3. Include full set of four lenses for each fixture. Fixtures to be hung with medium flood lenses installed.

4. Provide: 20 assorted 17”x22” gel sheets in colors to be selected by the owner.

5. Provide:

   a. Stage Electric #1: 15 – LSP

   b. Stage Electric #2: 15 – LSP

   c. Stage Electric #3: 15 – LSP

F. Cyclorama Floodlights: Multicolor, RGBA, LED fixture with 8 or 16 bit DMX control of intensity and color. Fixture shall be designed to provide a color wash of cyclorama curtains.

1. Lightweight aluminum housing. Fixture weight to be approximately 11 pounds.

2. A-symmetrical, specular aluminum reflector providing even asymmetrical distribution of light.

3. Integral multi-voltage power supply, 100-240VAC. 10A push button circuit breaker.

4. 6’ power cable with molded Edison plug. Feed thru power connectors for up to 6 units.

5. Convection cooled operation with no fans for operation within a 10C to 400C range. IP-20 rating for dry location use.

6. Compatible with DMX and RDM protocols. Feed thru 5 pin XLR connectors.

7. Field angles: Approximately 82o horizontal and 37o vertical.

8. Preprogrammed modes for fixed colors and color mixes, timed color changes, and strobes.

9. Three adjustable feet for floor mounting or pipe mounting with optional yoke and c-clamp.

10. 100 Watts maximum output at full RGBA using 3 Watt Red, Green, Blue, and Amber LEDs. LEDs to have a 50,000 hour nominal life rating.

11. Fixture to include a local control keypad for configuration settings of DMX-512A address, fixture personality, and stand alone operation.

12. Provide:

a. 6 - Spectra Cyc 100 complete with 6’ power cord, 10’ DMX cable, safety cable, yoke and c-clamp.

2.4 LAMPS

A. Comply with the standard of the ANSI C78 series that is applicable to each type of lamp. Where lamps of designated type, characteristics, and wattage are not indicated, provide lamps recommended by manufacturer of fixture in the highest wattage for which fixture is listed.

2.5 DISTRIBUTION COMPONENTS

A. Connector Strips: Factory-wired wire ways and receptacle assembly.

1. Wireway: 16 Ga. steel construction with screw covers with a 4.25" X 2.5" cross section. Length as required in 5’ increments.

2. Receptacles:

   a. Stage receptacles to be pigtail mounted, 18 inches long, with a strain relief grip at the wireway wall penetration.

   b. Provide five clusters of three receptacles on the stage electrics for the LSP spot lights wired on 6 circuits.

   c. The balance of receptacles shall be evenly distributed along the length and circuited as scheduled.

   d. Provide two PBGF receptacles wired on a non-dim for stage electrics 1 and 3 and one PBGF receptacle wired on a non-dim for the front of house electrics.

   e. Provide one DMX (D) output receptacle on stage electrics 1 and 3 and the two front of house electrics to provide control for future LED lights.

3. Receptacles Wiring: Connect to terminal blocks with 125-deg C, cross-linked, polyethylene insulated wire.

4. Ground lug.

5. Mounting: Steel mounting straps to wrap around the wireway and be located at 5' intervals. Mounting straps to include a formed section to attach to 1-1/2" (2” OD max.) schedule 40 pipe. Single or double pipe mounting as scheduled.

6. Electrical contractor to provide 1-1/2" schedule 40 black iron pipe with all joints made with bolted thru couplings as required for each front beam and stage connector strips. Pipe to extend a minimum of 24” beyond the wireway on each end.

7. Provide:

   a. Stage Electric #1: 1 - LCS - 2P - 40 - 15TLGP/6C - 10TLGP/5-2PBGF/1-D.

   b. Stage Electric #2: 1 - LCS - 2P - 40 - 15TLGP/6C - 6TLGP/3.

   c. Stage Electric #3: 1 - LCS - 2P - 40 - 15TLGP/6C - 6TLGP/3 - 2PBGF/1-D

   d. Front of House: 2 - LCS - 1P - 10 - 7TLGP/7C-1PBGF/1.

B. Gridiron Junction Boxes: Grid mounted box with terminals for contractor termination of load circuits.

1. Box: Welded steel, minimum of 16 gauge, with removable cover.

2. Terminal Blocks: Molded barrier type with screw lugs to suit supply conductors.

3. Ground lug.

4. Mounting: Surface

5. Provide:

a. Stage Electric #1: 1 – LJB12.

b. Stage Electric #2: 1 – LJB12.

c. Stage Electric #3: 1 – LJB12

C. Multi-conductor Cable: Flexible, multiple conductor cable with a SO jacket.

1. Length as required to interconnect the border lights to the grid junction box.

2. Minimum 12 gauge, stranded wire with color-coded insulation.

3. Two wires per circuit plus ground and 10% spares.

4. Strain relief grips installed at each end of cable.

5. Provide:

a. Stage Electric #1: 1 – LBC28.

b. Stage Electric #2: 1 – LBC24.

c. Stage Electric #3: 1 – LBC24

2.6 LIGHTING CONTROL SYSTEM

A. Description: Microprocessor-based, modular system consisting of dimmer and control modules operated from remote-control stations and a control console.

1. Comply with UL891.

2. Comply with USITT DMX 512-A for data transmission.

B. STAGE DIMMER RACK: Modular, freestanding cabinet with a welded steel frame and locking door over the dimmers. Main and neutral lugs: Rated to 600 amps per phase for 120/208V, 60Hz, 3 phase, 4 wire operation. Visible indicator lights for each phase. Provide the DX2 series by Lehigh Electric Products.

1. UL/C-UL Listed Dead Front Switchboard rated at 100,000 AIC.

2. Dimmer mounting: Removable steel trays with dimmer alignment guides. Dimmers are to be shipped separately.

3. Factory wired dimmer input power and control wiring. Load wire lugs for up to #6ga wire with optional #2ga wire lugs.

4. Cooling: Dimmers to be fan cooled whenever a control signal is active and shall operate in ambients to 40oC. Systems drawing air through multiple dimmer modules are not acceptable.

5. Air filter: Cleanable electrostatic air filter mounted in the door.

6. Dimensions: 16.5" wide, 12" deep, and 44" high.

7. Textured black powder coated paint.

8. Main and neutral lugs: Rated to 400 amps per phase for 120/208V, 60Hz, 3 phase, 4 wire operation. Visible indicator lights for each phase.

9. Provide a dry contact closure interface to accept a signal from the fire alarm system that shall bring the house lights to full.

10. Provide: 1 DX2–60 dimmer rack with:

    a. 46 - 2.4KW stage dimmers

    b. 6 - 2.4KW house dimmers (compatible with 0-10V DC control operation with shut-off power relay)

    c. 4 - 20A non-dim relays

    d. 1 - 15A/3P area protection circuit breaker.

C. STAGE DIMMER RACK ELECTRONICS: System Control Module (SCM) to include a DC power supply, dimmer control board, and active power phase and DMX link LED indicators.

1. 16 bit digital processor to control 512 dimmers with an optically isolated (2500V RMS minimum) DMX512 input. Digital system electronics shall have no digital to analog demultiplexing circuitry or analog ramping schemes.

2. Control Module Performance:

    a. Each dimmer’s output to be independently regulated over the incoming line voltage range, adjusting for both RMS variations and deformations in the incoming AC line. The output voltage to be maintained within +/- 1V of the desired setting provided the setting is below the level of the line voltage minus the dimmer loss.

    b. Response time to incoming line voltage changes not to exceed 16ms.

    c. Precisely control each dimmer, maintaining the dimmer curve and line voltage regulation using digital signal processing. Dimmers set to the same level to operate within +/-1V of each other.

    d. No interaction between any dimmers in the system.

    e. Dimmer turn-on/turn-off time not to exceed 1/10 second.

D. STAGE SYSTEM CONTROL MODULE: SCM to provide expanded control features including system configuration, back-up cues, and user programmable settings.

1. Operating data to be stored in a non-volatile battery backed and Flash memory. An RS232 port shall allow system configuration, operation, and off-line storage using a PC.

2. Ethernet link option to allow connection for remote monitoring, programming and subsystem networking using a compatible console or PC.

3. SCM to simultaneously accept up to 2 optically isolated (2500V RMS minimum) DMX512 inputs and one Collage control input.

4. LEDs to indicate inter-rack control link, PC link, DMXA link, DMXB link, Ethernet activity and Ethernet status.

5. Rack Control Station (RCS): RCS control station with 3.5" floppy disk drive for system programming, control, and off-line storage. RCS to include a 4 line by 20 character LCD display plus 26 keys: 4 cursor control, 0 thru 9, Clear, Enter, Capture, Config, Edit, Backup, Set, And/Thru, At/Dimr, Next/Fl, Focus, and Status. Keypad shall be enclosed membrane type with audible feedback switches and silkscreened legends.

6. The following functions to be programmable from a PC or RCS station:

a. Store 99 back up cues plus blackout with individual fade times to 999 seconds. Cues to be recorded using the current dimmer levels of the combined active links.

b. Preview and edit stored cues and modify channel levels and fade times. Cues may be edited live or blind.

c. Config mode for programmable rack partitioning to assign each dimmer to multiple control inputs (DMXA, DMXB, and/or Collage) with control sequencing to set the order and control link combinations. 5 digit alphanumeric ID assignable to each dimmer.

d. Program system response to lost control link:

1) Hold current levels for a programmed time interval or until another cue is manually selected.

2) Automatically recall a preselected backup cue.

3) Automatically transfer to another active control link.

e. Recall backup cues using one of three modes:

1) Recall Cue: Activate cues 0 thru 99 using RCS or PC. Cues may be recalled via remote recall stations. Master raise/lower control modifies active backup cue.

2) Backup Off: Returns rack control to the normal link.

3) Console Mode: Sequences through backup cues using programmed fade times. RCS display lists Active Cue, Next Cue, and Fade Time. The "Next" key permits a crossfade from an active cue to the next cue, and displays each incremental cue. Active Cue, Next Cue, and Fade Time may be changed at any time.

f. Dimmer focus check.

g. Program time clock events via a PC to activate back-up cues.

h. System diagnostic routine.

i. Basic Collage Architectural Controls:

1) Dimmer to channel to room patch for 512 dimmers on 128 channels.

2) Up to 48 control stations.

3) 16 rooms with 24 presets plus off per room with programmable room, channel, and preset names.

4) RS232 interface to A/V control systems.

j. Astronomical time clock control with 128 events including macro control.

k. Program remote station switches to a control function: preset, macro, station lock, preset master, and room combine control.

l. Program dimmers to meet or exceed the following:

1) Minimum and maximum control levels for each dimmer.

2) Control curves: 8 standard, one user programmable, and programmable non-dim trigger point.

3) Output voltage boost to allow for long cable drops.

4) Operate in dim or non-dim mode.

E. STAGE SYSTEM DIMMER MODULES: Steel housing with black powder coated finish, anodized extruded aluminum heat sink, ventilation slots, and handle. UL and C-UL Recognized.

1. Dimmer ratings: 2.4KW and 6.0KW as scheduled.

2. Plug-in design with floating power, load and control connectors to align with the mating dimmer rack receptacles. The control and power connector configuration shall eliminate arcing during dimmer insertion or removal.

3. Dimmer modules of the same rating to be interchangeable without tools.

4. Overload protection: Integral, fully magnetic, switch duty rated circuit breaker that is UL Listed under UL489 as a branch circuit protector with a minimum 10,000 AIC rating.

5. SSR: Back to back silicon controlled rectifiers (SCR), mounted on an exposed ceramic substrate in an electrically isolated assembly with opto-isolator, trigger SCR and steering bridge. Provide 4000 volts minimum isolation between AC and control lines. The SSR shall carry the dimmer's rated load indefinitely. Hot patching loads up to the dimmer's rating shall not damage the dimmer.

6. Temperature sensing: Monitor the module's internal temperature and deenergize the module if overheated. Each module shall include an overtemp LED. Systems not monitoring individual dimmer modules are not acceptable.

