SECTION 01 22 00
UNIT PRICES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The Unit Prices set forth herein shall, at the option of the City, be used to determine any equitable adjustment of the Contract Price in connection with the changes or extra work performed under this Contract as directed by the City.

B. It is mutually understood and agreed that such Unit Prices include all items of costs, equipment, taxes and insurance of every kind, overhead, and profit for the Contractor and they shall be used uniformly, without modification for addition and deductions. Prices listed under ADDITIONS and DEDUCTIONS are to be the complete total price billed to and paid by the City therefor. There can be no more than fifteen (15) percent difference in price between the additions and deductions.

1.02 UNIT PRICES FORM

(Note that items marked with * are not included in the base scope of work or the proposed alternates, and are included in the unit price list in case of field changes.)

	ITEM DESCRIPTION (All references to items shall correspond to work as described in the relevant portions of the Construction Documents, unless otherwise indicated, including all labor and materials for installation, e.g. subbase preparation, bases, footings, etc.)	**UNIT**	**ADDITIONS**	**DEDUCTIONS**
1	Trenching for utilities, not including removal/replacement of finish	C.Y.		
2	Saw Cut bituminous concrete pavement	L.F.		
3	Removal and disposal of bituminous concrete pavement, full depth (assume 3 1/2")	S.F.		
4	Ordinary borrow/clean fill, complete in place	C.Y.		
5	Dense Graded Crushed Stone, complete in place	C.Y.		
6	3/4" or 1/2" Crushed Stone/Drainage Stone, complete in place	C.Y.		
7	Planting Medium, complete in place	C.Y.		
8	Bituminous concrete paving, complete in place including base and subbase preparation	S.F.		
9	Color coating for bituminous concrete (including base coat), complete in place	S.Y.		
10	4" Cast in Place Concrete Curbing, complete in place	L.F.		
11	6" Cast in Place Concrete Curbing, complete in place	L.F.		
12	6" Cast in Place Concrete Wall, complete in place	L.F.		
13	Poured-In-Place Concrete Wall, 24" Wide, complete in place per Drawings	C.F.		
14	Poured in Place Rubber Transition Slope	S.F.		
15	Steel Edging, complete in place	L.F.		
16	Cast-In-Place Concrete footing/foundation, complete in place	C.Y.		
17	Cast-In-Place Concrete paving, complete in place	S.Y.		
18	Chair and Round Table complete in place: Unit = 2 chairs 1 table (Base Bid)	Ea.		
19	Bike Rack, complete in place	Ea.		
20	Single Bench with Backrest, complete in place	Ea.		
21	Double Bench with Backrest, complete in place	Ea.		
22	Double Bench with two Backrests, complete in place	Ea.		
23	Picnic Table, Complete in Place	Ea.		

24	Square Table with Two Seating Cubes, complete in place (ADD ALT #4)	Ea.		
25	*Trash and Recycling Compactor Unit, complete in place	Ea.		
26	Trash and Recycling Receptacles, complete in place	Ea.		
27	Drinking Fountain, complete in place	Ea.		
28	Community Bulletin Board, complete in place	Ea.		
29	Tree Stump Seat (from salvaged Black Locust from site) complete in place	Ea.		
30	Tree Log Bench (from salvaged Black Locust from site) complete in place	Ea.		
31	Sitting Boulders, complete in place	Ea.		
32	Stepping Stones, complete in place	Ea.		
33	Climbing Holds, complete in place	Ea.		
34	Precast Concrete Curb, complete in place	L.F.		
35	Painted Graphics on Existing Picket Fence to Remain (ADD ALT #6)	S.F.		
36	LED Pedestrian Light on post, complete in place	Ea.		
37	LED Tape Lighting with mounting channel, Complete In Place (excluding conduits or recesses)	L.F.		
38	2-outlet Outdoor GFI Receptacle with Locking Cover, complete in place	Ea.		
39	Electrical 1" Schedule 40 Conduit, complete in place	L.F.		
40	Electrical handhold, complete in place	Ea.		
41	Backflow Prevention Device, complete in place	Ea.		
42	New Water Meter, complete in place (purchased as directed by Water Dept.)	Ea.		
43	*New 1.5" Connection to Water Main in street incl. Corporation Stop, Curb Valve Box, all excavation, trenching, fees, permits, and details (not in base scope)	Ea.		
44	Irrigation PVC Pipe and Fittings, complete in place	L.F.		
45	Irrigation Polyethylene Pipe and Fittings, complete in place	L.F.		
46	Irrigation 12" pop-up with check valve complete in place	L.F.		
47	PVC Sleeve under Paving for Pipe/Conduit, complete in place	L.F.		
48	Irrigation Automatic Flush Valve, complete in place	Ea.		
49	Irrigation Valve Wire, complete in place	L.F.		
50	1" copper pipe Type K, complete in place	L.F.		
51	Tree Removal, 5” to 10” caliper, complete in place	Ea.		
52	Tree Removal, greater than 10” caliper, complete in place	Ea.		
53	* Vehicular bituminous concrete roadway patch, complete in place	S.F.		
54	Flexible Porous Pavement, complete in place	S.F.		
55	6" sch 40 PVC perf pipe wrapped in filter fabric, complete in place	L.F.		
56	6'-0" chain link fence, complete in place	L.F.		
57	4'-0" chain link fence, complete in place	L.F.		
58	Plant Protection Fencing, complete in place	L.F.		
59	Park signage: toddler area sign, complete in place	Ea.		
60	Park signage: park regulation sign, complete in place	Ea.		
61	Rock/Ledge Removal, complete and disposed	CY		
62	Trees: 2-2.5" caliper, complete in place	Ea.		
63	Trees: 3-3.5" caliper, complete in place	Ea.		
64	Shrubs #3 pot, complete in place	Ea.		
65	Perennial #1 pot, complete in place ADD ALT #3	Ea.		
66	Bulbs: per 100 qty, complete in place ADD ALT #3	Ea.		
67	Mulch, complete in place	C.Y.		

1.03 UNIT PRICE REQUIREMENTS

A. Sufficient prior notice shall be given in accordance with the General Conditions so that proper measurements of materials removed or to be replaced may be taken. All quantities used in the determination of additions to or deductions from the Contract Price

due to Unit Prices shall only be those that have been determined and approved by the City in advance.

B. The unit price bid shall be taken to include all labor and materials necessary to make the item of work complete in place, including all associated footings, base materials, backfill materials, excavations, equipment, overhead, and profit.

C. In case of substitution of items shown on the Drawings or called for in the Contract Documents, the change to the Contract Price for both item deleted and the item added, if of the same class of work, shall be based on the addition column.

END OF SECTION

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SECTION 01 23 00
ALTERNATES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including the conditions and general requirements of the Contract, Division 0 and applicable parts of Division 1, apply to the work under this Section.

B. The Contractor shall carefully examine all the Contract Documents for requirements that affect the work of this Section. The exact scope of this Section cannot be determined without a thorough review of all specification sections and other Contract Documents.

1.02 SUMMARY

A. The Schedule of Alternates included in this Section lists all the Alternates that appear in the Contract Documents, and the Specification Sections which are affected by each Alternate.

B. For each of the Alternates scheduled at the end of this Section, bidders shall state the amount in the proposal to be added to or deducted from the Contract Sum for the work.

C. Consult the individual Specification Sections and the Drawings for detailed requirements of each Alternate.

1.03 GENERAL INSTRUCTIONS

A. Each Bidder shall be held fully responsible for examining the scope of the Alternates generally defined herein and for recognizing any modifications to his work caused by any Alternate.

B. The Bid Alternate Price shall be complete cost, including overhead, profit, bonds, insurance, transportation, and all other costs connected with, or incidental to, the work described.

C. Alternates listed below in the Schedule of Alternates are listed in order. The Contract will be awarded on the basis of the Base Bid only, or the Base Bid plus any number of Alternates strictly added in order.

D. All dimensional and quantity estimates provided in the descriptions of the work below (noted with “approx.”) are provided for initial reference only; exact dimensions and quantities for the full extent of the work as described in the Drawings and Specifications shall be confirmed in field by the Contractor before submitting the price. The Contractor shall be responsible for the full extent of the work described, not to be limited by the approximate quantities.

1.04 ALTERNATES

A. Definition: “Alternates” are alternate products, materials, equipment, systems, methods, units of work, or major elements of the construction, which may, at the Authority’s option and under the terms established by the Contract or Agreement, be selected for the work in lieu of the corresponding requirements of the Contract Documents or in addition to the work of the Base Bid as noted.

B. Alternate Requirements: A Schedule of Alternates is included at the end of this Section. Each Alternate is defined using abbreviated language, recognizing that the Contract Documents define the requirements. Coordinate related work to ensure that work affected by each Alternate is complete and properly interfaced with work of each selected Alternate.

C. Provide written proposals for each Alternate on the Bid Form for the Authority's consideration. Each proposal amount shall include the entire cost of the Alternate portion of the work, including overhead, profit, and other costs including cost of interfacing and coordinating the Alternate with related and adjacent work.

1.05 SCHEDULE OF ALTERNATES

A. Alternate No. 1 – ADD Log Stepper

1. Work:

a. ADD Log Stepper as included in Section 116314 Play Equipment and as shown on L1.1 Materials Plan.

2. Refer to the following Specification sections for the work of Alternate No. 1:

a. Section 11 63 14 – Play Equipment

b. Section 03 30 53 – Cast-in-Place Concrete

B. Alternate No. 2 – REPLACE Lumberjack Climber – Base Bid with Lumberjack Climber – Add Alt.

1. Work:

a. ADD the Lumberjack Climber – Base Bid as included in Section 116314 Play Equipment.

b. DEDUCT Lumberjack Climber – Add Alt as included in Section 116314 Play Equipment and as shown on as shown on L1.1 Materials Plan.

c. DEDUCT the 5-12 Spinner as included in Section 116314 Play Equipment and as shown on L1.1 Materials Plan.

2. Refer to the following Specification sections for the work of Alternate No. 2:

a. Section 11 63 14 – Play Equipment

b. Section 03 30 53 – Cast-in-Place Concrete

C. Alternate No. 3 – ADD perennial and bulb plantings, associated irrigation, and plant protection fencing.

1. Work:

a. ADD furnishing and installation of perennial and bulb plantings as shown on L4.1 Planting Plan.

b. ADD sprinklered irrigation zones as shown on IR1.0

c. ADD plant protection fencing as shown on L1.1 Materials Plan and Detail 6, L6.3 Park Details 2.

2. Refer to the following Specification sections for the work of Alternate No. 3:

a. Section 32 00 00 – Planting

b. Section 32 80 00 – Irrigation

c. Section 32 30 00 – Site Improvements

D. Alternate No. 4 – REPLACE Round Tables with Swivel Seating with Square Tables and Seating Cubes with Backrests

1. Work:

a. ADD furnishing and installation of a total of 4 Square Tables and a total of 8 of Seating Cubes with Backrests as included in Section 323000 Site Improvements.

b. DEDUCT the 4 Round Tables with 8 Swivel Seats as included in Section 323000 Site Improvements and as shown on L1.1 Materials Plan.