7. Filtering: Toroidal choke to limit the current rise time to a minimum of 350 microseconds as measured from 10% to 90% of the output waveform at maximum load. Filtering to limit interference to audio systems, reduce lamp filament noise, and the introduction of RF on the AC line.

8. Dimmer Operation:

   a. Ambient temperature range of 0 to 40oC.

   b. Line voltage range from 90 to 140 volts.

   c. 95% dimmer efficiency.

   d. Symmetrical alternating current output, eliminating any DC component to the load.

   e. LED indicators track the dimmer's input control signal level.

9. Dimmer modules:

   a. Standard module: Controls incandescent, neon, cold cathode, and low-voltage lamp sources.

   b. Filler module: Blank dimmer housing to fill unused dimmer spaces.

   c. Fluorescent/LED module: Interfaces with 0-10V DC controlled dimmable electronic fluorescent ballasts and LEDs. Each module controls one 2400 watt circuit and includes a 20A/1P circuit breaker and a relay to turn the circuit off when the control level is at '0'.

   d. Circuit breaker Module: Two 20A/1P (10,000AIC) circuit breakers for constant circuits.

   e. Non-dim Module: Two 20-amp circuits with main circuit breakers and switched air-gap relays.

F. CONTROL CONSOLE: Control console to meet or exceed the Lehigh Rendition II Series as specified below:

1. General:

a. Lighting control console shall be a microprocessor based system designed to provide control of stage, studio, and other entertainment lighting systems. Console shall be available in a 24/48 or 48/96 two-scene preset configuration with 24 paged submasters. Control channel configurations to include 125, 250, or 512 conventional channels plus 1024 moving light channels.

b. Operating system providing a graphical user interface with mouse and keypad entry operation.

c. Up to 1536 channel memory mode to control 1024 dimmers using local DMX ports or 2048 outputs using Pathport, ArtNet, or ACN Streaming protocols.

d. Console shall support 10,000 cues, 999 cue lists, 999 groups, 4 X 999 palettes, 999 effects, and 2000 macros. All show data shall be stored in a solid state hard drive or to any USB storage device.

e. MIDI and MIDI Show control compatible.

f. Moving lights and scroller control capability.

g. Alphanumeric labeling of channels, cues, groups, submasters, shows, macros, and effects using onscreen keyboard display or optional keyboard.

h. Live or blind recording of cues, groups, submasters, macros, effects, subroutines, and patch.

i. Context sensitive help function with a complete on board operators manual.

j. Windows offline editor shall be provided.

k. System shall allow remote control from external devices including wireless remote focus, remote video and control from PC running client software, and universal fader wings. Wings requiring a PC to host the device shall not be acceptable.

l. Support for Cast Software WYSIWYG Autopatch and AutoFocus protocol. Consoles that do not off this support are not acceptable.

m. Dimensions:

1) Rendition 24/48: 31.5"W X 4.25"H X 17.25"D.

2) Rendition 48/96: 37.5"W X 4.25"H X 17.25"D.

2. Minimum System Hardware Requirements:

a. Solid state memory for operating system and data storage.

b. USB flash drive for show storage and software upgrades.

c. Twenty-four integral submasters will be provided. Systems that do not provide integral submasters shall not be acceptable.

d. Trackball for rate/level and moving light non-intensity parameter control.

e. Grandmaster with blackout button is provided.

f. Up to nine fader wings may be connected to the console for a maximum of 240 submasters. Wings shall be able to be connected remotely via ethernet. Wings requiring a PC to host this device are not acceptable.

g. Output/input interfaces:

1) MIDI in/thru/out ports - MIDI and MIDI Show Control.

2) PS2, dual Ethernet, and four USB ports.

3) Two RDM Ready DMX-512 output ports and one DMX-512 input port.

4) Video with VGA monitor.

5) AC convenience outlet.

h. Dimmer rack overtemp warning indicator alert on the monitor screen.

i. Keypad with 64 keys plus 4 cursor keys and mouse to access windows and controls display.

j. A full-function detachable alphanumeric keypad shall be provided keyboard.

3. Display functions:

a. Stage, Blind, Group Edit, Patch and Macro primary displays.

b. Menu displays:

1) File – Show I/O, USB I/O, Print, Imports.

2) Setup – System settings, defaults, output setup, ethernet configuration.

3) About - Channel, Dimmer, show.

4) Tools - Fixture editor, focus check, virtual keyboard

5) Help – online help, context sensitive help, upgrade software

c. Channel Display – Stage, Blind, Palette

d. Fixture Display – Stage, Blind, Palette, FCBI filtering

e. Patch Display – Channel List, Fixture List

f. Console status display listing fader status, active cues, grandmaster level, and submaster page.

g. Toolbox - Adjust levels with mouse using virtual ‘wheel’ or in 10% increments using virtual slider.

h. Palette Window – Groups, Fixture groups, Focus, Color, Beam, and Intensity

4. Channels

a. Up to 512 conventional control channels plus 1024 dedicated moving light channels. Consoles not providing separate conventional and moving light channels will not be considered equal.

b. And, thru, list construction

c. Channel parking to assign channel(s) to an independent control level unaffected by other console control levels, except blackout. Parked dimmer level shall have precedence over a parked channel level.

d. Assign independent channel control.

e. Flipped channel control with inverted control level.

f. Solo control to set all unselected channels to a '0' percent.

g. About channel function displays channel label, attributes, cues (first, last, and # of cues), current level and control source, parked status, and dimmers patched to.

h. About dimmer function displays dimmer label, channel patched to, proportional level, profile, DMX level, and parked status.

i. Focus check function provided to activate any dimmer or channel to a level.

j. Display to be color coded on a channel by channel basis to indicate channel control status as control source changes.

k. Update function modifies selected channel levels in a cue, submaster, or group without affecting other recorded levels

l. Release selected, captured, and independent channels from mouse or keypad control in blind or stage displays.

m. Proportional range editing of channel levels in cues, groups, and submasters.

n. 16-bit resolution assignment to be used for extra precision of a channel. 16-bit channel shall use two consecutive channels to store and display channel settings.

o. LTP (last action) assignment of channels to assist in moving light control.

p. Trackball, keyboard, or mouse control.

5. Cues:

a. Number from .1 to 999.9 plus alphanumeric labeling.

b. Cue level timing and delays for intensity Up/Down, Focus, Color and Beam.

c. Individual channel or non-intensity parameter timing and delay.

d. Follow: cue follows a cue with Go, Auto or Time operation.

e. Link a cue to another cue or macro.

f. Auto-mark: can be disabled on a cue by cue basis.

g. Multiple cue lists.

h. Types: crossfade, all fade, block, effect, or subroutine.

i. Subroutine Loop value.

j. Multipart cues with up to 20 parts.

k. Labels.

l. Update.

6. Playback:

a. The master faders shall consist of A/B and C/D fader pairs with clear, rate, back, go, and hold buttons.

b. Timed fades may be stopped, changed to manual, held, or modified anytime prior to the end of the fade. LEDs track the fade progress and the display indicates current status.

c. Quickstep function bypasses cue fade times (in/wait/out) for a quick show run thru.

7. Submasters:

a. Twenty-four integral submaster faders shall be provided. Each fader shall have two buttons for various functions and LEDs indicating Loaded, Timed, or Hold status. Systems that do not have integral submaster faders shall not be acceptable.

b. Types: pile-on, effect, or inhibitive.

c. Recorded live or blind and activated by bump button, submaster slider, or as part of a macro.

d. Effects shall be programmable to any pile-on submaster. Activating the submaster activates the effect that may operate indefinitely. Multiple effects and submasters may run simultaneously.

e. Up to 10 submaster memory pages shall be provided. Addition of wings will change the number of pages. Changing the page will not affect the active submasters.

f. Fader buttons to have enable, solo, or disable modes.

g. Timed bumps with up, dwell, and down times to 99:59 minutes. Dwell to be manual, hold, or timed.

8. Effects:

a. Minimum of 999 effects per show with 100 steps per effect.

b. Assignable to any submaster or cue.

c. In, dwell, and out step and effect times to 99:59 minutes.

d. High and low level settings.

e. Run in forward, reverse, and bounce directions in standard, alternate, and build patterns. Effects may be negative and random stepping with high and low rates.

9. Patch:

a. Proportional patching of 1024 dimmers (2048 over Ethernet).

b. Non-dim control with programmable turn-on level.

c. 16 user defined dimmer profiles.

d. Dimmer parking to assign a control level to a dimmer independent of all controls, except blackout.

e. Patch to DMX outputs and/or Ethernet universe.

f. Moving light fixture patch with fixture library by manufacturer, model, and mode.

10. Group:

a. Program channels into groups at proportional levels with 999 groups per show.

b. Access cues or submasters as a group.

c. Recall groups to create scene.

11. Macros:

a. Program up to 2,000 macros.

b. Maximum of 80 key presses per macro with most console keys programmable into macros.

c. Learn, execute, and macro editor functions.

d. Macro keys: M1 and M*.

12. Moving light control

a. 16-bit resolution for fixture attributes such as pan and tilt.

b. LTP (last action) channel assignment.

c. Flip channel attribute for inverse control.

d. Independent channel: Independent channels are not affected by Grandmaster, Blackout, or Solo.

e. Focus Presets Palettes: Records commonly used fixture attribute settings in 4 X 999 palettes to be referenced by cues and submasters.

f. Fixtures with CMY or RGB color mixing may be set using color picker or encoders. Color Picker values can be stored to palettes for recall.

g. Fixture library and built-in fixture editor

h. Fixture groups: Record up to 999 fixture groups. The groups are be automatically or manually generated.

i. Fixture patch: Add, remove, replace fixtures and set start channel, starting DMX address, flip pan, flip tilt, swap pan and tilt, and independent attributes.

j. Fixture non-intensity parameter parking.

k. Virtual channels: Provide 1024 virtual outputs for the exclusive control of moving lights.

l. Display: Non-intensity parameters are displayed in a spreadsheet format with fixture type and attributes provided in a descriptive format (ex. Gobo - open) rather than numerical values. It shall be possible for the user to choose which parameter category to display.

m. Fine/Coarse Control.

13. Stage Manager's Panel: Surface mounted steel cabinet with a hinged locking cover and a painted finish. Mount on the stage area as shown on the drawings.

a. Provide a CTM612 series master station. The station shall meet the following requirements:

1) Construction:

(a) Six gang station with a rugged ABS frame and clear Lexan overlay. Station is to mount in a standard single gang masonry style backbox.

(b) A graphic level LCD display for displaying the system preset and channel names.

(c) Capacitive touch sensing, backlit buttons with no moving parts. Stations with mechanical buttons are not acceptable.

(d) Integral Infrared receiver for wireless preset selection using a handheld infrared transmitter.

2) Operation:

(a) Station shall display the preset and channel names. Scroll up/down buttons scroll the station's 24 preset names in the LCD display. The Enter button activates the displayed preset.

(b) Master raise/lower buttons override the active preset scene and provide proportional control of the scene's channel control levels. Master override shall not change the original preset channel values stored in the system memory.

(c) Full button to fade selected channels to full output.

(d) Off button to fade all channels to off.

(e) Twelve capacitive touch sensitive potentiometers provide channel level setting. There shall be ten pages of control channels for 120 channels of control.

(f) Program up to 24 presets for independent control of the auditorium house, two LGI areas, and stage areas.

(g) All dimmers shall be programmable to the SMP master station using the dimmer rack RCS station. System shall automatically lock out the control of any stage dimmers from the SMP whenever the console is energized.

b. House control stations to be Collage CTE-LCD preset select station providing access to house presets 1 thru 24, off, and master raise/lower control. Station shall include an LCD to display the preset names and include capacitive touch sensing, backlit buttons with no moving parts. Stations with mechanical buttons are not acceptable.

14. House controls:

a. Provide four CTE602 entrance stations for on/off control of selected house light dimmers. Locate the stations at locations as shown on the drawings. Station shall include capacitive touch sensing, backlit buttons with no moving parts. Stations with mechanical buttons are not acceptable.

b. Provide Collage CTE-LCD preset station in a portable enclosure with a 25' cable and connector to plug into the remote receptacle stations.

15. Wireless DMX: Provide a wireless DMX transmitter at the dimmer rack and wireless DMX receivers with DMX Out receptacles on each of the front of house electrics and stage electrics 1 and 3.

16. Provide the following:

a. 1 - Rendition II 48/96-250 channel control console..

b. 1 - 25' control cable set.

c. 1 - 19” LCD flat screen color monitor.

d. Console and monitor dust covers.

e. 2 - Console control receptacles

f. Stage Manager’s Panel with:

1) 1 - CTM612 master station.

2) 1 - CTE-LCD preset select station.

g. 4 - CTE602 entrance stations.

h. 1 - Portable CTE-LCD house station.

i. 1 - Wireless DMX transmitter mounted with the dimmer cabinet.

j. 4 - Wireless DMX receivers with DMX Out receptacles on each of the front of house electrics and stage electrics 1 and 3

G. EMERGENCY TRANSFER CABINET

1. The Emergency Lighting Transfer Cabinet shall provide automatic transfer of both the phase and neutral legs of each branch circuit from normal to emergency power when normal power fails. The cabinet shall automatically reconnect circuits to normal power when normal power has been restored.

2. The transfer cabinet switches shall be electrically operated and mechanically held. The entire assembly shall be UL1008 listed and labeled. This equipment must comply with the regulations in NFPA 110 for Emergency and Standby Power Systems.

3. The Emergency Lighting Transfer Cabinet must satisfy the requirements of the following NFPA 70 (National Electric Code).

a. Article 701 – Legally Required Standby Systems

b. Article 700 – Emergency Systems

c. Article 540-11c – Motion Picture Houses

d. Article 520-7 – Theatres and Similar Locations

e. Article 518-3c – Places of Public Assembly

4. The Emergency Lighting Transfer Cabinet shall be a wall-mounted, NEMA 1 enclosure constructed of 14-gauge steel finished in ANSI 61, gray powder coat paint. All terminations and wiring shall be accessible via a hinged lockable door. The cabinet shall be pre-wired and tested at the factory with clearly marked terminals for contractor wiring of normal feed, emergency feed, lighting loads and sensing feeds.

5. Standard transfer relays shall be available at 20A and 50A current ratings.

6. The Emergency Lighting Transfer Cabinet shall accommodate circuits of two wire, dimmed incandescent or fluorescent lighting as well as three wire, dimmed, fluorescent lighting.

7. Emergency Lighting Transfer Cabinets with Type 3 emergency power feeds shall provide for power distribution and branch circuit protection internally for all emergency power circuits.

8. The front panel of the Emergency Lighting Transfer Cabinet shall contain a key-switch to simulate power failure for testing purposes as well as indicator lights to visually signal the presence of normal or emergency power.

9. Voltage sensing of the Normal source shall cause automatic transfer when the voltage of one or more phases drops below 55% of 120VAC.

10. Factory default settings for time delay of transfer are as follows: Normal to Emergency – 0 Seconds, Emergency back to Normal 3 Seconds. These settings shall be field adjustable.

11. Provisions for optional remote signal, fire alarm and other input signals shall be incorporated into the control circuit.

12. Provide a UL 1008 Emergency Lighting Transfer Cabinet to transfer a minimum of two emergency circuits.

2.7 FINISHES

A. Manufacturers' standard, unless otherwise indicated

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment according to the manufacturer's written instructions. Set permanently mounted items plumb and level and square with ceilings and walls.

B. Mounting of Equipment: Conform to manufacturer's instructions and Division 16 Section "Supporting Devices." Mounting heights indicated are to bottom of unit for suspended items and to center of unit for wall-mounted ones.

3.2 CONTROL WIRING INSTALLATION

A. Install equipment according to the manufacturer's written instructions. Set permanently mounted items plumb and level and square with ceilings and walls.

B. Mounting of Equipment: Conform to manufacturer's instructions and Division 16 Section "Supporting Devices." Mounting heights indicated are to bottom of unit for suspended items and to center of unit for wall-mounted ones.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Arrange and pay for the service of a factory-authorized service representative to test, adjust, and program the lighting control system.

B. Schedule visual and mechanical inspections and electrical tests with at least 21-days advanced notification.

C. Electrical Tests: Perform according to manufacturer's instructions. Exercise caution when testing devices containing solid-state components.

3.4 CLEANING AND ADJUSTING

A. Remove paint splatters and other spots, dirt, and debris. Repair scratches and mars of finish to match original finish. Clean fixtures, devices, and equipment internally and externally using methods and materials as recommended by manufacturers.

3.5 DEMONSTRATION

A. Demonstrate the system to prove compliance with requirements.

B. Direct Training: Arrange and pay for the services of a factory-authorized service representative to demonstrate the lighting control system and train the Owner's personnel.

1. Conduct a minimum of 1 day of training in operation and maintenance as specified under "Instructions to Owner's Employees" in Division 1 Section "Project Closeout." The training is to include system operation and maintenance procedures.

2. Schedule training with at least a 21-day advance notification.

3.6 COMMISSIONING

A. Operational Tests: Energize lighting controls systems, program controls, and check controlled outlets for light levels.

B. Correct deficiencies and retest deficient items. Verify by the system tests that specified requirements are met.

END OF SECTION

TABLE OF CONTENTS

SECTION 274000

AUDIO VISUAL

PART 1 - GENERAL 1

1.1 GENERAL PROVISIONS 1
1.2 SCOPE OF WORK 1
1.3 RELATED WORK 2
1.4 QUALIFICATIONS 2
1.5 DEFINITIONS 3
1.6 CODES, REFERENCES AND PERMITS 4
1.7 GENERAL REQUIREMENTS 6
1.8 MATERIAL AND EQUIPMENT STANDARDS 6
1.9 SUBMITTALS 6
1.10 OPERATION AND MAINTENANCE DATA 10
1.11 RECORD DRAWINGS 12
1.12 WARRANTIES 13
1.13 COORDINATION 13
1.14 COORDINATION DRAWINGS 14
1.15 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS 15
1.16 INSPECTION OF SITE CONDITIONS 16
1.17 SURVEY AND MEASUREMENTS 16
1.18 DELIVERY, STORAGE AND HANDLING 16
1.19 PROTECTION OF WORK AND PROPERTY 17
1.20 SUPERVISION 17
1.21 SAFETY PRECAUTIONS 17
1.22 SCHEDULE 17
1.23 HOISTING, SCAFFOLDING AND PLANKING 17
1.24 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORT 17
1.25 HAZARDOUS MATERIALS 18
1.26 ACCESSIBILITY 18
1.27 SEISMIC RESTRAINT REQUIREMENTS 18
1.28 PROJECT CLOSEOUT 19

PART 2 - PRODUCTS 22
2.1 GENERAL 22
2.2 SOURCE EQUIPMENT 22
2.3 CABLE SUPPORTS AND MANAGEMENT 22
2.4 GROUNDING 23
PART 3 - EXECUTION 23
3.1 GENERAL 23
3.2 SOURCE RECORD/PLAYBACK EQUIPMENT 27
3.3 SPEAKERS 27
3.4 EQUIPMENT RACK 27
3.5 CABLE PROTECTION 28
3.6 CABLE SUPPORT AND MANAGEMENT 28
3.7 GROUNDING 30
3.8 SYSTEM TESTING 30
3.9 FIRESTOPPING 31
3.10 LABELING AND IDENTIFICATION 32
3.11 DOCUMENTATION 33
3.12 SLEEVING AND PENETRATIONS 33
3.13 SEISMIC SUPPORTS, SUPPLEMENTARY STEEL AND CHANNELS 34
3.14 SYSTEM ACCEPTANCE 35
3.15 ACCEPTANCE DEMONSTRATIONS 36
3.16 PROJECT OWNER COORDINATION 36
3.17 CLEANING UP 37

SECTION 274000

AUDIO VISUAL

(PART OF WORK SECTION 270000 – ELECTRICAL WORK, TRADE BID REQUIRED)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. The GENERAL REQUIREMENTS, DIVISION 1, and BIDDING AND CONTRACT REQUIREMENTS, DIVISION 0, are hereby made a part of this Specification Section.

B. Examine all Drawings and all Sections of the Specifications and requirements and provisions affecting the work of this Section.

1.2 SCOPE OF WORK

A. This project includes the partial replacement and testing of existing audio visual components damaged by water. Selective demolition of existing systems shall be required.

B. The work under this Section includes providing of all material, labor, equipment and supplies and the performance of all operations to provide a complete working Integrated Audio Visual System as required by the Drawings and details and as specified herein. Where the Drawings, Specifications, Codes, Regulations, Laws, or the requirements of the local Authority conflict, provide the higher quality and higher quantity indicated or required and follow the most strict requirement. In general, the work includes, but is not limited to, the following:

a. Audio Control and Video system components

b. Cabling terminations for UTP audio and video.

c. Protection of new and existing work.

d. Record Drawings and Documentation.

e. Staging.

f. Operation and Maintenance Instructions and Manuals for the Section's work.

g. Fireproofing of Penetrations and Openings used by the Audio Visual Sub Contractor.

h. Access panels and doors.

i. Phasing of work and maintenance of service to existing and temporarily relocated items, Owner equipment or workstations, etc. as required to meet the project schedule.

j. Coordination with manufacturers, other trades and Owner.

k. Audio Visual equipment.

l. Ceiling/Wall Mounted Speaker Assemblies.

m. Cable and Plate Identification.

n. Supervision and Approval.

o. Testing

p. Operating and maintenance instructions and manuals.

q. Coordination and delivery of Audio Visual systems to the project site.

r. Shop drawings.

s. Record (as-built) drawings.

t. Programming for audio, video and control equipment.

u. Testing and staging of Audio Visual systems.

v. Training session for end-user of functional Audio Visual system.

w. Table box assemblies.

1.3 RELATED WORK

A. Principal classes of Work related to the Work of this Section are listed in the Specification Table of Contents, and are specified to be performed under the indicated Sections of the Specifications. Refer to the indicated Sections for description of the extent and nature of the indicated Work, and for coordination with related trades. This listing may not include all related Work items. It is the responsibility of the Contractor to coordinate and schedule the Work of this Section with that of all other trades.

B. The following work is not included in this section and will be provided under other sections:

1.4 QUALIFICATIONS

A. The installer (Firm and Employees) shall be experienced in the operations they are engaged to perform. Demonstrate at least five years of continuous recent experience on similar projects. The installer shall hold and provide recent, up-to-date licenses, certifications and training certificates in the area the project is located and for the equipment to be installed.

B. The successful bidder shall be thoroughly familiar with the cabinet methods set forth in the latest release of the BICSI TDMM's (Building Industry Consulting Services International Telecommunications Distribution Methods Manuals) and unless otherwise specified, shall supervise the installation in accordance with the recommendations and practices outlined in the latest release of the BICSI Telecommunications Cabling Installation Manual.

C. Provide names of contacts from the last five similar projects including the General Contractor, Owner's representative, Architect and Engineer. Indicate project locations, scope and current phone numbers that the contacts can be reached at.

D. Qualified Audio Visual installation firms shall have demonstrable design and installation training with certifications of competence. Certified training shall be industry recognized and at least equal to:

1. Building Industry Consulting Service International, Inc. (BICSI), Registered Communications Distribution Designer (RCDD).

2. Approved Manufacturer's Certified Installer Program (i.e. Bose)

   a. Each foreman and installer working on this project shall be trained and certified to the qualified level as specified by the manufacturer(s) for installation and maintenance of equipment being provided on this project. The training shall consist of at least a minimum of proper installation techniques of their specific equipment in order to have a complete operating system meeting or exceeding the requirements as specified herein. Each foreman and installer working on this project shall provide documentation from the manufacturer indicating that they have been adequately trained prior to the start of the project. Only foreman and installers who have been properly trained and documented by the manufacturer whose equipment is being provided on this project shall be allowed to install.

   b. Maintain at the site, an updated copy of the Manufacturer Trained Installers list including a copy of their training documentation from the manufacturer. This documentation shall be made available to the Owner's representative upon request.