2. Refer to the following Specification sections for the work of Alternate No. 4:

a. Section 32 30 00 – Site Improvements

b. Section 03 30 53 – Cast-in-Place Concrete

E. Alternate No. 5 – ADD Painted Graphics on Existing Picket Fence to remain

1. Work:

a. ADD painted graphics on existing picket fence to remain, at rear of park and along overlook side, as included in Section 323000 Site Improvements, and as shown in Details 4 & 5, L6.7 Fence Details.

2. Refer to the following Specification sections for the work of Alternate No. 5:

a. Section 32 30 00 – Site Improvements

F. Alternate No. 6 – REPLACE Water Play Feature with Custom Precast Concrete Water Play Feature

1. Work:

a. ADD the Custom Precast Concrete Water Play Feature, as included in Section 323000 Site Improvements, and as shown in Details 1 – 5, L6.6 Play Details. Custom Precast Water Play Feature consists of:

1. Farm Pump
2. Precast Concrete Upper Basin with Undulating Surface
3. Precast Concrete Lower Basin
4. 2” Diameter Drain
5. Pipe Connection to Lower Basin
6. Water Gate cast into Precast Lower Basin
7. Cast-in-place Concrete Foundation

b. DEDUCT the Water Play Feature, as included in Section 323000 Site Improvements, and as shown on L1.1 Materials Plan and in Detail 7, L6.6 Play Details. Water Play Feature consists of:

1. Farm Pump
2. Stainless Steel Water Trough with Flap
3. Stainless Steel Mixing Table
4. Cast-in-place Concrete Foundation

2. Refer to the following Specification sections for the work of Alternate No. 6:

a. Section 32 30 00 – Site Improvements

b. Section 03 30 53 – Cast-in-Place Concrete

G. Alternate No. 7 – ADD increased area of Overlook Platform

1. Work:

a. ADD furnishing and installation of all materials required to complete the full-size Overlook Platform as shown on L1.1 Materials Plan and L7.1 Platform Plans.

2. Refer to the following Specification sections for the work of Alternate No. 7:

a. Section 05 12 00 – Metal Fabrications

b. Section 05 50 00 – Metal Fabrications

c. Section 03 30 53 – Cast-in-Place Concrete

END OF SECTION

SECTION 01 33 00
SUBMITTALS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The work to be performed under this Section shall include the compilation and submittal of all required shop drawings, manufacturer's cuts, specifications, and certifications of all materials and equipment for the Landscape Architect's approval. Actual product samples may also be required as stipulated in the technical specifications sections.

B. All submittals shall be submitted within four (4) weeks after the award of the contract, and may be made and distributed digitally with the approval of the Owner via email or File Transfer Protocol (FTP) site. Alternatively, submittals may be made in hard copy form; four (4) copies (Contractor, Owner's Rep, Landscape Architect, and Other City Department) shall be in four (4) submittal packages so that manuals can be prepared for office and field reference.

PART 2 - SUBMITTALS

2.01 REQUIREMENTS

A. References are made throughout the Specifications and Drawings where submittals are required. All finishes, colors, and patterns are to be reviewed and approved by submittal or field sample.

B. Where the Contractor's intention is to furnish the materials or equipment as specified, a list of all such elements, by Specification section, shall accompany the submittals so that the entire submittal is complete for the project.

PART 3 - EXECUTION

3.01 SUBMISSIONS

A. Submit all documents and data either in a collated, manual format, with four (4) manuals to be submitted; OR distributed digitally with the approval of the Owner. Include a Table of Contents of the material for reference. The submittal is to be entire and complete, addressing all furnishings and installation.

B. Submit all required product or material samples concurrent with the materials/equipment information manuals described above. Each submittal shall reference its appropriate specification section, part and paragraph.

END OF SECTION

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SECTION 01 41 00
PERMITS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The conditions and general requirements of the Contract, Division 0 and applicable parts of Division 1, apply to the work under this Section.

B. The Contractor shall perform the work in accordance with the Contract Documents, and any applicable municipal requirements.

1.02 SCOPE OF WORK

A. The Contractor shall be responsible for obtaining all permits required to complete the work of this contract, to provide all coordination and furnish all bonds, assurances and required warranties. As applicable, the Contractor shall be responsible for any/all fees associated with the securing of permits necessary for the execution of the work of this contract. Should any street work be required, a contractor specifically approved by the City shall perform it.

1.03 PERMITS

A. The Contractor shall prepare permit applications and obtain applicable permits after the contract is awarded, bearing all expenses. All required permits shall be obtained, INCLUDING BUT NOT LIMITED TO the following:

1. Backflow Preventers (Cross-Connection Permit)
2. Permit for excavation in the Public Way (520 CMR 14.00) as needed
3. Electrical (Eversource) Permit
4. Plumbing Permit
5. Parking Permits as needed and appropriate.

B. All materials and equipment shall conform to permit requirements and the City's Standards for utilities, excavation, backfilling, patching, and surveying, or other work unless stated in these specifications. The contractor shall coordinate as necessary with the appropriate City official and/or private utility.

C. Permit and Work Order fees: The contractor is responsible for all Permit and License fees, including those associated with the EVERSOURCE Permit and Work order. Exceptions are:

1. The application fee for the MBTA License to Enter will be paid by the City
2. All City permit fees will be waived.

D. EVERSOURCE Permit: The contractor is responsible for obtaining and coordinating electric service improvements with EVERSOURCE and ensuring that the project is completed in a timely manner. All fees associated with the Eversource Permit will be the responsibility of the contractor. Questions regarding EVERSOURCE permitting and forms should be directed to:

John Daly, Eversource Energy, 1 NSTAR Way, Westwood, MA 02090, (781)441-3206, john.daly.jr@eversource.com

E. MBTA License: As discussed elsewhere, an MBTA License to Enter is required before work can proceed on the slope adjacent to the MBTA property. The City is applying for the License and will pay the application fee, however the Contractor will be responsible for additional insurance requirements, and all employees working in the area adjacent to the MBTA property shall take Railroad safety classes.

1.04 DIGSAFE

A. Contact DigSafe seventy-two (72) hours prior to initiating work at #1-888-344-7233.

PART 2 - MATERIALS

2.01 GENERAL

A. All materials and equipment shall conform to permit requirements and the City's standards for utilities, excavation, backfill, patching, and surveying or other work unless otherwise stated in these specifications. Coordinate as necessary with the appropriate City official and/or private utility.

PART 3 - EXECUTION

3.01 GENERAL

A. Execute all work per permit requirements. All plumbing and electric work to be approved by City Inspectors; sidewalk ramps to be approved by City Engineer.

PART 4 - GUARANTEE

4.01 GENERAL

A. Guarantee all work per permit requirements.

END OF SECTION

SECTION 01 55 00
VEHICULAR ACCESS AND PARKING

PART 1 - GENERAL

1.01 SCOPE

A. The conditions and general requirements of the Contract, Division 0, apply to the work under this Section.

B. This section addresses requirements, restrictions, and available options for the Contractor, subcontractors, work crews, and delivery vehicles during the duration of the project.

PART 2 - MATERIALS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 ON-SITE PARKING AND STORAGE

A. Site soils in unpaved or cleared areas shall be protected from compaction, spills, and other damage at all times. The Contractor shall be responsible for ensuring that no vehicles are parked and no equipment or materials are stored on existing pavements intended to remain, or on areas intended as lawn or planting bed.

B. All areas used for storage or stockpiling shall be protected with secured temporary fencing and protected from damage to the pavements.

C. Vehicular access for fire prevention shall remain unblocked by parked vehicles or stored equipment and materials at all times.

D. The Contractor shall be solely responsible for all vehicles, materials, and equipment left on the premises outside working hours.

E. The Contractor shall repair or replace, at no cost to the Owner, any existing pavement or curbing intended to remain which is damaged by vehicular use or entry into the project site.

3.02 ON-STREET PARKING

A. The Contractor is responsible for observing all regulations of the Somerville Traffic and Parking Department.

1. Many of the streets in the vicinity of the project site are Resident Permit Parking Only. The Contractor shall be solely responsible for observing parking regulations.

2. “Contractor Permits” valid for a 30-day period in the neighborhood of a specific address or addresses are available (with a valid Building Permit) from the Traffic and Parking office at 133 Holland Street. (As of the Bid Date, the permits are $35/vehicle/month.) See the City Traffic & Parking Department website at http://www.parksomerville.com/parking-permits for further information.

3.03 PROJECT SITE VEHICLE ACCESS AND CIRCULATION REQUIREMENTS

A. The Contractor shall use police details as necessary for work impacting the public right-of-way, including any activity for which the Department of Traffic and Parking, or City or State regulations, require a police detail.

B. The Contractor shall submit a Traffic and Pedestrian Management Plan to the department of Traffic and Parking for review and approval prior to commencing construction, detailing all proposed and requested measures.

C. The existing concrete sidewalk, and all existing trees not indicated for removal, shall be protected during construction, see Section 015639 Tree Protection and Health Maintenance for more detail.

D. All tree and pavement protection shall be in place before construction equipment accesses the site, and shall be properly maintained through construction per 01 56 00 to the satisfaction of the Landscape Architect and Owner.

E. The Contractor shall make all reasonable efforts to maintain pedestrian access along the sidewalk at all times during the project, except as required when work is actively occurring at the sidewalk area. When work necessitates closure of the sidewalk, signage shall be hung indicating the closure and pedestrians shall be routed to the opposite side of Central Street.

END OF SECTION

SECTION 01 56 00
TEMPORARY BARRIERS AND ENCLOSURES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The conditions and general requirements of the Contract, Division 0 and applicable parts of Division 1, apply to the work under this Section.

B. All references to products by manufacturer, trade name or performance Specifications bearing the connotation "or Approved Equal" shall be as determined by the Landscape Architect and the City, per MGL c. 30 s. 39M, part b, criteria 1.

1.02 WORK INCLUDED

A. Provide all labor, equipment, implements and materials required to furnish, install, construct and perform all site improvements complete as shown on the Drawings and specified herein.

B. To be included, but not limited to the following:

1. Temporary Construction Perimeter Fencing;
2. All other temporary barriers and controls needed for protection of the public during construction.

1.03 REFERENCES

A. Examine all other Sections of the Specifications and all Drawings for the relationship of the work under this Section and the work of other trades. Cooperate with all trades and all departments of the City and coordinate all work under this Section therewith.

B. The following related items are included under the Sections listed below:

1. Section 01 57 00 – Environmental Protections;
2. Section 01 56 39 – Tree Protection and Health Maintenance
3. Section 10 14 00 – Project Signage.

1.04 SUBMITTALS

A. Shop Drawings and Samples

1. Provide complete Shop Drawings and/or samples and catalog cuts for all items called for on the Drawings and as specified and in accordance with applicable requirements under Division 1.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original unopened and undamaged packages with labels legible and intact.

B. Store materials in unopened packages in a manner to prevent damage from the environment and construction operations.

C. Handle in accordance with manufacturer's instructions.

D. The Contractor shall be solely responsible for all materials stored on the site once delivered. Any materials left unsecured at the job site shall be solely at the contractor’s own risk.

1.06 DEFINITIONS

A. The following items are included herein and shall mean:

1. NCLMA – National Chain Link Manufacturers' Association;
2. OSHA – Occupational Safety and Health Act.

PART 2 - MATERIALS

2.01 BARRIERS AND BARRICADES

A. Provide barriers to prevent unauthorized entry to construction areas to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations.

1. Comply with standards and code requirements for erection of structurally adequate barriers.
2. Install barriers of a neat and uniform appearance.
3. Provide graphics and signs warning of the hazard being protected against.
4. Where appropriate and needed provide lighting, including flashing red or amber lights.
5. Provide barriers at public rights-of-way and for public access to existing buildings when adjacent to construction operations.

B. Provide barricades with blinking beacon light at all open trenches and other excavations.

C. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

2.02 TEMPORARY CONSTRUCTION FENCING

A. Prior to any excavation work the Contractor shall provide temporary construction fencing as shown on the Drawings and/or as required to completely protect the work area and injury to persons or property.

B. The Contractor shall furnish and install temporary fencing of the following type in all areas where existing fencing lengths are inadequate to enclose the construction.

1. Chain link fencing, **eight feet (8') high min. at shared property line with MBTA,** and six feet (6') high min. along the remaining limit of work, fabricated from No. 9 gauge galvanized wire woven in a 2" diamond mesh with top salvage and having galvanized steel H or pipe intermediate and terminal posts. Post spacing shall not exceed eight feet (8') on center. Cross bracing, reinforcing gates and other parts of fencing shall conform to standard Specifications of the National Chain Link Manufacturers Association. All posts shall be set into temporary concrete footings or on temporary chain link fencing stands as approved by the Landscape Architect.

C. The Contractor shall furnish and install matching gates equipped with suitable locks and other hardware where necessary to provide access for construction apparatus or fire

fighting equipment. The Owner shall be provided with a copy of the key used for all locks.

D. Temporary tree protection fencing shall be as specified in Section 01 56 39 – Tree Protection and Health Maintenance

2.03 TEMPORARY WORK IN PUBLIC WAYS

A. Prior to commencing any work in public ways and other areas which are legally used by vehicles or pedestrians, the Contractor shall submit in writing the proposed methods of protection to the Official. Work shall not be commenced in these areas until written approval is received from the Official.

B. In general, all excavations in public ways shall be protected by substantial barriers which will offer complete protection against accidents for pedestrian and vehicular traffic without interrupting the normal flow of traffic. All barriers must be properly lighted with electric or battery powered safety lights and must be maintained in good working order by the Contractor for the duration of the time such barriers are required.

C. Trenches across sidewalks shall be completely covered with a temporary walkway, comprised of properly supported nominal 2" thick lumber laid with butt joints and covered with exterior grade plywood, 1/2" minimum thickness. Provide continuous 2" x 4" rails and posts secured to the temporary walkway conforming to the requirements of the Occupational Safety and Health Act (OSHA).

D. Wherever temporary chutes are to be extended over sidewalks or other pedestrian or vehicular traffic areas, the bottom and sides of the chutes shall be provided with continuous dustproof and weatherproof lining, applied to the exterior surfaces.

E. The Contractor will be required to furnish, install, and maintain in good condition, at no increase in Contract Price or Contract Time, all other safety measures which in the judgment of the Official are required to protect the public from accidents due to work performed under this Contract. This requirement is supplementary to the Contractor's rights and obligations to provide and employ safety measures as s/he may deem necessary or as may be required by law or standard safety practices.

PART 3 - EXECUTION

3.01 BARRIERS, BARRICADES AND ENCLOSURES

A. Install temporary items as specified herein and in the Drawings or, where not specified, to level of quality suitable for the intended purpose as judged by the Project Consultant.

3.02 REMOVAL OF TEMPORARY BARRIERS, ENCLOSURES AND PROTECTIONS

A. Remove temporary barriers, barricades, fencing, enclosures and protections as warranted by the progress of the Work and prior to Substantial Completion.

B. Remove in-ground elements of all temporary barrier installations (if any) completely. Grade site as noted.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition at start of work or as specified elsewhere in the Contract Documents.

END OF SECTION

SECTION 015639
TREE PROTECTION AND HEALTH MAINTENANCE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work to be done under this section consists of instituting and maintaining positive measures to protect and maintain public shade trees within and adjacent to the limits of work as detailed on the Drawings and as directed by the Landscape Architect.

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B. This work includes proactive measures prior to, during and after construction to ensure the short- and long-term health of existing trees to remain on site and to prevent damage due to construction operations.

C. Tree Protection should be assumed for existing trees to remain within the project limit of work as shown in the Drawings. Tree protection shall remain in place throughout the duration of the construction project but may be temporarily relocated to allow for work in select areas in close proximity to the trees to occur as approved by the Landscape Architect. Tree protection shall be promptly restored following work operations. The measures described herein are anticipated to be required and will be verified based on actual field conditions.

D. Provisions under this Section include: tree protection fencing measures to minimize disturbance to existing trees and their root systems; canopy and root system review and evaluation; canopy and root pruning in areas of proposed disturbance; and post-pruning care including mulching and watering of root zones.

E. Work in this section includes the following:

1. Existing Tree and Root Protection
2. Preparation of a Tree Protection and Maintenance Plan and Work Schedule
3. Hiring of a Certified Arborist for the Duration of the Construction Activity
4. Developing a Plant Health Care Program
5. Tree Pruning
6. Subsurface Root Exploration
7. Tree and Root pruning and/or removal of existing vegetation under direction of Owner’s Representative

1.02 GENERAL REQUIREMENTS

A. Pruning: The Contractor shall prune trees within the limit of work under the direction of a Massachusetts Certified Arborist and only as directed by Landscape Architect and Owner’s Representative. Provide protection of existing trees and vegetation not designated for removal within the limits of work.

B. Conduct pruning operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities only as directed by the Owner’s Representative. Do not close or obstruct streets, walks or other occupied or used facilities without permission from the Owner’s Representative. Pruning operations shall include the specific pruning requests identified in this specification.

C. Public trees are protected by Massachusetts State Law, Chapter 87. Section 12 states that a fine of up to five hundred dollars, ($500.00) per incident of damage to public shade

trees can be levied. Each branch broken or improperly pruned, each improper wounding of the trunks of the trees, and each root improperly pruned shall constitute an infraction. Section 12 further provides that anyone who negligently or willfully damages a tree will be liable to the City for all damages.

D. The Contractor shall take the utmost care to avoid unauthorized, unnecessary or improper wounding of City or private shade trees. Prior to construction, the Contractor shall provide a Tree Protection and Maintenance Plan and Work Schedule. A Massachusetts or International Certified Arborist shall be sub-contracted by the Contractor to provide a protection and maintenance plan and perform specified work. All plans and schedules shall be subject to review and approval by the City Tree Warden. Infraction of Massachusetts State Law Chapter 87 or failure to provide a protection plan and work schedule will result in fines or the immediate cancellation of the contract.

E. The Contractor shall engage a board certified arborist based within 20 miles of the project site and with a **minimum of five (5) years of experience** including experience with supersonic air tools such as the “airspade” for the project.

F. The work shall consist of the provision of all labor, materials, equipment, and transportation required to complete the pruning as required by the Engineer in strict accordance with the conditions and specifications of these Contract Documents. The work shall include, but is not necessarily limited to, the following:

1. Attending initial site visit and assessment with City representatives
2. Securing necessary permits and approvals before commencement of work
3. Posting work areas for parking restrictions
4. Marking work zones for traffic and pedestrian control
5. Providing a schedule of work for City review and approval
6. Visual assessment of each tree to be pruned including the assessment of the need for airspading and/or tree root pruning
7. Determination of pruning objectives
8. Making pruning cuts and wound care
9. Wood waste and debris consolidation & disposal
10. Site cleanup

1.03 QUALITY ASSURANCE

A. Tree Protection measures to be performed by Massachusetts Certified Arborist based within 20 miles of the project site and with a minimum of five years of experience and as reviewed and approved by the Owner’s Representative and City Tree Warden.

B. Certification shall be current. Proof of certification shall be submitted per SUBMITTALS paragraph of this Section.

1.04 SUBMITTALS

A. Certification: Submit the Certification of the arborist to be performing the work.

B. Tree Protection and Maintenance Plan, Plant Health Care Program and Work Schedule: submit for review and approval by the Owner’s Representative and City Tree Warden at least two (2) weeks prior to beginning initial work on a project street.

C. Product Data: Submit most recent printed information from manufacturers for:

1. Tree Watering Bags (if proposed for use in Tree Protection and Maintenance plan)

D. Samples: Submit samples of:

1. Tree Protection Fencing
2. Tree Protection Stakes
3. Wood Chips
4. Tree Watering Bags (if proposed for use in Tree Protection and Maintenance plan)

E. Submit location plan of staging areas and schedule for moving staging equipment into those areas. Plan and schedule shall be submitted to Owner for approval prior to mobilization and related site preparation operations.

1.05 WARRANTY

A. Damage and Destruction of Trees:

1. The Contractor shall be liable for all damage and/or disturbance to existing trees and shrubs not otherwise designated for removal throughout all portions of the Work of this Contract. Actual charges for damage to plants shall be in accordance with the schedules defined in this Section, SITE PREPARATION, with assessed charges to be deducted from sums payable under the Construction Contract.

a. Damage which, in the Owner's Representative's opinion, can be remedied by corrective maintenance shall be repaired immediately.

b. Trees or shrubs which are damaged irreparably shall, at the Owner's Representative's discretion, be replaced by the Contractor with new trees or shrubs of the same size and type.

c. In the event that replacement of damaged trees is impractical as determined by the Owner's Representative, the full replacement costs will be assessed to the Contractor's account.

2. Damaged trees or shrubs which require removal and/or replacement shall be removed as noted below:

a. Remove all trees, stumps, brush, vegetation, downed timber, rubbish, organic matter and other rubbish or extraneous debris.

b. Fell trees in such a way as to not injure other trees to be saved.

PART 2 - MATERIALS

2.01 TREE PROTECTION FENCE

A. For existing beech tree in central planter, tree protection fencing shall be temporary chain link fence as specified in Section 015600 – Temporary Barriers and Enclosures.

B. Tree protection fence for all other trees to remain shall be equal to the following:

1. Fencing: heavy-duty bright orange 2.5”-max diamond-mesh HDPE safety/barrier fence with tensile strength of at least 250 lb/ft, 4'-0” high, with smooth upper and lower edges, “Sentry HD” by Tenax of Baltimore, MD or Approved Equal.

2. Stakes for fencing shall be 7’ long wood or metal drive stakes, commonly used to support fencing. Stakes shall be spaced 5’ on center maximum. Attachment shall be by construction-grade staples to wood or wiring to metal at a minimum of 3 locations.