3. infoComm International Communications Industries Association, INC. (ICIA) Certified Technology Specialist (CTS)

4. infoComm International Communications Industries Association, INC. (ICIA) Certified Technology Specialist - Installation (CTS-I)

5. infoComm International Communications Industries Association, INC. (ICIA) Registered Installer

1.5 DEFINITIONS

A. As used in this Section, the following items are understood to have the following meaning:

1. ***"Contractor or Sub Contractor or Sub-Sub Contractor"***, unless otherwise qualified, shall mean the installer of the work specified under this Section.

2. ***"Furnish"*** shall mean purchase and deliver to the project site, complete with every necessary appurtenance.

3. ***"Install"*** shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting and proper operation at the proper location in the project.

4. ***"Provide"*** shall mean "Furnish" and "Install".

5. ***"Work"*** shall mean all labor, materials, equipment, apparatus, controls, accessories and all other items required for a proper and complete installation.

6. ***"Concealed"*** shall mean hidden from sight in chases, furred-in spaces, shafts, hung ceilings, embedded in construction or in a crawl space. Areas to be concealed as part of tenant alterations to the building shall also be considered in this definition.

7. ***"Exposed"*** shall mean not installed underground or concealed as defined above.

8. ***"Furnished by Others"*** shall mean materials or equipment purchased under other sections of the general contract and installed by this section of the specifications by this Trade Contractor.

9. ***"Owners Representative"*** shall be the party responsible to make decisions regarding all contractual obligations in reference to the Scope of Work for the Owner.

10. ***"Date of Substantial Completion"*** shall indicate the date where the work has been formally accepted as evidenced by completed final punch list or where the work has reached the stage that the Owner obtains beneficial use and commences utilization of the installed systems for business or occupancy purposes. The GENERAL REQUIREMENTS, DIVISION 1, shall supercede this definition where specifically defined.

1.6 CODES, REFERENCES AND PERMITS

A. Materials, installation of systems and equipment provided under this section shall be done in strict accordance with Massachusetts Department of Public Safety Codes, Massachusetts Department of Environmental Protection, Massachusetts State Building Code 780 CMR and any other Codes and Regulations having jurisdiction including but not limited to:

1. All Applicable NFPA Standards

2. Massachusetts Electrical Code (MEC)

3. Occupational Safety and Health Administration (OSHA)

4. State and Local Building Codes

5. Underwriters' Laboratories, Inc (UL)

B. Unless otherwise specified or indicated, materials, workmanship and equipment performance shall conform with the latest governing edition of the following standards,

codes, specifications, requirements, and regulations, except when more rigid requirements are specified or are required by applicable codes but not limited to:

1. American National Standards Institute (ANSI)
2. American Society of Testing and Materials (ASTM)
3. Institute of Electrical and Electronics Engineers (IEEE)
4. Insulated Cable Engineers Association (ICEA)
5. National Electric Manufacturers Association (NEMA)
6. TIA/EIA – Telecommunications Industry Alliance/Electronics Industry Alliance
7. FCC – Federal Communications Commission
8. NEC – National Electric Code
9. NFPA 70 – National Fire Protection Association
10. ANSI/TIA/EIA-568-B.1– Commercial Building Telecommunications Cabling

    Part 1 – General Requirements
11. ANSI/TIA/EIA – 568-B.2- Commercial Building Telecommunications Cabling

    Part 2: Balanced Twisted Pair Cabling
12. ANSI/TIA/EIA-568-B.3 – Commercial Building Telecommunications Cabling
13. ANSI/TIA/EIA-569-A – Commercial Building Standard for Telecommunications Pathways and Spaces
14. ANSI/TIA/EIA-606 – The Administration Standards for the Telecommunications Infrastructure of Commercial Building
15. ANSI/TIA/EIA-607 – Commercial Building Grounding and Bonding Requirements for Telecommunications
16. FCC Part 15 (addresses electromagnetic radiation)
17. FCC Part 68 (connection of premise equipment and wiring to the network)
18. ANSI/ICEA – Insulated Cable Engineers Association
19. SP – Standards Proposal (EIA/TIA)
20. UL Compliance: The communication system supplied shall be listed by Underwriter's Laboratories under UL Standard 1459 (designation WYQQ on UL Listing Card) for Telephone Appliance and Equipment. A copy of the UL listing card for the proposed system shall be included with the Contractor's submittal.

C. Give all notices, file all plans, obtain all permits and licenses, and obtain all necessary approvals from authorities having jurisdiction. Deliver all certificates of inspection to the authorities having jurisdiction. No work shall be covered before examination and approval by the Owner's Representative, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work to conform to requirements, satisfactory to Owner's Representative, and without extra cost to the Owner. If work is covered before inspection and approval, this Contractor shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.7 GENERAL REQUIREMENTS

A. Nameplates

Each major component of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment.

1.8 MATERIAL AND EQUIPMENT STANDARDS

A. Where equipment or materials are specified with the name of a manufacturer, such specification shall be deemed to be used for the purpose of establishing a standard for that particular item. No equipment or material shall be used unless previously approved by the Owner's Representative.

B. Substitutions may be offered for review provided the material, equipment or process offered for consideration is equal in every respect to that indicated or specified. The request for each substitution must be accompanied by complete specifications together with drawings or samples to properly appraise the materials, equipment or process. The Contractor shall highlight and list all applicable specification requirements which the substituted material deviates from.

C. If a substitution of materials or equipment in whole or in part is made, this Contractor shall bear the cost of any changes necessitated by any other trade as a result of said substitution.

D. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers as approved.

E. If three or more manufacturers are indicated without the term "or equal" to "or approved equal", then the material and equipment shall be supplied by one of those indicated and that material and equipment shall conform in all respects to the Drawings and Specifications.

F. Provide products of one manufacturer for each classification of equipment.

1.9 SUBMITTALS

A. Conform to the requirements of **Division 1**, **General Conditions**, for schedule and form of all submittals unless specifically noted otherwise in this section. Coordinate this submittal with submittals for all other finishes. Shop drawings and design layouts shall be prepared by licensed installing Contractors and shall note the name(s), license number(s) and license expiration date(s) of the Contractor(s) installing electrical systems.

B. Definitions:

1. Shop Drawings are information prepared by the Contractor to illustrate portions of the work in more detail than indicated in the Contract Documents.

2. Acceptable Manufacturers: The mechanical design for each product is based on the single manufacturer listed in the schedule or shown on the drawings. In Part 2 of the specifications, certain Alternate Manufacturers are listed as being acceptable. In addition, the MATERIAL AND EQUIPMENT STANDARDS paragraph potentially allows for substitutions as being acceptable. These are acceptable only if, as a minimum, they:

   a. Meet all performance criteria listed in the schedules and outlined in the specifications. For example, to be acceptable, a category 5e cable must deliver equal Mhz at equal or greater rates as the cable listed in the schedules.

   b. Fit within the available space it was designed for, including space for maintenance and component removal, with no modification to either the space or the product. Clearances to walls, ceilings, and other equipment will be at least equal to those shown on the design drawings. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Engineer has determined that the manufacturer's products will fit within the available space – this determination is solely the responsibility of the Contractor.

   c. Products must adhere to all Architectural considerations including, but not limited to; being of the same color as the product scheduled or specified, fitting within the Architectural enclosures and details, and for diffusers – being the same size and of the same physical appearance as scheduled or specified products.

C. Submittal Procedures, Format and Requirements

1. Review submittal packages for compliance with Contract Documents and then submit to Owner's Representative for review. Submit enough sets of shop drawings such that, after review, two sets will be kept by the reviewer, with only the remaining sets returned with reviewer's marks and comments.

2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:

   a. Title

   b. Equipment number

   c. Name and location of project

   d. Names of Owner, Engineer and Seller

   e. Names of manufacturers, suppliers, vendors, etc.

   f. Date of submittal

g. Whether original submittal or resubmitted

3. Shop Drawings showing manufacturer's product data shall contain detailed dimensional drawings (minimum ¼" – 1' scale) including plans and sections (where physical clearance could be an issue). Provide larger scale details as necessary.

4. Submit accurate and complete description of materials of construction, manufacturer's published performance characteristics, sizes, weights, capacity ratings (performance data, alone, is not acceptable), electrical requirements, starting characteristics, wiring diagrams, and acoustical performance for complete assemblies. Drawings shall clearly indicate location (terminal lock or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.

5. Provide Shop Drawings showing details of connections to all equipment. If connection details are not submitted and connections are found to be installed incorrectly, this Contractor shall reinstall them within the original contract price.

6. Provide complete data for all auxiliary services and utilities required by submitted equipment. This shall include fuel, cooling and exhaust requirements and points of connections.

7. Provide a complete description of all controllers and instrumentation required including electrical power requirements for all components and detailed information on termination diagrams, and all control interfaces with a central control system.

8. Provide installation and erection information including; lifting requirements, and any special rigging or installation requirements for all equipment.

9. The Owner's Representative shall approve all materials before commitment for materials is made.

D. Product Data: Submit complete manufacturer's product description and technical information including:

1. Source Equipment

2. Interface Equipment

3. Cameras

4. Distribution Amplifiers

5. Switching/Routing Devices

6. Mixers

7. Digital Signal Processors

8. Amplifiers

9. Speakers

10. Control Devices

11. Mounting Supports

12. Cable Specifications

13. Cable Termination Hardware

14. Training Materials

15. Audio, Video and Control Program

16. Plates and Panels

17. RF distribution system

18. Cable supports and management

E. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal. Clearly mark or high-light each product part number within each submittal.

1. Do not submit multiple product information in a single bound manual.

2. Three-ring binders shall be accepted.

F. Deviations:

1. Concerning deviations other than substitutions proposed deviations from Contract Documents shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the deviation to the attention of the Owner's Representative.

2. Without letters flagging the deviation to the Owner's Representative, it is possible that the Engineer may not notice such deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Owner's Representative, the Seller shall hold the Engineers, his consultants and the Owner harmless for any and all adverse consequences resulting from the deviations being implemented. This shall apply regardless of whether the Engineer has reviewed or approved shop drawings containing the deviation, and will be strictly enforced.

3. Approval of proposed deviations, if any, will be made at discretion of Engineer.

G. Schedule: Incorporate shop drawing review period into construction schedule so that Work is not delayed. This Contractor shall assume full responsibility for delays caused

by not incorporating the following shop drawing review time requirements into his project schedule. Allow at least 10 working days, exclusive of transmittal time, for review each time shop drawing is submitted or resubmitted with the exception that 20 working days, exclusive of transmittal time are required for the following:

H. Responsibility

1. Intent of Submittal review is to check for capacity, rating, and certain construction features. The Contractor shall ensure that work meets requirements of Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with approved submittals to extent that they agree with Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of Contract Documents. The Engineer's noting of some errors while overlooking others will not excuse the Contractor from proceeding in error. Contract Documents requirements are not limited, waived nor superseded in any way by review.

2. Inform Contractors, manufacturers, suppliers, etc. of scope and limited nature of review process and enforce compliance with contract documents.

I. In the event that the Contractor fails to provide Shop Drawings for any of the products specified herein:

1. The Contractor shall furnish and install all materials and equipment herein specified in complete accordance with these Specifications.

2. If the Contractor furnishes and installs material and/or equipment that is not in complete accordance with these Specifications, he shall be responsible for the removal of this material and/or equipment. He shall also be responsible for the replacement of this material and/or equipment with material and/or equipment that is in complete accordance with these Specifications, at the direction of the Owner’s Representative.

3. Removal and replacement of materials and/or equipment that is not in complete compliance with these Specifications shall be done at no extra cost to the Owner.

4. Removal and replacement of materials and/or equipment that is not in complete compliance with these Specifications shall not be allowed as a basis for a claim of delay of completion of the Work.

J. Mark dimensions and values in units to match those specified.

K. The Contractor shall submit all Audio Visual system drawings for review and approval by RDK Engineers prior to installation of components.

1.10 OPERATION AND MAINTENANCE DATA

A. Commence preparation of the Operating and Maintenance (O&M) manuals immediately upon receipt of "Approved" or "Approved as Noted" shop drawings and submit each section within one month. The final submission shall be no later than two months prior to the projected date of Substantial Completion of the Project.

B. Submit O&M table of contents in the submittal phase. O&M manuals shall be built as submittals are accepted and shall include the individual equipment manufacturer's data retrieval sheet, as per Attachment A in Part IV for input into the Owner's Maintenance Management System. Form shall be provided and completed electronically.

C. Each O&M document shall include the manufacturer's web address for equipment specific O&M information for Internet access by the Owner.

D. The manual shall consist of three (3) sets of manuals and include three (3) sets of CDs, which shall contain the scanned content of the entire manual. The manual shall highlight the actual equipment used and not be a master catalog of all similar products of the manufacturer. The manual shall be submitted for review prior to creation of the CDs.

E. The Manual shall contain the following:

1. Operations Manual

    a. Systems description including all relevant information needed for day-to-day operations and management.

    b. Wiring diagrams, schematics, logic diagrams and sequence of operations that accurately depict the system.

    c. Depiction of each interface screen where programmable logic and visual displays are provided. Descriptors shall be provided to define displayed data, alarms, etc.

    d. A single sheet (for ease of removal) of all access codes and passwords necessary to access all levels of control and programming.

    e. Trouble shooting guide defining common alarms/problems with possible cause and effect.

2. Maintenance Manual

    a. Define all maintenance activities required to ensure system operation within manufacturer's specified parameters. Provide table of all required activities plotted vs. interval with adequate fill-in-space for "activity completion date" and "comments". Where multiple instrument readings are required, provide data sheet formatted to accommodate activity.

    b. Define recommended spare parts inventory with part numbers and source defined for ordering by the Owner. Identify lead time on all parts, source location and cost.

    c. Provide copy of all warranty information with associated date of substantial completion (commencement of warranty) and end date of

coverage. Define all components/subsystems specifically included and excluded.

d. Provide all information as listed on the facility support services data sheet as per attachment A in Part IV for input into the Owner's maintenance management system. Form shall be provided and completed electronically.

e. Provide O&M manuals for each of the following:

1) Audio Visual Systems

2) Local Sound System

3) As-Built Records

4) Pathway/Space Records

5) Test Reports

6) Extended Manufacturer Warranty Certification

1.11 RECORD DRAWINGS

A. Refer to DIVISION 1, General Conditions, for record drawings and procedures to be provided under this section, unless specifically noted otherwise in this section.

B. Record Drawings (red-line drawings) will be updated by this Contractor daily for review with the monthly requisition. The record drawing shall be an accurate depiction of the systems as completed, including dimensions (vertical/horizontal) of concealed components off fixed building elements.

C. The Foreman shall maintain complete and separate set of prints of Contract Drawings at job site at all times and shall record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design.

D. At completion of work the Contractor shall prepare a complete set of record drawings on AutoCAD showing all systems as actually installed. The Architectural background AutoCAD files will be made available for the Contractor's copying, at his expense, to serve as backgrounds for the drawings. The Contractor shall transfer changes from field drawings onto AutoCAD drawings and submit copy of files and three sets of prints to Owner's Representative for comments as to compliance with this section. CADD layering as established by the A&E design team shall be maintained with any and all changes done by the Contractor.

E. The Architect and Engineer are not granting to the Contractor any ownership or property interest in the CADD Drawings by the delivery of the CADD Disks to the Contractor. The Contractor's rights to use the CADD disks and the CADD drawings are limited to use for the sole purpose of assisting in the Contractor's performance of it contractual obligations under its contract with respect to the Project. The Architect and Engineer are granting no further rights. Any reuse or other use the Contractor will be at the Contractor's sole risk and without liability to the Architect and Engineer. The Contractor

hereby waives and releases any losses, claims, damages, liabilities of any nature whatsoever, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor. The Contractor, to the maximum extent permitted by law, hereby agrees to indemnify, defend and hold the Architect and Engineer harmless from all loses, claims, damages, liabilities, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor.

F. Record Drawings, shall show “as-built” condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and model numbers of final equipment installation.

G. The Contractor shall submit the record set for approval by the Engineer a minimum of four weeks prior to seeking the permanent certificate of occupancy.

1.12 WARRANTIES

A. Submit manufacturer's standard replacement warranties for material and equipment furnished under this Section. Such warranties shall be in addition to and not in lieu of all liabilities which the manufacturer and the Audio Visual Contractor may have by law or by provisions of the Contract Documents.

B. All materials, equipment and work furnished under this Section shall be guaranteed against all defects in materials and workmanship for a minimum period of one-year (1) commencing with the Date of Substantial Completion. Where individual equipment sections specify longer warranties, provide the longer warranty. Any failure due to defective material, equipment or workmanship which may develop, shall be corrected at no expense to the Owner including all damage to areas, materials and other systems resulting from such failures.

C. Provide a minimum 1 year manufacturer’s guarantee / warranty. This warranty / guarantee shall include all labor and material and shall be provided by a factory certified installer for the products being installed under this Section.

D. Guarantee that all elements of each system meet the specified performance requirements as set forth herein or as indicated on the Drawings.

E. Upon receipt of notice from the Owner of the failure of any part of the systems during the warranty period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.

1.13 COORDINATION

A. Refer to Division 1, General Conditions, for coordination requirements applicable to this section, unless specifically noted otherwise in this section.

B. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as required.

C. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections. Any

conflicts shall be referred immediately to the Owner's Representative for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Owner's Representative's satisfaction at no expense to the Owner.

D. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section may interfere with work of other sections, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 3/8" scale or larger working drawings and sections, clearly showing how the work is to be installed in relation to the work of other sections.

E. Keep fully informed as to the shape, size and position of all openings required for all apparatus, conduit, cable, sleeves, etc., and give information in advance to allow construction of required openings. Furnish all sleeves, pockets, supports and incidentals, and coordinate with the General Contractor for the proper setting of same.

F. All distribution systems which require pitch or slope such as condensate drains and water piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, ducts, lights and apparatus and install work to avoid interferences.

G. Fire Protection, Plumbing, HVAC, Electrical and any other systems shall be shown and coordinated on these transparencies in the order listed by the respective Contractors.

H. This Contractor shall, with the approval of the Owner's Representative and without extra charge, make reasonable modifications in his work as required by normal structural interferences, or by interference with work of other trades, or for proper execution of the work.

1.14 COORDINATION DRAWINGS

A. Provide a set of coordination drawings for use in verifying required code clearances of all electrical equipment and for use in coordinating installation of equipment with other trades. Where practical, the CADD layering as established by the A&E team for the construction documents, shall be utilized in the preparation of all coordination drawings. Where CADD layering deviates from the A&E team's layering convention, the Contractor shall submit the proposed layering system for approval. The CADD layering used shall provide, as a minimum, the flexibility of illustrating trade specific items similar to the established A&E team layering standard.

B. The intent of the coordination drawings is to identify and resolve installation conflicts prior to fabrication and installation of any MEP trade.

C. The HVAC Contractor's floor plan coordination drawings shall be the basis for floor plan coordination. The Electrical Contractor's reflected ceiling plans shall be the basis for reflected ceiling plan coordination. All other trades shall provide the HVAC / Electrical Contractors with their Drawings / Layers for incorporation into one set of coordinated multi-trade drawings.

D. The CADD Drawings prepared by the Architect and Engineer contain representations of certain elements of the Project, and are not necessarily complete, nor are the CADD Drawings comparable or identical to final construction drawings. The Architect and

Engineer make no representations or warranties with respect to the accuracy or completeness of the CADD Drawings. The Architect and Engineer do not recommend that the Contractor use the CADD Drawings in connection with the preparation of shop drawings. Should the Contractor choose to do so, however, the Contractor shall carefully review and compare the CADD Drawings with the corresponding final construction drawings to verify their accuracy and identify all discrepancies, differences, and inconsistencies in design, locations, dimensions, scope, and all other respects between the CADD Drawings and the corresponding final construction drawings. The Contractor, shall base the preparation and submission of shop drawings, and in general, shall base the performance of all its obligations with respect to the Project upon the information contained in the final construction drawings and not the CADD drawings. Nothing shall be construed as to relieve the Contractor of any of its obligations (such as, by way of illustration, the obligation to make field measurements or to coordinate drawings) under its contract with respect to the Project.

E. Audio Visual Coordination Drawings shall be prepared as outlined below.

1. Prepare Audio Visual Coordination Drawings showing all Audio Visual work to be installed as part of Section 274000. The Coordination Drawings shall be created using AutoCAD and shall have a scale of ¼" or 3/8".

2. The Audio Visual Coordination Drawings shall show projectors, screens, wall plates, interfaces, racks and speakers. Drawings shall include dimensions and elevation tags for all equipment, devices and material.

3. After incorporating all trades, resolve any areas of conflicts between trades under the direction of the General Contractor / Construction Manager and submit fully coordinated drawings to the Owner's Representative.

4. Do not install any of this work prior to the preparation and Engineer's review of the final Coordination Drawings. If Audio Visual work proceeds prior to the final Coordination Drawings, any change to the Audio Visual work to correct the interferences and conflicts which result will be made by this Contractor at no additional cost to the Owner.

5. Coordination Drawings are for this Contractor's and Owner's Representative's use during construction and shall not be construed as replacing any shop, "as-built", or Record Drawings required elsewhere in these Contract Documents.

6. Owner's Representative's review of Coordination Drawings shall not relieve this Contractor from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirements of the Contract.

1.15 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. It is the intention of the Specifications and Drawings to call for complete, finished work, tested and ready for continuous operation. Any apparatus, appliance, material or work not shown on the Drawings, but mentioned in the Specifications or vice-versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be provided by this Contractor without additional expense to the Owner.

B. The Drawings are generally diagrammatic. The locations of all items that are not definitely fixed by dimensions are approximate only. The exact locations must be determined at the project and shall have the approval of the Owner's Representative before being installed. This Contractor shall follow Drawings, including his shop drawings, in laying out work and shall check the Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions. Where space conditions appear inadequate, notify the Owner's Representative before proceeding with the installation. This Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

C. Any requests for information (RFI) for resolving an apparent conflict or unclarity, or a request for additional detail, shall include a sketch or equivalent description of Contractors proposed solution.

D. Size of conduits, cable trays, raceways and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the true intent and purpose of the Drawings, all necessary parts to make complete approved working systems ready for use, shall be furnished without extra charge. All work shall be installed in an approved workmanlike manner.

1.16 INSPECTION OF SITE CONDITIONS

A. Prior to submission of bid, visit the site and review the related construction documents to determine the conditions under which the Work has to be performed and send a report, in writing, to the Owner's Representative, noting any conditions which might adversely affect the Work of this Section of the Specifications.

1.17 SURVEY AND MEASUREMENTS

A. Base all required measurements, horizontal and vertical, from referenced points established with the Owner's Representative. The Audio Visual Contractor shall be responsible for correctly laying out the Work required under this Section of the Specifications.

B. In the event of discrepancy between actual measurements and those indicated, notify the Owner's Representative in writing and do not proceed with the related work until instructions have been issued.

1.18 DELIVERY, STORAGE AND HANDLING

A. No materials shall be delivered or stored on site until corresponding Shop Drawings have been approved.

B. All manufactured materials shall be delivered to the site in original packages or containers bearing the manufacturer's labels and product identification.

C. Protect materials against dampness. Store off floors, under cover and adequately protected from damage.

D. Inspect all equipment and materials, upon receipt at the job site, for damage and conformance to approved shop drawings.

1.19 PROTECTION OF WORK AND PROPERTY

A. This Contractor shall be responsible for the care and protection of all work included under this Section until the completion and final acceptance of this Contract.