PART 3 - EXECUTION

3.01 GENERAL

A. For definitions and pruning standards, the Contractor is required to adhere to the requirements of ANSI A300, American National Standard for Tree Care Operations “Tree, Shrub and Other Woody Plant Maintenance Standard Practices”.

3.02 PROTECTION OF EXISTING TREES

A. The Contractor shall install the existing tree protection fencing in the locations shown on the Contract Drawings and as directed by the Landscape Architect.

1. The tree protection fence shall be installed prior to the start of any construction work, including any and all mobilization activities and delivery of material or equipment to the site. Remove fencing only after heavy site preparation construction has been completed as determined by the Owner’s Representative in writing.
2. Do not alter fencing unless directed to do so by the Landscape Architect or Owner’s Representative in writing.

B. Erect the protective fence so that it is securely in place and resistant to seasonal climatic forces, adjacent pedestrian movement, and work operations to ensure root and tree protection.

C. Periodically inspect, repair and maintain protective fences during the course of construction operations. During periods of construction stoppages, including but not limited to delays and over-wintering, periodically inspect, repair and maintain protective fences. Of particular concern is compaction by vehicles once the existing pavement has been removed, exposing roots to damage and to drying out.

D. Landscape Architect reserves the right to require Contractor to provide additional or more secure tree protection devices if it is determined that the existing trees are not being properly protected or if the vegetation is threatened with damage through the construction operations.

E. If the Landscape Architect or Owner’s Representative determines that trees are not being protected to the standards herein, Landscape Architect or Owner’s Representative may order construction activity to stop immediately and to remain stopped until the non-compliant condition or practice is corrected. The Contractor shall comply with this provision at no additional cost to the City. This provision in no way affects the Contractor’s obligation to complete the work of this contract by the date specified.

F. If injury should occur to any tree during construction, it should be evaluated as soon as possible by the Landscape Architect or Owner’s Representative so that appropriate treatments can be applied.

G. Any grading, construction, demolition, or other work that is expected to encounter tree roots, must be monitored by a licensed arborist. Provide notice to licensed arborist three (3) days prior to activity.

H. Before grading or excavation, trees shall be root pruned 1 foot outside the tree protections zone by cutting all roots cleanly to a depth of 24 inches. Roots shall be cut by manually digging a trench and cutting exposed roots with a saw, vibrating knife, rock saw, narrow trencher with sharp blades, or other root-pruning equipment approved by the licensed arborist.

I. Any roots damaged during grading or construction shall be exposed to sound tissue and cut cleanly with a saw.

J. If temporary haul or access roads must pass over the root area of trees to be retained, a road bed of 6 inches of mulch or gravel shall be created to protect the soil. The road bed material shall be replenished as necessary to maintain a 6-inch depth.

K. Soil from any excavation activities shall not be placed within the tree protection zone, either temporarily or permanently.

L. Any accidental encroachment shall be reported to the Owner's Representative.

M. **Failure to protect existing vegetation to remain and the resource area from construction equipment and construction materials or both will be regarded as a severe violation of the requirements of the Contract Documents**. In the event that the Contractor violates the requirements of tree protection and resource area in any manner as determined by the Owner's Representative, remedial activities shall be performed.

3.03 ROOT PROTECTION

A. Roots that cannot be avoided during construction shall be carefully and cleanly cut or shaved. Only hand methods for grubbing roots will be accepted inside drip lines of trees to be left standing. All root pruning and shaving must be completed by the certified arborist under the supervision of the Owner's Representative. Root pruning shall include application of root treatment or fertilizer as required. In order to minimize impact to roots, arborist shall uncover roots with air spade.

B. Exposed tree roots shall be covered with damp burlap or similar protective covering to keep roots from drying out until trench is backfilled and roots are covered with soil.

C. Damaged tree roots shall be cut back to uninjured tissue using a well sharpened pruning shear or pruning saw capable of providing a clean, sharp, flush cut.

D. Tunneling shall be the preferred method of excavation adjacent to tree roots to avoid root pruning. If root pruning is unavoidable, a certified arborist shall be onsite to execute or oversee the operation with sufficiently sharpened hand tools and in such a fashion as to have minimum negative impact on tree health and safety.

3.04 ROOT PRUNING

A. Where construction will be in close proximity to existing trees designated to remain, roots shall be pruned prior to trenching and tunneling operations. Root pruning shall be performed as early as possible before trenching or tunneling operations. Proximity shall be as determined in the field by the Landscape Architect or Owner's Representative.

B. Root pruning is the physical cutting of tree roots to minimize root damage and promote healing. Root prune using a sharpened spade for all roots smaller than one-inch (25 mm) diameter. Root prune using an ax or chainsaw for all roots greater than one-inch (25 mm)

diameter. Any method which tears roots or disturbs the soil beyond the grading limit is unacceptable. Do not use backhoe bucket or any other excavating machine to root prune.

C. Backfill root pruning trench with existing soil mixed with peat moss to a mixture of approximately 75 percent loam and 25 percent humus by volume. Tamp soil in 6-inch (150 mm) lifts. Each lift shall be compacted to a point at which a foot print makes only a 1/16 inch (1.5 mm) impression.

D. Apply mulch to a depth of 4 inches (100 mm) at minimum 10 ft. (3.0 m) to 15 ft. (4.5 m) radius around tree to reduce compaction and increase moisture retention

3.05 TEMPORARY ACCESS

A. Temporary access within plant protection areas is permitted to perform construction operations as approved by the Landscape Architect or Owner's Representative. Work within tree protection areas shall be performed by hand to avoid damage to trees. Restore tree protection at the end of each day's operation.

3.06 GENERAL HORTICULTURAL TREE AND ROOT RELATIONSHIPS

A. The majority of a tree's roots are located in the upper few inches of topsoil. For this reason, trees are vulnerable to immediate and long-term damage. Immediate damage to roots is caused by grading, use of vehicles and tools, and excess pedestrian traffic above the roots. Long-term damage is caused by the compaction of the soil above the roots by use of vehicles, storage of materials, and excess pedestrian traffic.

B. Protection of a tree therefore includes the protection of the roots of the tree as well as its trunk, branches, and leaves. Roots are best protected by fencing off as large an area as possible around each tree, so that no driving, parking, walking, or storage of materials takes place where it may cause damage.

C. The roots of a tree often extend far into the surrounding landscape, including areas well beyond the outer perimeter of the tree's canopy / drip line. For this reason, operations should be confined to the smallest possible area.

D. As a practical minimum, however, every effort shall be made to protect the area beneath the canopy of the tree, also known as the area inside the "drip line." This area is sometimes referred to as the "root zone."

E. Soil is most vulnerable to compaction, and roots to damage, when the soil is wet.

3.07 PRUNING SAFETY STANDARDS

A. Tree pruning and airspading shall be performed only by certified arborists or arborist trainees who, through related training or on-the-job experience, or both, are familiar with the practices and hazards of arboriculture and the equipment used in such operations.

B. The Contractor's certified arborist must be present at all times while tree pruning is performed.

C. Tree pruning operations shall comply with the American National Standard for Tree Care Operations—Safety Requirements (ANSI Z133.1), as approved by the American National Standards Institute, and published by the National Arborists Association. Operations shall

also comply with applicable Occupational Health and Safety Administration (OSHA) standards.

3.08 PRUNING OBJECTIVES

Tree pruning shall be conducted as directed by the Landscape Architect or Owner's Representative. The pruning operation shall focus on the following types of pruning:

A. Cleaning. Cleaning shall consist of selective pruning to remove one or more of the following parts—dead, diseased, and/or broken branches. All deadwood that is two (2) inches or greater in diameter shall be removed. Branches with splits, large cavities or any defect that may result in failure shall be reduced, or removed to the trunk if reduction is not feasible.

B. Thinning. Thinning shall consist of selective pruning to reduce density of live branches. Thinning shall result in an even distribution of branches on individual limbs and throughout the crown.

C. Raising. Raising shall consist of selective pruning to provide vertical clearance. The intent of crown raising for this project will be the removal of all branches extending lower than fourteen (14) feet above a public roadway and eight (8) feet above a public sidewalk. This includes trees endangered by traffic re-routing as the result of construction operations, as well as trees over existing roadways and sidewalks which do not presently meet these height requirements. However, the level of pruning of each tree will be determined at the site walk with the Contractor, Contractor's arborist, Engineer and City arborist. Additionally, any cuts to lateral branches over 4" as well as any questionable cuts will require the approval of the City arborist.

D. Reducing. Reduction shall consist of selective pruning to decrease height and/or spread. Consideration shall be given to the ability of a tree species to tolerate this type of pruning. All branches obstructing park signs, street signs, traffic signs, traffic lights, and park or street lighting shall be removed. Branches shall be pruned away from all houses and buildings a minimum of five (5) feet, or more if appropriate to the tree shape and structure.

3.09 PRUNING PRACTICES

A. The Contractor's certified arborist shall visually inspect each tree before commencing work.

B. If a condition is observed requiring attention, the condition should be reported to the City within 24 hours. Such conditions may include structural weakness, rot or decay that cannot be corrected by cleaning, and dead trees.

C. Equipment and work practices that damage living tissue and bark beyond the scope of work shall be avoided. Climbing spurs shall not be used when climbing and pruning trees. Spurs may be used to reach an injured climber or when removing a tree.

D. Pruning tools (e.g. chain saws, pole saws, hand saws, pole pruners, etc.) shall be sharp and regularly sharpened and maintained throughout the Contract Term.

E. Not more than 25% of the foliage of an individual tree should be removed within an annual growing season. The percentage and distribution of foliage to be removed shall

vary according to the tree species, age, health and site, in accordance with the types of pruning identified above.

F. Not more than 25% of the foliage of a branch or limb shall be removed when it is cut back to a lateral. The lateral shall be large enough to assume apical dominance.

G. Heading shall be permitted only by the expressed permission of the City, when needed to reach a defined objective.

H. Topping and lion tailing shall be considered unacceptable pruning practices.

I. All pruning cuts shall be made in accordance with the American National Standard for Tree Care Operations—Standard Practices (ANSI A300 Part 1), as approved by the American National Standards Institute, and published by the National Arborists Association (revised 2001). All terminology included in these Technical Specifications shall be defined by ANSI A300 Part 1.

J. When tracing wounds, only loose, damaged tissue should be removed. No other wound treatments shall be used.

K. On mature trees the maximum diameter of any undesirable branch (dead, broken, rubbing, structurally unsound) that may be left shall not exceed 2 in. (50.8 mm).

L. Pruning cuts shall be clean and smooth with the bark at the edge of the cut firmly attached to the wood.

M. Large or heavy branches that cannot be thrown clear shall be lowered on ropes to present injury to the tree and other property.

N. Rope injury to trees from leading out heavy wood shall be avoided by using a cambium guard or installing a false crotch.

3.10 ACTIVITIES PROHIBITED WITHIN DRIP LINE

A. Do not store and stockpile construction materials and/or excavated materials, park vehicles, drive vehicles, remove soils, and stockpile soils within the drip line of trees, including trees located on adjacent properties which overhang the site unless otherwise indicated in Contract Drawings.