B. Protect all equipment and materials from damage from all causes including, but not limited to, fire, vandalism and theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment at no additional cost to the Owner.

C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this Section and make good damage thus caused.

D. Damaged materials are to be removed from the site; no site storage of damaged materials will be allowed.

1.20 SUPERVISION

A. Supply the service of a competent Supervisor with a minimum of 5 years experience in Audio Visual construction supervision who shall be in charge of the Audio Visual work at the site.

1.21 SAFETY PRECAUTIONS

A. Life safety and accident prevention shall be a primary consideration. Comply with all of the safety requirements of the Owner and OSHA throughout the entire construction period of the project.

B. Furnish, place and maintain proper guards and any other necessary construction required to secure safety of life and/or property.

1.22 SCHEDULE

A. Construct work in sequence under provisions of Division 1 and as coordinated with the Owner’s Representative.

1.23 HOISTING, SCAFFOLDING AND PLANKING

A. The work to be done under this Section of the Specifications shall include the furnishing, set-up and maintenance of all derricks, hoisting machinery, cranes, helicopters, scaffolds, staging and planking as required for the work.

1.24 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORT

A. Provide all supplementary steel, factory fabricated channels and supports required for the proper installation, mounting and support of all Audio Visual equipment, piping, etc., required by the Specifications.

B. Supplementary steel and factory fabricated channels shall be firmly connected to building construction in a manner approved by the Owner's Representative as shown on the drawings or herein specified.

C. The type and size of the supporting channels and supplementary steel shall be determined by the Contractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.

D. All supplementary steel and factory fabricated channels shall be installed in a neat and workmanlike manner parallel to the walls, floors and ceiling construction. All turns shall be made with 90 degree and 45 degree fittings, as required to suit the construction and installation conditions.

E. All supplementary steel including factory fabricated channels, supports and fittings shall be galvanized steel, aluminum or stainless steel where exposed or subject to rust producing atmosphere. Factory fabricated channels shall be manufactured by Unistrut, H-strut, Powerstrut or approved equal.

1.25 HAZARDOUS MATERIALS

A. Removed batteries shall be recycled by a facility approved by the Owner's representative. A uniform hazardous waste manifest shall be prepared for all disposals and returned with all applicable signoffs prior to application for final payment.

B. Fiberoptic cable shall be separated from general waste.

C. A uniform hazardous waste manifest shall be prepared for all disposals and returned with all applicable signoffs prior to application for final payment. All handling shall conform to EPA requirements. Provide breakout cost for this scope.

D. Where it has been identified that asbestos-containing material exists within the scope limits, refer to the Asbestos Abatement specification section for requirements.

1.26 ACCESSIBILITY

A. All work provided under this Section of the Specification shall be installed so that parts requiring periodic inspection, maintenance and repair are accessible. Work of this trade shall not infringe upon clearances required by equipment of other trades, especially code required clearances to electrical gear. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Owner's Representative.

1.27 SEISMIC RESTRAINT REQUIREMENTS

A. Submit working plans and calculations reviewed, signed and stamped by a professional Engineer who is registered in the State where the project is located and has specific experience in seismic calculations, certifying that the plans meet all seismic requirements established by authorities having jurisdiction over the project.

B. For each seismic restraint, provide certified calculations to verify adequacy to meet the following design requirements:

1. Ability to accommodate relative seismic displacements of supported item between points of support.

2. Ability to accommodate the required seismic forces.

C. For each respective set of anchor bolts provide calculations to verify adequacy to meet combined seismic-induced sheer and tension forces.

D. For each weldment between structure and item subject to seismic force, provide calculations to verify adequacy.

E. Restraints shall maintain the restrained item in a captive position without short circuiting the vibration isolation.

1.28 PROJECT CLOSEOUT

A. Certificates Of Approval

1. Upon completion of all work, provide certificates of inspections from the following equipment manufacturers stating that the authorized factory representatives have inspected and tested the operation of their respective equipment and found the equipment to be in satisfactory operating condition and installed per the manufacturers installation instructions and requirements.

a. Audio and Video test reports

b. Record Drawings

c. Manufacturer Extended Warranty

B. Construction Observations By The Engineer

1. The Engineer is contracted to make **one** progress site visits during construction, **one** substantial completion (punch list) site visit for determining substantial completion and **one** Final site visit to determine if all work is complete.

2. The Trade Contractors and the General Contractor are required to inspect their own work and make any corrections to the work to comply with the specifications and the contract documents. It is not the responsibility of the Engineer to develop lists of incomplete work items.

3. Progress Site Visits

a. The purpose of the progress site visit by the Engineer is to observe if the work is proceeding in accordance with the contract documents.

b. The Engineer will prepare a field report which will note in general the work completed since the last observation visit, work found not to be in accordance with the contract documents and work not corrected since the previous observation visit.

C. Substantial Completion

1. When the Contractor considers the Work under this Section is substantially complete, the Contractor shall submit written notice, through the General Contractor, with a detailed list of items remaining to be completed or corrected and a schedule of when each remaining work item will be completed. Should the Engineer determine the list of remaining work does not constitute substantial completion the Engineer will notify the Architect and/or Owner and he will not make a substantial completion site visit.

2. The following items shall be completed prior to the written request for substantial completion site visit:

    a. Certification of successful operation of all systems

    b. Training of the Owner's personnel in the operation of the systems

    c. Record Drawings in accordance with the contract specifications

    d. Operation and Maintenance manuals

    e. Testing reports

    f. Manufacturer's certificates of approvals, extended warranty

    g. Emergency contact list for reporting of malfunctioning equipment during the warrantee period

    h. Contractors Project Completion certificate

3. Should the Engineer, during the substantial completion visit, observe that the Work is substantially complete, s/he will provide a written listing of the observed deficiencies referred herein as the Punch List. The Punch List will provide for a place for the Contractor and general Contractor to sign off and date each item individually indicating that the observed deficiency item has been corrected.

4. Should the Engineer, during the substantial completion site visit, observe that the Work is not substantially complete, s/he will provide, a written list of the major deficiencies and a reason for the work not being considered substantially complete.

5. If the work is found not to be substantially complete then the Engineer shall be reimbursed for his time to reobserve the work. A reobservation fee shall be charged to the Contractor through the contractual agreement for any further observations by the Engineer.

6. The Contractor shall remedy all deficiencies listed in the punch list within the time frame required by the contract.

D. Engineers Construction Completion Certification

1. Where required by the applicable code, the Engineers Construction Completion Certification will be issued by RDK Engineers when all life safety and health related issues are complete, all required functional tests are complete and all reports are complete. The following is a minimum listing of the required systems

to be tested with reports generated indicating they are complete and ready for use:

a. Audio systems

b. Video system

c. Control systems

d. Cabling Infrastructure Test Reports

2. There shall be NO outstanding items identified on the punch list for scope within any of these categories.

E. Final Completion

1. The following items shall be submitted prior to the written request for Final completion:

a. Revised Substantial Completion items to be resubmitted in accordance with the review process comments

b. Warranties commencing the date of Substantial completion

c. Individual Signed and dated Punch List acknowledging completion of all punch list items

2. When the Contractor considers all of the punch list work items complete, the Sub Contractor shall submit written notice through the General Contractor that all Punch List items are complete and resolved and the work is ready for final observation site visit. The signature lines for completion of each punch list item shall be signed by the Contractor indicating the work is complete and signed by the General Contractor indicating s/he has inspected the work and found it to be complete. Should the Engineer find the work to be finally complete and all Punch List items are complete the Engineer will make a recommendation to the Architect or Owner. If the Engineer has found the punch list work to be incomplete during final inspection a written listing of the observed deficiencies will be prepared by the Engineer.

3. If the work is not fully complete then the Engineer shall be reimbursed for his time to reobserve the work. A reobservation fee shall be charged to the Contractor through the contractual agreement for any reobservations by the Engineer.

F. Re-observation Fees

1. The re-observation fee shall be $1200.00 per visit.

G. Contractor's Project Completion Certificate

1. Upon completion of work and prior to request for Certificate of Occupancy, each Trade Contractor and the General Contractor shall issue a certificate stating that work has been installed generally consistent with construction documents and all

applicable codes. RDK Engineers can furnish a blank Contractor's certificate form upon request. The certificate shall certify:

a. Execution of all work has been in accordance with the approved construction documents.

b. Execution and control of all methods of construction was in a safe and satisfactory manner in accordance with all applicable local, state and federal statutes and regulations.

2. The certificate shall include the following information:

a. Project

b. Permit Number

c. Location

d. Construction Documents

e. Date on Plans and Specifications submitted for approval and issuance of the Building Permit

f. Addendum(a) and Revision Dates

3. The certificate shall be signed by the Contractor and include the following:

a. Signature

b. Date

c. Company

d. License Number

e. License Expiration Date

PART 2 - PRODUCTS

2.1 GENERAL

A. All devices shall comply with ANSI/TIA/EIA 568-B.1, B.2, B.3 standard including all Addenda.

B. Equipment manufacturers and part numbers are indicated on the AV drawings.

2.2 SOURCE EQUIPMENT

A. See drawings for component parts.

2.3 CABLE SUPPORTS AND MANAGEMENT

A. Cable hangers shall be open-top cable supports (J-Supports), 2" diameter loop.

B. J-hook supports shall be installed in accordance with the manufacturer's recommendations and located at intervals such that the cables do not rest on ceiling tile or grid at any point along the distance. Refer to Part 3 (Execution) of this specification for additional cable routing requirements.

C. Hook and loop fasteners shall be designed for their specific application. For example, if a hook and loop fastener is used to support cables to a rack, it shall have a grommeted outlet for use with a 10-32 rack mounting screw.

D. Cable-ties shall be correctly sized to support the quantity and types of cables installed.

E. Beam clamps shall be steel with threaded bolt type closure. Spring steel or "quickclip" type clamps are prohibited.

2.4 GROUNDING

A. Refer to Section 2.01 – GENERAL for additional manufacturer's requirements.

B. Jumper cable shall be hollow braided, 60 amp capacity and copper.

C. Jumpers shall have compression or exothermic type terminals on both ends of cables. Terminals shall be compatible with jumper cable material and equipment material in order to not have any degenerative reaction.

PART 3 - EXECUTION

3.1 GENERAL

A. All devices shall comply with manufacturer installation requirements.

B. Coordinate all work with all contract documents including but not limited to:

1. Architectural Floor Plans and Equipment Layouts.

2. Electrical Contract Drawings.

3. Telecommunication Drawings

4. Mechanical Equipment.

5. Somerville Audio Visual Project Manager

C. Coordinate all work with all on-site Contractors including but not limited to:

1. Electrical Contractor

2. General Contractor

3. Equipment Installer.

4. Somerville Audio Visual Project Manager

D. Refer to electrical drawings for pathways including sleeves, conduits, cable tray, and poke-through's, to be utilized by this Contractor.

E. Refer to telecommunications contract documents (drawings and specifications) fit-up, riser, ladder rack, elevations, and additional information.

F. Cooperate and coordinate with work of other sections in executing work of this section.

G. Perform work so that progress of entire project including work of other sections is not interfered with or delayed. Obtain detailed installation information from all manufacturers of equipment provided under other sections.

H. Provide information as requested on items furnished under this section which shall be installed under other sections.

I. Materials and Workmanship

1. Work shall be executed in workmanlike manner and shall be neat, plum, parallel to the building structure perpendicular to all electronics and associated cabling and neat in appearance when completed. All work shall adhere to the standards as set forth in this specification (See Section 1). Maintain maximum headroom at all times. Do not run work exposed unless shown exposed on drawings.

2. Material and equipment shall be new and installed according to manufacturer’s recommended best practices so that completed installation shall operate safely and efficiently, and be neatly installed.

J. This Contractor owns the greater quantity and better quality where conflicts exist.

K. Continuity of Services: Do not interrupt existing services. Existing services shall remain operational at all times. If the existing services need to be disrupted for any reason the Contractor shall contact the Owner (representative to be announced at a later date) and schedule the aforementioned shutdown. The Contractor shall schedule the shutdown with the Owner 48 hours in advance.

L. All cabling shall be terminated at both ends unless noted otherwise.

M. The requirements of Part One and Part Two of the Specifications also apply to the execution of the work.

N. Verify the exact location prior to bid of all items that may be indicated and determine exact location of all electrical items that are not indicated on the Drawings.

O. Include the cost of all work including sub-letting of any work that may be required to complete the work indicated in order to avoid work stoppages and jurisdictional disputes. The work to be sublet shall conform with precedent agreements and decisions of record. Jurisdictional assignment shall be a responsibility under this Section's contractual obligation.

P. Do not install equipment and materials which have not been reviewed by the Architect. Equipment and materials which are installed without the Architect's review or without

complying to comments issued with the review shall be removed from the project when so instructed by the Architect. No payment will be made for unapproved or removal if it is ordered removed. The Installer shall be responsible for any ancillary costs incurred because of its removal and the installation of the correct equipment and materials.

Q. Obtain detailed information on installation requirements from the manufacturers of all equipment to be furnished, installed or provided. At the start of construction, check all Contract Documents including all Drawings and all Sections of the specifications for equipment requiring electrical connections and service and verify electrical characteristics of equipment prior to roughing.

R. Any and all material installed or work performed in violation of above requirements shall be re-adjusted and corrected by the Installer without charge.

S. Refer to all Drawings associated with the project, prior to the installation or roughing-in of the electrical outlets, conduit and equipment, to determine the exact location of all outlets.

T. After installation, equipment shall be protected to prevent damage during the construction period. Openings in conduits and boxes shall be closed to prevent the entrance of foreign materials.

U. Home runs indicated are not to be combined or reduced without written consent from the Architect.

V. All connections to equipment shall be made as required, and in accordance with the approved submittal and setting drawings.

W. Delivery, Storage and Handling:

1. Deliver, store, protect and handle products in accordance with recommended practices listed in Manufacturer's Installation and Maintenance Manuals.

2. Deliver equipment in individual shipping splits for ease of handling, mount on shipping skids and wrap for protection.

3. Inspect and report concealed damage to carrier within specified time.

4. Store in a clean, dry space. Maintain factory protection or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation. Meet the requirements and recommendations of NFPA 70B and the Manufacturer. Location shall be protected to prevent moisture from entering enclosures and material.

5. Handle in accordance with NEMA and the Manufacturer's recommendations and instructions to avoid damaging equipment, installed devices and finish.

6. The equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the Contractor shall be required to brace the equipment suitably to insure that the tilting does not impair the functional integrity of the equipment.

X. Site Observation:

1. Site observation visits will be performed randomly during the project by the Architect. Reports will be generated noting observations. Deficiencies noted on the site visit reports shall be corrected. All work shall comply with the Contract Documents, applicable Codes, regulations and local Authorities whether or not a particular deficiency has been noted in a site visit report.

2. Be responsible to notify the Architect ten working days prior to closing in work behind walls, raised access floors, ceilings, etc., so that installed work can be observed prior to being concealed.

3. Work concealed prior to observation and correction of deficiencies shall be made accessible for review at the discretion of the Architect. Bear all costs for allowing worked to be reviewed.

4. Areas shall stay accessible until deficiencies are corrected and accepted. Notify the Architect when all deficiencies are corrected. Return reports with items indicated as corrected prior to re-observation by the Architect.

Y. Project Open House:

1. If the Owner elects to have an open house at the end of the project, provide assistance to the Owner. Cooperate and provide manpower to operate and demonstrate systems during the open house as requested by the Owner.

Z. Change Orders, Modifications, Revisions and Directives:

1. When change orders, modifications, revisions or Architect's Directives are issued or authorized, provide the required additional material, equipment, personnel and workers to prevent delays in the work, and to complete the work within the time limit of the Contract unless a specific time extension is requested with the change and accepted. Include costs for expediting deliveries where required.

2. Requests for additional compensation shall be submitted broken down and associated by item, tasks and Drawing or sketch number with material and labor costs, so quantities can be easily verified.

3. Requests shall be properly and adequately identified so the scope of work can be clearly determined. Indicate who originated change in work.

4. Submit on all credits broken down as requested for adds. Credits shall be separately identified and accounted for. Do not indicate as net changes with adds.

5. Unit costs for labor and material shall be equal for adds, deletes and credits.

AA. Loose materials shall not be stored on-site. A "gang box" is acceptable to be placed in a location agreeable to the Owner and the General Contractor. The Installer is responsible for all equipment and materials and for their delivery until the system is deemed complete and accepted by the Owner.

BB. Under no circumstances shall the Owner's or General Contractor's waste containers, compactor or dumpster be used for any kind of waste material.

CC. A trailer may be used for the storage of materials to be located on the Owner's property at a location designated by the Owner and the General Contractor. Such on-site storage shall be kept locked by the Installer. Security for the trailer and its contents shall be strictly the responsibility of the Installer.

DD. Protect existing in spaces where work is being performed to protect it from damage and from the accumulation of dirt.

EE. Any ceilings, walls, floors, furniture, equipment, furnishings, etc., damaged by the work of this Section shall be replaced, or at the Owner's option, repaired with similar materials, workmanship and quality.

FF. Work includes field survey of existing conditions, systems, equipment and tracing of existing circuits in order to determine scope of work.

GG. Maintain the existing building in operation at all times during the entire construction period. If it is necessary to have a system shutdown, a written request for approval shall be submitted in advance stating the estimated shutdown time. Work shall be planned to minimize shutdown. Shutdowns shall be at the convenience of the Owner and, if necessary, on premium time.

HH. Clean and touch up all equipment, materials and work sites at the completion of work in each area.

II. Certain portions of the work area may be occupied during construction. Determine which areas and schedule work accordingly and include necessary premium time.

JJ. Verification and Coordination:

1. The Audio Visual Contractor shall be responsible for verifying wiring installed by others.

2. The Audio Visual Contractor shall be responsible for coordination of all related equipment provided by others, but utilized by this Contractor (e.g. projection screens, podiums, PC's)

3.2 SOURCE RECORD/PLAYBACK EQUIPMENT

A. All source record/playback equipment shall be tested and working prior to installation.

B. Sound check all audio sources for quality assurance.

3.3 SPEAKERS

A. Enclosures shall be supported directly from the ceiling structure as approved by manufacturer. Supporting directly to the ceiling tile is not acceptable.

3.4 EQUIPMENT RACK

A. All racks shall be wired completely in shop. No internal rack wiring shall be done on the job site.

B. Provide a blank or ventilation panel for all empty rack spaces.

C. Equipment racks to be isolated from equipments racks of other systems.

D. All power supplies shall be located, oriented and connected electrically to minimize hum and RFI interference. Further, all plug-in type power supplies shall be firmly attached using mechanical fasteners to its associated power receptacle to insure accidental removal and/or connection loss.

E. All equipment shall be rack mounted and permanently installed. All power supplies, rack mounts, interconnects, brackets, etc. shall be included as the may not be specifically called out herein.

F. All racks shall be secured to the floor or podium using the factory recommended hardware and installation practices.

G. All racks shall be properly grounded, conforming to ANSI/TIA/EIA 607, NEC, SEC 250 and 800 and all related grounding standards and codes.

H. Install cable racks in accordance with ANSI/NFPA 70, Article 318 requirements and as specified herein.

3.5 CABLE PROTECTION

A. Cables to be installed in existing enclosed open bays or furred spaces where conduit stubs are not provided, shall be protected from chafing or any damage. The Installer shall verify that the warranty shall not be violated before installing any cabling in these locations.

B. Provide bushings in all metal studs and other openings where cables will pass through. Bushings shall be of two (2) piece construction with one piece inserted through the openings and the second piece locking it into place. Single piece bushings with locking tabs or friction fit are specifically prohibited.

C. Provide cutting, coring, sleeves and bushings and seal as required at all penetrations.

D. Fiberoptic backbone cables shall be installed in innerduct. Innerduct shall be plenum rated where installed in HVAC air plenum spaces.

E. Cables damaged during installation shall not be repaired. They shall be completely replaced with new cable at no additional cost.

3.6 CABLE SUPPORT AND MANAGEMENT

A. Generally, cable pathways are provided by others. The pathways shall be parallel to building lines and shall sweep/turn at 90 degree angles maintaining minimum bend radius for cable and will comply with the guidelines and recommendations outlined in ANSI/TIA/EIA-568 B.1, B.2, B.3 and ANSI/TIA/EIA-569-A.

B. Provide cable and supports as required. All cables shall be supported.

C. Where cable tray, ladder rack and conduit are not provided for support of the AV cables, provide cable support at 4 to 5 foot intervals. J-hooks should also be placed at every cable tray intersection, at every gap in cable tray, at every cable drop point such as conduit stub-up, without exception, and wherever support is needed to avoid sagging or to avoid touching piping, ducting or other trades work. Use of the ceiling wire grid installed by others is not permitted. Cable Contractor must provide separate hangers for securing J-hooks and their installation and should be coordinated with General Contractor.

D. Cable supports shall be mounted independently from the building structure. Cables shall not be supported from the ceiling structure, mechanical, electrical, fire protection or plumbing devices.

E. Where metal conduit is provided by others for use by the installer, provide each end of the conduit with plastic grommets for cable sheath protection.

F. Provide all strain relief for purpose of maintaining bend radius and providing additional protection/support of exposed cables.

G. Provide cable management and support as required. Refer to Audio Visual drawings and details for location and quantity of horizontal cable management.

H. Install cables in pathways provided under Electrical Section or required under the execution part of this section.

I. Provide all equipment and cabling for a complete installed operating system. In general, pathways, outlet boxes and grounding are provided under Electrical Section. However, it is the Installers responsibility under this Section to coordinate with the Drawings and Specifications for Electrical Section and to provide all pathways and outlet boxes required that are not provided under Electrical Section.

J. All pathways provided under this Section shall comply with fill capacities as per the Electrical Code, EIA/TIA, BICSI and ICIA.

K. Cable bending radius shall not be less than minimum required by EIA/TIA, BICSI and ICIA.

L. Cabling installed concealed shall be supported from the building structure (e.g. cable trays, “J" hooks, etc.).

M. At a minimum, exposed cabling installed in return air plenums shall be plenum rated cables.

N. Clearances: Clearances between cabling and other building systems as required by EIA/TIA 569-A and BICSI shall be maintained throughout the building.

O. All cables shall be installed in a neat and workman-like manner. Cables shall be installed parallel and perpendicular to building elements.

P. Cables installed in each room and Audio Visual closets shall be installed in approved pathway systems (cable runway, etc.). Under no circumstance shall cables be allowed to "hang" across any spaces. Wrap cables frequently in order to dress them properly.

Q. All cables shall have a minimum of 10 foot service loops in the Audio Visual closets and rooms and shall have a minimum of 18 inch service loop at the work area outlet.

R. Provide expansion fittings and adequate cable slack at all building expansion joints.

S. Cables damaged during installation shall not be repaired. They shall be completely replaces with new cable at no additional cost.

3.7 GROUNDING

A. Insulate all conductors in conduit from the conduit, back boxes, and from each other.

B. Insulate all conduits and electrical boxes from equipment racks, sound system, and audio system ground. Ground all conduits ONLY to power system ground.

C. Ground power strips in equipment racks shall be insulated from power system ground.

D. The resistance of the ground system from the common ground point at the rack to the building ground point shall not exceed 0.1 ohm.

E. Equipment racks and/or cabinets contained within the AV Room shall be bonded with #6 AWG.

F. The Contractor shall ensure that ONLY the audio visual equipment shall be connected to the audio visual dedicated ground system.

G. The Contractor shall ensure the Electrical Contractor has provided adequate power circuits for ALL Audio Visual equipment.

3.8 SYSTEM TESTING

A. All cables shall be tested.

B. Provide a hard copy of all test results. Handwritten test results will not be accepted.

C. All testing shall be completed after all Audio Visual outlets have been secured in their final position and are properly labeled per this specification.