3.11 TREE PRUNING EQUIPMENT

A. The following equipment and vehicles shall be available on-site for use. All gas- powered equipment and vehicles must be five years old or less and in good condition as determined by the Engineer.

1. One (1) aerial lift trucks with an articulating boom that have a working height of not less than sixty (60) feet with Contractor’s name painted on each side.
2. One (1) chipper dump trucks with a minimum capacity of nine (9) cubic yards, with Contractor’s name painted on each side.
3. One (1) wood chippers with a capacity for 16” diameter limbs.
4. All relevant traffic control devices as prescribed by the Manual of Uniform Traffic Control Devices (MUTCD) of the U.S. Department of Transportation.
5. Supersonic air tools such as the “airspade” for use on designated trees with root conflicts as designated by Engineer.

3.12 PLANT HEALTH CARE PROGRAM

A. Prior to mobilization and construction operations, Contractor's arborist to document and submit a strategy for maintaining the health of existing trees within the project limits including strategies for watering and fertilizing as outlined below.

B. Watering: Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.

C. For Beech tree in Central Planter:
1. Soil testing and amendment: Existing soil shall be tested and amended to correct pH and mineral deficiencies.
2. Existing soil volume shall be aerated and organic matter shall be integrated into the root zone, using the air excavation tool (airspade). The entire root zone shall then be covered with 2-3 of composted hardwood chip mulch (NOT bark mulch).
3. Prophylactic treatment with Agri-fos or other systemic fungicide shall be applied to reduce potential for root disease.

D. Drainage: Do not permit water to stand around the base of plants within the drip line during construction operations except during that period of inundating flooding which would, in its natural course, cover the base of trees. Provide temporary drainage where required to avoid ponding during construction operations.

3.13 DAMAGE DUE TO CONSTRUCTION OPERATIONS

A. Contractor shall be responsible for the health of the existing trees in the immediate vicinity of construction. Trees damaged by construction operations which, as determined by the Engineer, can be remedied by corrective pruning measures shall be addressed immediately.

B. Engineer shall engage an independent qualified Arborist to inspect the damaged trees and to make a determination on damage, sustainability, and remediation procedures.

C. The Contractor shall strictly adhere to the independent Arborist’s recommendations.

D. Broken limbs shall be pruned according to industry standards.

E. Wounds shall not be painted.

F. The total cost of tree repair, including the cost of the independent Arborist, shall be borne by the Contractor.

3.14 TREE REPLACEMENT DUE TO DAMAGE

A. If the independent Arborist determines that the damaged tree cannot be repaired and restored to full-growth status, the Contractor shall replace the damaged tree(s) and pay liquidated damages as noted below.

B. The size of the replacement tree shall equal ½” caliper for every 1” caliper inch of the damaged tree (size of the damaged tree shall be measured, the new tree shall be based on nursery measurements). The species of the replacement tree shall be determined by the Engineer and the City.

C. In addition to providing a new tree replacement, Contractor shall pay City $250.00 for every caliper inch of the damaged tree (the size of the damaged tree shall be as shown on the Drawings).

D. An example of the conditions stated above: A 20” caliper tree was damaged and determined to need replacement. To remedy this situation, the Contractor would purchase and install a 10” caliper tree and pay the Owner $5,000.

E. The total cost of tree replacement, including the cost of the tree and stump removal and the independent Arborist, shall be borne by the Contractor.

3.15 DISPOSAL OF WASTE MATERIALS

A. Remove waste materials and unsuitable topsoil from project area and dispose of off-site in a legal manner. Waste materials shall include but not be limited to timber, brush, refuse, stumps, roots, vines, debris and other objectionable matter. Removal includes raking and sweeping after completion of clearing and pruning operations.

B. Tree branches shall be removed in such a manner so as not to cause damage to other parts of the tree, or to surrounding people and property. Where necessary, ropes or other equipment shall be used to lower large branches to the ground.

C. All severed limbs shall be chipped, hauled away from the site, and disposed of in a legal manner. All wood waste, sawdust, leaves, and associated organic debris shall be collected from both public ways and adjacent private property, hauled away from the site, and disposed of in a legal manner.

D. Site cleanup shall follow as closely as possible to the pruning operation.

3.16 POST-CONSTRUCTION CLEANUP

A. After construction is complete, but prior to preparation and seeding of lawn area and planting, remove and properly dispose of the following off site: wood chips, temporary fencing, branch protection, tree boxes and trunk protection, and other materials.

END OF SECTION

SECTION 01 57 00
ENVIRONMENTAL PROTECTIONS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The conditions and general requirements of the Contract, Division 0 and applicable parts of Division 1, apply to the work under this Section.

B. All references to products by manufacturer, trade name or performance Specifications bearing the connotation "or Approved Equal" shall be as determined by the Landscape Architect and the City, per MGL c. 30 s. 39M, part b, criteria 1.

1.02 SCOPE OF WORK

A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.

1. Implementation
2. Area of Construction Activity
3. Protection of Water Resources
4. Protecting and Minimizing Exposed Areas
5. Location of Storage Areas
6. Protection of Landscape
7. Clearing and Grubbing
8. Discharge of Dewatering Operations
9. Dust Control
10. Separation and Replacement of Topsoil
11. Silt Fence
12. Catch Basin Filter (Silt Sack)
13. Noise Control

1.03 NOTIFICATION

A. The Landscape Architect or Owner’s Representative will notify the Contractor in writing of any non-compliance with the foregoing provisions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Landscape Architect or Owner’s Representative may order stoppage of all or part of the work until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

PART 2 - MATERIALS

2.01 SILT FENCE

A. Contractor shall erect and maintain a temporary silt fence as shown on the Drawings. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.

B. The Silt fence shall be “Silt Fence’ by Mirafi or Approved Equal. Silt fence fabric shall be Mirafi 100X; or approved equal.

C. Supporting posts shall be spaced 4 feet on center, and driven at least two feet into the ground. Posts shall be 2 inch square or heavier wood posts, or standard steel posts.

D. Fabric shall be anchored in a 4 inch deep trench dug on the upslope side of the posts. The trench shall be at least 6 inches wide. The fabric shall be laid in the trench,backfilled and compacted.

E. Fabric rolls shall be spliced at posts. The fabric shall be overlapped 6 inches, folded over and securely fastened to posts.

2.02 CATCH BASIN FILTER (SILT SACK)

A. Contractor shall provide a catch basin filter at catch basins in the vicinity of the project to prevent construction related sediment from entering the drainage system.

B. Catch Basin Filters shall be “Silt Sak” by Jennian, Melrose, MA, “Dandy Bag” by DandyProducts (800) 591-2284, or “Drain Pac”, or approved equivalent.

C. The catch basin filter shall be manufactured to fit the opening of the catchbasin or drop inlet. The sediment filter device shall have the following features:

1. Two dump straps attached at the bottom to facilitate the emptying of the device and shall have lifting loops as an integral part of the system.

2. Yellow restraint cord approximately halfway up the sack to keep the sides away from the catch basin walls. Yellow restraint cord is also a visual means of indicating when the sack should be emptied.

3. Fabric shall consist of a woven polypropylene geotextile and be sewn by a double needle machine, using a high strength nylon thread.

4. Sediment filter device shall have a certified average wide width per ASTM Standard D (4884 standard of 165 lbs/in.)

D. The Contractor shall remove and restore sediment filter devices for anticipated weather events as required by the City or the Owner’s Representative.

2.03 DUST CONTROL MEASURES

A. If the Landscape Architect or Owner’s Representative decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed herein.

B. Calcium Chloride

1. Calcium chloride shall conform to the requirements of AASHTO-M 144, Type I or Type II and Specification for Calcium Chloride, ASTM D98. The calcium chloride shall be packaged in moisture proof bags or in airtight drums with the manufacturer, name of product, net weight, and percentage of calcium chloride guaranteed by the manufacturer legibly marked on each container.

2. Calcium chloride failing to meet the requirements of the aforementioned specifications or that which has become caked or sticky in shipment, may be rejected by the Landscape Architect and Owner's Representative.

C. Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

PART 3 - EXECUTION

3.01 IMPLEMENTATION

A. Prior to commencement of work, the Contractor shall meet with the Landscape Architect and Owner's Representative to develop mutual understandings relative to compliance of the environmental protection program.

B. The Contractor shall submit for approval details and literature fully describing environmental protection methods to be employed in carrying out construction activities.

3.02 AREA OF CONSTRUCTION ACTIVITY

A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the Contract Drawings and Specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition, after completion of construction, at least equal to that which existed prior to work under this contract. The Contractor shall keep the active vehicular access to the site clear of debris, equipment and vehicles at all times for Fire Department access.

3.03 PROTECTION OF WATER RESOURCES

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids, solvents, or other harmful materials. The Contractor shall also prevent the transport of soil, dirt, and salt to surface streams, wetlands, and/or catch basins. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters, and run-off of demolition site sediments into stormwater collection systems. Measures shall include placement of catch basin filters at catch basins and silt fence where so indicated on Drawing L-1.0 – Demolition & Site Prep Plan.

3.04 LOCATION OF STORAGE AREAS

A. The location of the Contractor's storage areas for equipment and/or materials shall be placed upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Landscape Architect and Owner's Representative. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Landscape Architect and Owner's Representative.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of baled hay or straw around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

C. The Landscape Architect or Owner's Representative may designate a particular area or areas where the Contractor may store materials used in his operations. Temporary storage trailers, if used, shall be installed at Contractor's cost.

3.05 PROTECTION OF LANDSCAPE

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Landscape Architect or Owner's Representative. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

B. Branches, limbs, and roots shall not be cut except by permission of the Landscape Architect or Owner's Representative. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Where, in the opinion of the Landscape Architect or Owner's Representative or as indicated on the Drawings, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by other operations, the Contractor shall protect such trees by placing protective measures as shown on the drawings, and as specified in Section 015639 – Tree Protection and Health Maintenance for more detail.

3.06 CLEARING AND GRUBBING

A. The Contractor shall clear and grub only on the Owner's land or the Owner's easements, and only the area required for demolition operations, as approved by the Landscape Architect or Owner's Representative.

3.08 DISCHARGE OF DEWATERING OPERATIONS

A. Any water that is pumped and discharged from a trench and/or excavation as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.

B. Under no circumstances shall the Contractor discharge water to any areas designated as wetlands.

C. The pumped water shall be filtered through baled hay, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

D. Contaminated dewatering effluent shall be handled, and if necessary, disposed of in accordance with applicable regulations and permits. Any required monitoring and analysis of the effluent shall be performed by the Contractor and the laboratory results shall be submitted to the Landscape Architect and Owner's Representative.

E. Water pumped or drained from excavations, water courses, or other structures encountered in the work shall be disposed of in strict compliance with pertinent federal, state and local environmental regulations. Any damage caused by or resulting from dewatering operations shall be the sole responsibility of the Contractor.