D. Building must be operational (i.e.; building lighting and power must be energized) during tests.

E. The Contractor shall furnish all equipment necessary to perform all work required to determine or modify the performance of the audio visual systems in accordance with the specifications.

F. The Contractor shall test the audio visual systems continuously for 24 hours in field conditions to assure that they meet the manufacturers described performance specifications. Replace any and all equipment that fails at no cost to the Owner.

Audio Systems:

All audio systems shall meet the following minimum acoustical performance specifications upon testing using a sound level meter.

Frequency Response:	±1.0 dB, 60 – 40,000Hz
Total Harmonic Distortion (THD):	< 1% from 50 – 15,000Hz
Inter Modulation Distortion (IMD):	< 1%
Signal-to-Noise Ratio:	> 58dB
Hum and Noise Level:	-80dBu, 20 – 20,000Hz
Linear Crosstalk:	-40dBu below 100% of rated power output, 50 – 15,000 Hz
Nonlinear Crosstalk:	> 70dB below 100% of rated power output, 50 – 15,000Hz
Signal Level:	+4dBu

Audio signal and system shall be tested for distortion, audio playback level, and sync with video source. Distortion shall be corrected and retested until fully functional.

Video Systems:

All video systems shall conform to NTSC standards unless system is installed outside the United States. Then all systems shall conform to appropriate local video standards.

Black Level performance:	53.5mV or 7.5 IRE
White Level performance:	714mV or 100 IRE
Sync Level performance:	-286mV or -40 IRE
Differential Gain (DG):	<1% at 3.58 MHz
Differential Phase (DP):	±1° at 3.58 MHz

Audio Visual Contractor shall utilize an Extron VTG300 or approved equal audio/video test generator.

Audio Visual Contractor shall ensure all images are in focus. Focus testing and alignments of image shall be made using multiple sources (DVD, VHS, PC). Correct any shifting that may occur.

3.9 FIRESTOPPING

A. All conduits, sleeves, and cable tray point of entry shall be properly firestopped, per local, state, and federal codes with reusable firestopping materials.

3.10 LABELING AND IDENTIFICATION

A. All equipment and cabling shall be properly identified by means of clear and concise labels. All identification shall meet or exceed the minimum requirements of EIA/TIA 568, B.1, B.2, B.3, 606, BICSI and ICIA standards.

B. All labels must be permanent and shall be clearly printed on clear or opaque tape and meet the following requirements:

1. The font shall be approximately 1/8” in height, block characters and clearly legible.

2. The text and color shall contrast with the label background (e.g., black on white).

3. Hand written labels are not acceptable.

4. All labeling material shall meet the minimum flame rating requirements.

5. Embossed type labels are not acceptable.

6. Label patch panels and cross connect blocks numerically, top-to-bottom.

7. Label cable segments by designated incoming label.

8. Labels shall be constructed of approved material in order to meet the legibility, defacement, adhesion (adhesive labels only), and exposure requirements of UL969.

9. Labels shall be mounted horizontally in order to be read from left to right.

C. Cable Coded Identifiers

1. Please provide all cabling with the following coded identifiers:

FXXX	VGA and RGBHV
RGBXXX	Component Video
YCXXX	S-Video
VXXX	Composite Video
ALXXX	Line Level Audio (Left)
ARXXX	Line Level Audio (Right)
AXXX	Line Level Audio (Mono)
MXXX	Microphone Audio

CXXX	Control
TPXXX	Shielded/Unshielded Twisted Pair
RFXXX	Radio Frequency (Antenna)

D. All cables shall be clearly labeled on both ends

E. Label all interfaces, wall plates and panels as specified above.

F. Coordinate all labeling with the Somerville Audio Visual project manager.

3.11 DOCUMENTATION

A. Provide the Owner with:

1. Hard copy documentation of "As-Built" Audio Visual Cabling Systems Administration Reports.

2. Hard copy documentation of test results for every cable segment and link in 3-ring binder. Documents shall include measured values as well as whether or not the test passed.

3. "As-Built" drawings indicating location of all equipment including but not limited to projectors, screens, wall plates, interfaces, racks and cable routing. Indicate labeling for each piece of equipment.

4. Refer to Part One for additional documentation.

3.12 SLEEVING AND PENETRATIONS

A. Raceways and openings shall be laid out in advance to permit their provision in the work. Sleeves and raceway shall be set before masonry is constructed. Any extra work required where sleeves or raceways have been omitted or improperly placed shall be performed at the expense of the Installer which made the error or omission, including coring.

B. Provide sleeves for raceways and cable trays penetrating all types of floors, fire walls, or smoke partitions. Install approved material to provide for fire stop.

C. Provide waterproof seals inside and outside raceway when penetrating from the exterior or underground.

D. Provide acoustic sealer in sleeves between occupied spaces.

E. Sleeves installed in floors shall extend two inches (50mm) above the finished floor unless specifically indicated otherwise.

F. Provide sleeves in masonry construction and in full height (slab to slab) walls.

G. Provide sleeves for all openings.

H. Penetrations through fire rated construction shall comply with a listed fire rated assembly as detailed in the UL Fire Resistance. Pipe sleeves through floors, exterior walls and fire-rated construction shall be galvanized Schedule 40 steel pipe. Pipe sleeves through non-fire-rated partitions shall be 26-gauge galvanized steel.

I. Through Penetration Assemblies: The combination of materials shall have the same fire rating, in hours, as the wall or floor, as tested in accordance with the code referenced editions of ANSI/UL 1479 (ASTM E-814). The combination of materials shall be classified by UL for the fire rating required and shall be listed as a numbered system in the UL Fire Resistance Directory.

1. Caulking of conduit and cable tray penetrations through floor slabs, smoke barriers and fire rated partitions shall be performed under the Division 7 Section for Firestops and Smokeseals.

J. Provide adjustable escutcheons on exposed conduit that passes through finished floors, walls, and ceilings. Escutcheons shall be chromium-plated cast brass, sized to cover sleeve opening and to accommodate pipe and insulation.

3.13 SEISMIC SUPPORTS, SUPPLEMENTARY STEEL AND CHANNELS

A. Provide all supports, supplementary steel and channels required for the proper Seismic installation, mounting and support of all work installed under this Section.

B. All supports, supplementary steel and channels shall be furnished, installed and secured with all fittings, support rods and appurtenances required for a complete support or mounting system.

C. Supplementary steel and channels shall be firmly connected to the building construction in a manner approved by the Architect prior to the installation of same. Submit to the Architect, via the General Contractor, the locations proposed for using supplementary steel and channels for the support of equipment, fixtures and raceways. The submittal shall indicate the mounting methods, size and details of the supports, channels and steel; it shall indicate also that weight which the supports, channels and supplementary steel is to carry.

D. The type and size of the supporting channels and supplementary steel shall be of sufficient strength and size for seismic restraint and to allow only a minimum deflection in conformance with the channel and supplementary steel manufacturer's requirements for loading.

E. All supplementary steel and channels shall be installed in a neat and workmanlike manner parallel to the walls, floor and ceiling construction. All turns shall be made with 90 degrees and 45 degrees fittings, as required to suit the construction and installation conditions.

F. All supplementary steel, channels, supports, and fittings, shall be Underwriters' Laboratories, Incorporated, approved, be galvanized steel and be manufactured by Steel City, Unistrut, Power-Strut, T. J. Cope or approved equal.

G. Provide supports to meet the required Seismic rating as indicated under "Part One" of this Specification.

H. Provide beam clamps with set screws (C-clamp type).

I. Work under this Section shall be held in place by Seismic rated methods.

J. Supporting from the roof decking will not be acceptable.

K. Provide expansion anchors on masonry units or brick work. Power actuated supports will not be accepted.

L. Provide stainless steel or corrosion resistant supports in corrosive areas on wet or damp areas.

M. Support work from the building structure, independent of suspended ceilings, roof deck or other trades work. Where ductwork, pipes, pipe racks, type of building construction materials or structural framing members provide obstruction or difficult support means, hanger rods shall be used in association with horizontal sections of steel support channels, in an approved manner.

N. All work shall be installed in a rigid and satisfactory manner and shall be supported by bar hangers in frame construction or shall be fastened directly with wood screws on wood, bolts with expansion shields on concrete or brick toggle bolts on hollow masonry units, and machine screws or welded threaded studs on metal. Threaded studs of the proper type and holding capacity driven in by a power charge and provided with lock washers and nuts are acceptable for mounting of equipment on solid concrete walls or slabs.

O. Obtain written permission from the General Contractor allowing use of power activated charges. Use only properly trained and licensed operators.

P. Do not use power charge driven supports for any work that is to be hung from a horizontal surface without written permission from the Architect.

Q. Preset inserts of the proper type and holding capacity shall be used in overhead slab construction wherever possible.

R. Provide lateral supports for work to prevent excessive movement during a seismic event using rods, braces or galvanized or stainless steel cables.

S. Pendants, supports or hanging rods longer than 12 inches (300mm) shall be laterally braced.

T. Where installed in damp, wet and areas requiring wash down, all surface mounted panels, boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between wall and equipment.

3.14 SYSTEM ACCEPTANCE

A. Obtain written acceptance from the Owner or their authorized representative for each audio-visual system installed on this project. Failure to obtain written acceptance shall result in delay of start of warranty period. No claim for additional costs will be allowed due to not receiving written acceptance. Warranty period will start upon receipt of written acceptance.

3.15 ACCEPTANCE DEMONSTRATIONS

A. Systems installed under this section shall be demonstrated to the Owner and Architect. Demonstrations are in addition to necessary testing and training sessions. Notify all parties at least 7 days prior to the scheduled demonstration. Schedule demonstrations in cooperation with and at times convenient to all parties and so as to not disturb ongoing activities.

B. Systems shall be tested prior to the demonstrations and each system shall be fully operational and tested prior to arranging the Acceptance Demonstration. Final payments will be withheld until a satisfactory demonstration is provided for all systems indicated or requested.

C. If the demonstration is not totally complete, performing all functions, features and connections or interfaces with other systems, or if there is a failure during the demonstration, additional demonstrations shall be arranged. Provide and pay for all costs, labor and expenses incurred for all attendees for each additional demonstration required for acceptance and demonstration of complete system operation.

D. Demonstrations shall be scheduled in ample time to complete all activities prior to final acceptance and Owner occupancy. Demonstrations shall take place at least 30 days prior to the scheduled project completion date and 30 days prior to Owner's use and occupancy.

E. As a minimum, provide demonstrations for systems indicated under "Work Included" under Part One of the Specifications. Provide demonstrations of additional systems as requested by the Owner or Architect.

3.16 PROJECT OWNER COORDINATION

A. Prior to Substantial Completion of the project and in ample time to address and resolve any coordination issues, request and arrange meetings between the Owner, Owner's Vendors and Consultants, Architect, and General Contractor to discuss the Scope of Work for each system being provided and the interface required for a fully functional and operational system upon project completion. Initial meetings shall be scheduled three months prior to the scheduled Substantial Completion date or as soon as Submittals are submitted and reviewed for projects with shorter schedules.

B. At these meetings the required interface with the Owner shall be reviewed, requests for information required to complete programming or for coordination shall be presented and system operation and philosophy shall be discussed.

C. Additional meetings shall be held as requested by any party so that all issues are resolved and with the goal and intent being that all systems are fully operational and functional

upon project Substantial Completion and that the responsibility for all components required is clearly established.

3.17 CLEANING UP

A. Upon completion of all work and testing, thoroughly inspect all exposed portions of installation and completely remove all exposed labels, markings, and foreign material.

B. The interior of all equipment and cabinets shall be left clean; exposed surfaces shall be cleaned and plated surfaces polished.

C. Repair damage to finish surfaces resulting from work under this section.

D. Remove material and equipment from areas of work and storage areas.

E. All equipment shall be clean from dirt, dust, and fingerprints prior to final acceptance.

F. Touch up all damaged pre-finished equipment using materials and methods recommended by the Manufacturer.

END OF SECTION