3.09 DUST CONTROL

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Landscape Architect or Owner's Representative decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed herein.

B. Application

1. Calcium chloride shall be applied when ordered by the Landscape Architect or Owner's Representative and only in areas which will not be adversely affected by the application.

2. Calcium chloride shall be uniformly applied at the rate of 1-1/2 pounds per square yard or at any other rate as directed by the Landscape Architect or Owner's Representative. Application shall be by means of a mechanical spreader, or other approved methods. The number and frequency of applications shall be determined by the Landscape Architect and Owner's Representative.

3. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar.

4. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

3.10 SEPARATION AND REPLACEMENT OF TOPSOIL

A. Topsoil for reuse shall be carefully removed from areas where excavations are to be made, and separately stored to be used again as directed. The topsoil shall be stored in an area acceptable to the Landscape Architect or Owner's Representative and adequate measures shall be employed to prevent erosion of said material.

3.11 NOISE CONTROL

A. The Contractor shall adhere to the City ordinances for Noise Control (Article VII, Division 2) throughout the construction period. Noise control will be strictly enforced by the City.

B. No construction shall occur between 7pm-7am Monday through Saturday, or any time on Sunday. Any exemption to prohibited construction hours must be authorized by a City representative.

C. Contractor shall not permit engine idling on the job site. This shall be enforced through random, unannounced periodic inspections.

END OF SECTION

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SECTION 01 57 16
RODENT CONTROL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The conditions and general requirements of the Contract, Division 0 and applicable parts of Division 1, apply to the work under this Section.

1.02 WORK INCLUDED:

A. This section specifies requirements for rodent control activities by the Contractor at all work and laydown (or staging) areas in connection with this Contract.

B. The Contractor shall retain the services of a licensed rodent exterminator to conduct an inspection of the work and laydown areas and report on the presence of rodents and take any necessary measures to eliminate existing rodent populations prior to start of work. All rodent control to be in place and approved prior to any equipment delivery or demolition.

1.03 SUBMITTALS:

In accordance with requirements of general specifications, submit the following:

A. Within ten days after Notice to Proceed, submit to the Landscape Architect and Owner's Representative a written description of rodent control measures to be used and the areas to be included in the program.

B. Provide the name and background of the licensed rodent exterminator retained to provide any necessary rodent eradication measures prior to start of work. The licensed rodent exterminator must be approved by City Director of Inspectional Services.

PART 2 - MATERIALS

2.01 CONTAINERS:

A. Use metal or heavy-duty plastic refuse containers with tight-fitting lids for disposal of all garbage, or trash associated with food. These containers shall not have openings that allow access by rodents.

PART 3 - EXECUTION

3.01 WORK AND LAYDOWN AREAS WITHIN THE CONTRACT AREA:

A. Before mobilization begins, obtain written verification from the rodent exterminator that rodent populations have been effectively controlled in areas to be occupied.

B. Following site clearing and before demolition, excavation, or construction, inspect work and laydown areas and remove all remaining trash, debris, and weeds.

C. Maintain work and laydown areas free of trash, garbage, weeds, and debris. Provide and enforce proper use of refuse containers to ensure that rodents and other pests are not harbored or attracted.

D. Designate specific locations as lunch and coffee break areas to prevent random disposal of garbage and trash. Keep those areas free of litter and garbage, and provide refuse containers as described in 2.01 of this section. Keep refuse containers upright with their lids shut tight.

E. Have all refuse containers emptied daily to maintain site sanitation.

F. Notify the Owner's Representative within 24 hours whenever rodents (rats or mice) or signs of rodent activity (burrows or droppings) are observed in work or laydown areas. Take appropriate action to locate and control the rodents.

END OF SECTION

SECTION 01 71 00
CONSTRUCTION LAYOUT

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The conditions and general requirements of the Contract, Division 0 and applicable parts of Division 1, apply to the work under this Section.

B. The work under this section shall consist of field staking the horizontal and vertical alignment of all essential features and proposed work, including walls, curbs, sidewalks, fencing, drainage, electrical and utility structures, plantings, furnishings, play equipment, and other related features as shown on the plans, by a registered Engineer or Land Surveyor. The Contractor shall familiarize himself with the existing conditions and shall be responsible for locating or re-establishing survey field ties, property lines, and benchmarks indicated on the plans.

PART 2 - MATERIALS

2.01 LAYOUT AND STAKING

A. The Contractor shall be responsible for furnishing all stakes, pins, and grade markings as required to implement the work of layout and staking and shall make all field adjustments ordered by the Landscape Architect or Owner's Representative at no extra cost to the Owner.

B. Upon request by the Landscape Architect or Owner's Representative, the Contractor shall make available to the Owner survey instruments and operator necessary to check the proposed vertical and horizontal alignments at no extra cost.

PART 3 - EXECUTION

3.01 SURVEY LAYOUT

A. The Contractor shall use the alignments shown on the plans to establish the layout of all proposed features and shall perform field adjustments as ordered by the Landscape Architect or Owner's Representative.

B. All layout shall be by the dimensions noted on the Drawings; do not scale directly from the plans. If clarification regarding a dimension or intended layout procedure is required, contact the Landscape Architect.

C. All dimensions marked on the Drawings with "+/-" or "(Verify)" are intended for confirmation of conformance to the expected conditions and (where applicable) that acceptable slopes and clearances are provided. Once layout has been established using other dimensions, the Contractor shall verify these dimensions (to within a tolerance of ½") and report any discrepancy to the Landscape Architect for acceptance or instruction regarding adjustment. These confirmation dimensions should not be used to lay out elements.

D. The Surveyor shall lay out the essential or necessary grades and locations of site furnishings, footings, pavements, utilities, structures and other proposed elements. The surveyor shall verify the location of any existing spikes, stakes, pipes, drill holes, etc. and shall be responsible for their accuracy. Proposed features shall be located in relation to dimensions shown on the drawings and as adjusted by the Landscape Architect.

E. The Contractor shall inform the Landscape Architect and Owner's Representative when the general layout is completed and shall not begin excavation until the Landscape Architect approves the various alignments. Any discrepancies encountered in field conditions shall be reported to the Landscape Architect and Owner's Representative immediately and shall be adjusted as directed.

F. The Contractor shall be responsible for maintaining the correct vertical and horizontal alignment of all elements, which responsibility shall not be waived by the Landscape Architect's approval of basic layout and stakeout.

END OF SECTION

SECTION 01 78 00
CLOSEOUT DOCUMENTATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The work to be performed under this Section shall include the compilation and submittal of all required maintenance manuals, maintenance and repair products, warranty information, detailed procedures, product information, submittal records, as-built drawings, and certifications of all materials and equipment for the Landscape Architect's approval. Additional submissions may also be required as stipulated in the technical specifications sections.

B. Upon Final Completion of all park construction, the contractor shall submit: three complete copies of a park maintenance manual, and three copies of an as-built drawing set, with three compact disc (CD) copies of the as-built drawings.

C. The City will not issue the final check for park retainage until the submittal and approval of the maintenance manual and as-built drawings.

PART 2 - SUBMITTALS

2.01 MAINTENANCE MANUAL

A. The Maintenance shall be in the form of a three ring binder, organized and tabbed into appropriate sections, and shall include the following items:

1. A complete landscape maintenance plan with recommended maintenance schedules and procedures for all park systems including: watering, fertilization, spring start up procedures, fall clean-up,park winterization procedures, and all maintenance recommended or required by the manufacturers of included products;
2. A letter from the contractor stating the period of warranty for all parts, materials, and workmanship, from the date of Final Completion;
3. All product information, product directions, and warranties;
4. List of all plant material, and sizes of plant containers;
5. Copies of City permits with signatures of inspectors;
6. Contact information for all subcontractors including email addresses; and
7. A record of all submittals and dates of approvals.
8. References are made throughout the Specifications and Drawings where additional record submittals are required.

2.02 PARK MAINTENANCE KIT

A. At the completion of construction, the Contractor shall provide to the City Department of Public Works, Parks Maintenance Division, a Maintenance Kit containing all touch-up paint, maintenance instructions, spare parts, and other maintenance materials provided by the manufacturers of all improvements.

B. The Maintenance Kit shall be delivered in a single container clearly labeled with the Park Name, and each item shall be identified as to the source.

2.03 AS-BUILT DRAWINGS

A. As-Built drawing shall be a complete and accurate record that incorporate any and all changes to the construction plan set issued at the time of contract initiation. As-built drawings shall be clearly marked and annotated and shall include but not be limited to: all field changes, change orders, and supplemental drawings provided by the Landscape Architect.

B. As-Built Drawings shall include complete records of all water, drainage, and electric utilities installed, including sizing, location, and inverts of all drainage pipes and structures, and sizing and location of all water service lines and electrical conduits.

C. The Compact Discs shall include an electronic copy of all as-built drawings.

PART 3 - EXECUTION

3.01 SUBMISSIONS

A. Submit all documents and data in a collated, manual format, with three (3) manuals to be submitted. Include a Table of Contents of the material for reference. The submittal is to be entire and complete, addressing all requirements listed above.

SECTION 024100
DEMOLITION AND SITE PREPARATION

PART – 1 GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 DESCRIPTION OF WORK

A. The work of this section includes all necessary site preparation, utility work, demolition and the removal of waste resulting from demolition, including, but not limited to the areas listed in this section.

B. The following list of items is to be used as a guide and shall not be considered limiting the scope of the work.

1. Layout, Lines and Levels
2. Protection of Property
3. Removal and Stockpile of Site Elements to be reused
4. Removal of Trees and stumps
5. Removal of shrubs and other vegetation
6. Clearing and grubbing
7. Disconnecting, capping or sealing of utilities as required
8. Protection from injury or defacement of objects indicated by the Owner's Representative to be preserved.
9. Other features as indicated on the drawings.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Section 310000 – Earthwork

1.04 REFERENCES

A. NFPA 241 Safeguarding Building Construction and Demolition Operations.

1.05 SUBMITTALS

A. Submit copies of requests for and certificates of severance of utility services to the Owner's Representative prior to start of site preparation work.

B. Submit copies of demolition and disposal permits to the Owner's Representative prior to start of work of this Section.

C. Photograph existing conditions of trees and plantings adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

D. Submit record drawings identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.06 LAYOUT, LINES AND LEVELS

A. Before demolition is started, the contractor shall completely stake out for the work of this

section for the Owner's Representative's approval of layout and for the Owner's Representative's approval of elements to be relocated. This laying out shall be performed by a licensed engineer or surveyor. Grade stakes shall be set where spot elevations are shown as required to grade properly, establish and maintain benchmarks. Where proposed site work elevations are to closely represent existing conditions, the Contractor shall shoot spot grades for reference and establish elevational bench marks for use in constructing the finished work.

B. Before installation of site improvements is started, locations shall be staked out for the Owner's Representative's approval.

C. The layout shall be subject to possible modifications whether by inaccuracies in existing grades, by elements designated to remain or by other site conditions. Except in the case of substantial increase in the quantity of materials authorized in writing by the Owner's Representative, these modifications shall not entitle the Contractor to additional compensation.

D. When the Contractor submits his proposal, it will be interpreted to mean that he has examined the site, fully understands the existing and proposed conditions and has made due allowance for them in his proposal.

1.07 REQUIREMENTS OF REGULATORY AGENCIES

A. All work shall conform to the drawings and specifications and shall comply with applicable codes and regulations.

B. All work shall comply with all rules, regulations, laws and ordinances of the State of Massachusetts, the City of Somerville, and of all other authorities having jurisdiction. All labor, materials, equipment and services necessary to make the work comply with such requirements shall be provided without additional cost to the Owner.

C. The Contractor shall, at his own expense, secure and pay for all permits, inspections, fees and give all legal notices that may be required in connection with his work, including the notification of local utility companies regarding location of subsurface water, gas, electric and other utility lines.

1.08 PROTECTION OF PROPERTY

A. The work of this Contract shall be executed in such a manner that no damage or injury will occur to the public, to all properties and structures off or on the site which may be in any way affected by the operations under the Contract. Any damage to on-site structures, streets, paving, gas, water, electric, or any other pipes, mains, conduits overhead or underground utility wire, fences, and any and all other property should be corrected at no cost to the Owner. Should any damage or injury be caused by the Contractor or anyone in his employ, or by work under this Contract, the Contractor shall, at his own expense, make good such damage and assume all responsibility for such damage and assume all responsibility for such injury without cost to the Owner.

B. All areas of the site used for construction staging by the Contractor shall be fully restored (re-sodded, re-seeded, re-paved, etc.) to the satisfaction of the Owner prior to completion of the contract work.

1.09 PROTECTION OF SITE ELEMENTS

A. No material shall be stockpiled, no equipment shall be parked or repaired and no oil, grease, gasoline, concrete or other debris dumped within 15 feet of plant materials or existing structures to remain.

B. Active utilities existing on the site shall be carefully protected from damage. When an active utility line is exposed during construction, its location and elevation shall be plotted on the record drawings and the Owner's Representative shall be notified in writing.

C. Inactive or abandoned utilities encountered during construction operations shall be removed, plugged or capped as directed by the Owner's Representative and as indicated on the drawings. The location of such utilities shall be noted on the record drawings and reported in writing to the Owner's Representative.

1.10 DEWATERING

A. Keep excavation continuously free of water from all sources without extra cost to the Owner. Provide, maintain and operate pumps and related equipment, including standby equipment of sufficient capacity to keep excavations free of all water at all times and under any and all contingencies that may arise until the completion of the Contract.

B. Dispose of water through temporary pipelines or ditches with discharge to suitable outfall points. Prevent erosion of surrounding areas. Protect roads and other improvements on the site. Build temporary culverts if required. At completion of dewatering, remove temporary facilities and restore subgrade, and damaged areas.

C. Dewatering and obtaining a NPDES dewatering permit is the sole responsibility of the contractor.

PART 2 – PRODUCTS – NOT APPLICABLE

PART 3 – EXECUTION

3.01 DEMOLITION

A. Prior to commencing demolition, contractor shall hold a site meeting with Owner's Representative to confirm site elements to be protected and stockpiled for re-use. Such elements include, but may not be limited to:

1. Park Name Flag Sign
2. Park Rules Sign
3. Big Belly Trash and Recycling Compactor Unit
4. See-saw

B. Demolish and remove all site elements, structures, foundations, and paving as indicated on the drawings or as directed by the Owner's Representative.

C. All precautions shall be taken to protect the public from flying or falling debris. Prevent dust and dirt from rising by thoroughly wetting masonry, concrete, and other debris.

D. Plant material to remain as indicated on the drawings shall be protected at the drip line as specified in Section 015639 – Tree Protection and Health Maintenance.

E. Upon completion, all debris created shall be removed from site. Burning of materials on the job site will not be permitted. All staging, scaffolding, protective devices and other equipment not required by other trades shall be removed. All surfaces will be swept clean and site will be left free of any and all debris.

F. Work under this Section is to be carried on under the direction of the Owner's

Representative.

3.02 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify the Owner not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without the Owner's written permission.

3.03 CLEARING AND GRUBBING

A. Remove, trees and tree stumps, shrubs, grass, and other vegetation as indicated on contract documents.

1. Tree removal on the slope adjacent to MBTA property shall require a crane and shall be done in a manner that ensures that all debris remains on City property.

2. Logs from removed black locust (Robinia pseudoacacia) trees shall be salvaged for reuse as Wood Seating Logs (See L1.1 Materials Plan). Confirm logs to be reused with Landscape Architect.

B. Do not remove trees, shrubs, and other vegetation indicated to remain.

C. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction. See Section 015639 – Tree Protection and Health Maintenance for further detail.

D. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18" below exposed subgrade, except where plans indicate that stumps shall be left in place – See sheet L1.0 – Demolition and Site Prep Plan.

E. Use only hand methods for grubbing within tree protection zone.

F. Chip removed tree branches and dispose of off-site.

G. Fill depressions caused by clearing, grubbing and stump grinding operations with satisfactory soil material unless further excavation or earthwork is indicated.

H. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.04 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off the Owner's property.

1. Burning on site is prohibited.

2. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

B. Contractor shall stockpile any items to be re-used on site and provide protection from theft, damage or vandalism.

END OF SECTION 024100

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SECTION 033053
CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Coordinate the work of this section with Bidding and Contract Requirements; Conditions of the Contract; Division 1 – General Requirements, Technical Specifications, Division 2 and the Contract Drawings.

B. All references to products or manufacturer trade name or performance Specifications bearing the connotation “or Approved Equal” shall be as determined by the Landscape Architect and the City, per MGL c 30 x 39M, part b, criteria 1.

1.02 DESCRIPTION OF WORK

A. Provide all labor, equipment, implements, and materials required to furnish, install, and construct all reinforced concrete footings, concrete walls, concrete foundations, concrete curbing work as shown on the Drawings and as specified herein.

B. Work under this section shall include, but is not limited to:

1. Concrete footings and foundations for furnishings, play equipment, etc
2. Concrete flush curbing
3. Concrete walls
4. Concrete reinforcement and accessories

C. Related Work:

1. Section 116813 Playground Equipment
2. Section 323113 Chain Link Fences and Gates
3. Section 051200 Structural Steel
4. Section 310000 Earthwork
5. Section 337000 Electrical Utilities
6. Section 055000 Metal Fabrications
7. Section 061000 Rough Carpentry
8. Section 062000 Finish Carpentry
9. Section 323000 Site Improvements

1.03 REFERENCES

A. General:
1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3.Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

A. American Concrete Institute (ACI):

1. ACI 211.1 Proportions for Normal, Heavyweight and Mass Concrete
2. ACI 303.1 Specification for Cast-in-Place Architectural Concrete
3. ACI 305 Recommended Practices for Hot Weather Concreting
4. ACI 306 Recommended Practices for Cold Weather Concreting
5. ACI 308 Curing Concrete
6. ACI 309 Consolidation of Concrete
7. ACI 318 Building Code Requirements for Reinforced Concrete

B. ASTM International:

1. ASTM C31 Making and Curing Concrete Test Specimens in the Field
2. ASTM C33 Concrete Aggregates
3. ASTM C94 Ready Mix Concrete
4. ASTM C143 Test Method for Slump of Portland Cement Concrete
5. ASTM C150 Portland Cement
6. ASTM C156 Test Method for Water Retention by Concrete Curing Materials
7. ASTM C171 Sheet Materials for Curing Concrete
8. ASTM C172 Sampling of Freshly Mixed Concrete
9. ASTM C260 Air Entraining Admixtures for Concrete
10. ASTM C309 Liquid Membrane - Forming Compounds for Curing Concrete
11. ASTM C330 Lightweight Aggregates for Structural Concrete
12. ASTM C494 Chemical Admixtures for Concrete
13. ASTM E1745 Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs

1.04 QUALITY ASSURANCE

A. Utilize the same source, stock or brand of concrete materials for each class or mix of concrete. If necessary, obtain and stockpile materials in sufficient quantity to ensure continuity and uniformity.

B. Cast-in-Place concrete work shall conform to ACI 301 and ACI 318.

C. Dimensions, locations and details of furniture footings and pads and similar features indicated on Drawings are approximate. Owner's Rep shall approve final locations in the field.

1.05 CONCRETE MIX DESIGN

A. All concrete shall have a 28 compressive strength of 4500 psi with a maximum water-cementitious materials ratio of 0.45. Footings and piers shall have 5.5% air entrainment and maximum aggregate size of 1 ½". All other concrete shall have 6% air entrainment, and maximum aggregate size of 3/4".

1.06 TESTING AND INSPECTION SERVICES

A. The Contractor shall retain an independent testing laboratory to perform all sampling and testing in connection with all materials entering into the concrete work, including cement, aggregates, admixtures and water.

B. The Contractor shall furnish, without charge, representative material to be used in the concrete mix to the testing laboratory. Materials shall be of sufficient quantity to test the Contractor's proposed design mixes and provide cured samples of the concrete. Materials shall be delivered in sufficient time to perform the test and prepare the samples, allowing ten days for architects review, and prior to the first concrete placement.

1.07 SUBMITTALS

A. The Contractor shall submit the following to the Landscape Architect for Approval.

1. Certified concrete mix data and tests.
    a. Include compression test data used to establish mix proportions
2. Preformed joint filler: Two pieces, full depth and width, 4" in length
3. Prior to start of concrete work, contractor shall submit to Owner's Representative for review a schedule for execution of Work of this Section.
4. Shop drawings indicating fabrication and size, location and spacing of reinforcing bar.

1.08 PERFORMANCE CRITERIA

A. Perform cast-in-placed concrete work in accordance with ACI 301 unless otherwise specified.

B. Concrete slump shall be no less than 2 in. nor greater than 4 in., determined in accordance with ASTM C 143.

PART 2 - MATERIALS

2.01 CONCRETE MATERIALS

A. Cement: shall be Type 1 of II Portland Cement conforming to ASTM C150.

B. Cement Replacement Materials: Granulated Slag conforming to ASTM C989 may be used as a cement replacement up to 20 percent. Fly ash or Silica Fume is not permitted.

C. Aggregates: Shall conform to ASTM C33

D. Water: Shall conform to ASTM C94

E. Admixtures:

1. Air Entraining Admixture: Shall conform to ASTIM -260
2. High or Medium Water Reducing Admixture: Shall conform to ASTM -494Tpe F,D or E.

2.02 FORM MATERIAL

A. Form materials for non-exposed work shall be plywood, lumber or metal with lumber dressed on at least two edges and one side.
B. Cylindrical forms shall be Sonotube fiber strippable fiber forms or approved equal and shall be selected and assembled to meet ACI 301
C. Form materials for exposed work shall be plywood, metal, metal-framed plywood faced, or other acceptable materials. Plywood shall be APA Ref 1. B-B (Concrete Form), Class 1 Exterior Grade plywood or B-B or A-C Class 1 high density overlay concrete form plywood. Formwork materials shall produce smooth, continuous, straight and level surfaces.
D. Form ties: Provide prefabricated, adjustable length galvanized steel snap-off ties, with brackets, cones, come docks and other accessories.
E. Form Coatings: Commercial formulation compounds that will not bond with, stain, or adversely affect concrete.

F. Forms shall be true to line and free from warp, and shall be sufficient strength, when staked to resist the pressure of the concrete without springing. Formwork shall be designed so that sections may be fastened together to prevent vertical or horizontal movement of ends.

2.03 CONCRETE REINFORCING

A. Steel reinforcing bars shall conform to ASTM A 615.

1. Bars employed as reinforcement shall be deformed type, epoxy-coated where noted.

2. Bars employed as dowels where indicated on the Drawings shall be hot-rolled plain rounds.

3. Unless otherwise indicated on the Drawings, reinforcing bars shall be Grade 60.

B. Wire reinforcement shall conform to ASTM A497 or A184, flat sheets only.

C. Provide #6 chair bars, high chairs, ties, clips, slab bolsters, standees, and other accessories where not specified on the drawings in accordance with Manual of Standard Practice or Detailing Reinforcing Concrete Structures ACI 315 or CRSI-WRSI Manual of Standard Practice. Use plastic tips on all chairs places on the sides of concrete formwork.

E. Do not tack- or spot-weld crossing bars.

2.04 GROUT

A. Nonshrink grout shall be pre-mixed non-shrinking, high strength grout. Compressive strength in 28 days shall be 5,000 psi minimum, but in no case less than the specified strength of the adjacent concrete. Manufacturer shall provide evidence that the material meets the requirements of the COE CRD-C 621 (558). Grout permanently exposed to view shall be nonoxidizing.

PART 3 - EXECUTION

3.01 FORMWORK

A. Formwork shall comply with ACI 303.1 limits on form-facing panel deflection, and surface irregularities. For areas above grade and exposed to view on seat walls tolerances are 1/8 inch.

B. Fabricate forms for easy removal so that no prying against concrete surfaces are required for their removal.

C. Clean forms and surfaces to receive concrete. Remove chips, sawdust, dirt and any other debris just prior to placing concrete.

D. Where forms are being re-used, all facing surfaces of formwork to be cleaned, repaired, and new form-release agent applied. All laitance and fins must be removed. Do not used patched forms for seat walls.

E. Form-Facing Panels for Exposed to View Finishes: exterior-grade plywood panels, nonabsorptive, that will provide continuous, true, and smooth architectural concrete surfaces.

F. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

3.02 REINFORCING

A. Before being placed in position, thoroughly clean reinforcing of loose mill and rust scale, dirt, ice, and other foreign material which may reduce bond between concrete and reinforcing. Where there is delay in placing concrete after reinforcement is in place, bars shall be re-inspected and cleaned.

B. Bars showing cracks after bending shall be discarded.

C. Unless otherwise indicated on Drawings, extend reinforcing within 2 in. of formwork and expansion joints. Reinforcing shall continue through control joints. Adjacent sheets of fabric reinforcing shall lap 6 in.

D. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel and anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to Owner's Representative.

E. Splicing of Reinforcement: As shown on drawings but not less than 50 bar diameters for slabs and beam bottom bars, and not less than 65 bar diameters for walls and beam top steel. Provide a lap of 8 in or two wire spaces, whichever is larger, for WWR. Tie wires together at lap.

F. Minimum Reinforcement: Unless otherwise noted, reinforce all walls with at least #4 @ 12 in. each way each face and 2 - #6 each edge. In slabs, provide at least 0.0018 times the area of concrete in each direction.

G. Provide Minimum Clear Cover as follows:

Concrete placed against earth:	3 in.
Formed concrete exposed to earth, water or weather:	2 in.
Interior faces of walls:	1 in.
Columns or piers (main reinforcement):	2 in.

3.03 CONCRETE PLACEMENT

A. Mixing and placing of concrete shall be in accordance ACI 304R-89. Mixing on site shall be subject to the Landscape Architect approval upon a written submittal by the Contractor describing the method of mixing and placing.

B. All concrete shall have Air Entraining Admixture and Medium or High Range Water Reducing Admixture (M/HRWR). Mix, prior to the addition of M/HRWR, shall be designed for minimum water content (optimum slump of 2 inches of W/C of 0.40). Fluidity shall be attained by the addition of a Medium Range Water Reducing Admixture to a slump of 7" +/- 1".

C. Form voids to be filled with concrete shall be cleaned of all debris and water before depositing concrete.

D. Deposit concrete as nearly as practical in its final position but not farther than 6 feet horizontally from the final position. All deposits of concrete shall have a subsequent deposit place on top and /or adjacent to the fresh face and consolidated within 15 minutes. Deposit layers shall not exceed 24 inches in height.

E. Consolidation:

1. All concrete shall be consolidated by internal vibration. Vibrators shall be placed through the concrete vertically at consistent spacing that will thoroughly blend the deposits, remove entrapped air, and consolidate the concrete. Vibrator head shall be inserted rapidly and withdrawn slowly to remove maximum amount of entrapped air.
2. Caution must be exercised in using vibrators to prevent injury to the form surface material or displacement of embedded items

3.04 REPAIR OF DEFECTIVE AREAS (ACI 201 9)

A. Modify or replace concrete not conforming to required lines, details and elevations. Match repairs to color, texture, and uniformity of surrounding surfaces.

3.05 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures according to ACI 301.

B. Begin curing immediately after applying as-cast formed finishes to concrete. Cure by one or a combination of the following methods that will not mottle, discolor, or stain concrete:

1. Moisture Curing: Keep exposed surfaces of cast-in-place architectural concrete continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period; use cover material and waterproof tape.

3.06 FINISHING VERTICAL CONCRETE

A. Exposed vertical surfaces shall be formed to produce a "smooth form finish", as defined in ACI 301. Concrete which is exposed to view on exterior of finished structures shall receive smooth rubbed finish, in accordance with ACI 301 and as follows:

1. To permit satisfactory finishing, forms shall be removed from vertical faces of concrete as early as is possible without damaging surface. Immediately after stripping forms, fins or projections left by forms shall be chipped off, and surfaces rubbed smooth.

2. Voids and faults shall be patched. Surface of the patch shall be flush with the surrounding surface after finishing operations are complete. Surface shall be kept continuously damp until patches are firm enough to be rubbed without damage.

3. Rubbing shall be performed while the surface is wet using carborundum or cement sand brick, to achieve a smooth, uniform, even textured finish. Blend patched and chipped areas to match appearance of rest of surface.

B. Rubbed Finish: After removal of forms, patching and repairing, and while concrete is still green, spread slurry consisting of 1 part portland cement concrete and 1-1/2 part damp, loose sand by volume, over pre-dampened surface. Apply using burlap pads or sponge rubber floats. Remove surplus materials, and then rub with clean burlap.

C. As-Formed Finish: Remove fins by stoning, otherwise leave texture imparted by forms.

D. Vertical surfaces of concrete which will be concealed in finished structure shall be formed to produce a “rough form finish”, as defined in ACI 301.

3.07 FINISHING HORIZONTAL CONCRETE

A. Screed off and wood-float concrete slabs and pads to smooth surface, true to line and grade, and free of hollows and bumps. Surface shall be dense, smooth, and at exact level and slope required.

B. Horizontal surfaces of concrete which will be exposed shall be given a light broomed finish, with direction of grooves in concrete surface perpendicular to length of concrete slab or pad. After concrete has set sufficiently to prevent coarse aggregate from being tom from surface, but before it has completely set, brooms shall be drawn across it to produce a pattem of small parallel grooves. Broomed surface shall be uniform, with no smooth, unduly rough or porous spots, or other irregularities. Coarse aggregate shall not be dislodged by brooming operation.

C. Where finishing is performed before end of curing period, concrete shall not be permitted to dry out, and kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

3.08 ENVIRONMENTAL CONDITIONS

A. Winter concreting shall be in accordance with ACI 306R-BB

B. Hot weather concrete shall be performed in accordance with ACI 305R-89 when concrete temperature is above 90 degrees Fahrenheit and drying conditions are high

3.09 PROTECTION

A. Pay special attention to surfaces near work or other trades. This protection shall assure protection from paint, oils, rust, stains, and impact of any other kind. Precautions shall be taken to prevent freezing, of curing water and injury to the surface during the period of protection and curing. Any such damaged surfaces shall be repaired or replaced to satisfaction of the Landscape Architect. All exposed concrete surfaces shall be free of damage at time of acceptance.

B. Contractor shall be responsible for security to guard against graffiti or damage to concrete work.

3.10 FIELD QUALITY CONTROL

A. During the progress of work and as directed by the Landscape Architect, the testing laboratory will make periodic tests as follows:

1. At least three specimens shall be taken for the compression strength test.
2. Specimens shall be made and tested in accordance with the requirements of applicable ASTM Designations C-172, C-31 and C-39.
3. The slump of each batch of concrete from which specimens are made shall be measured in accordance with the provisions of ASTM method C143.
4. Once specimen of each set shall be tested at seven days and the others at 28 days. Copies of the test reports shall be promptly submitted to the Landscape Architecture/Engineer.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 325	(2011) Steel Construction Manual
AISC 326	(2009) Detailing for Steel Construction
AISC 360	(2010) Specification for Structural Steel Buildings
AISC DESIGN GUIDE 10	(1997) Erection Bracing of Low-Rise Structural Steel Buildings

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel
AWS D1.8/D1.8M	(2009) Structural Welding Code—Seismic Supplement

ASME INTERNATIONAL (ASME)

ASME B46.1	(2009) Surface Texture, Surface Roughness, Waviness and Lay

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A143/A143M	(2007; R 2014) Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
ASTM A307	(2014) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel

ASTM A490	(2014a) Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
ASTM A500/A500M	(2013) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A563	(2015) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A563M	(2007; R 2013) Standard Specification for Carbon and Alloy Steel Nuts (Metric)
ASTM A6/A6M	(2016) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A992/A992M	(2011) Standard Specification for Structural Steel Shapes
ASTM C1107/C1107M	(2014a) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C827/C827M	(2016) Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
ASTM F1554	(2015; E 2016) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F2329	(2013) Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
ASTM F436	(2011) Hardened Steel Washers
ASTM F844	(2007a; R 2013) Washers, Steel, Plain (Flat), Unhardened for General Use

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1	(2000; E 2004) Shop, Field, and Maintenance Painting of Steel
SSPC Paint 20	(2002; E 2004) Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)
SSPC Paint 29	(2002; E 2004) Zinc Dust Sacrificial Primer, Performance-Based

SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

SD-03 Product Data

Shop Primer

Welding Electrodes and Rods

Non-Shrink Grout

SD-06 Test Reports

Class B Coating

Bolts, Nuts, and Washers

Weld Inspection Reports

Bolt Testing Reports

SD-07 Certificates

Steel

Bolts, Nuts, and Washers

Galvanizing

AISC Fabrication Plant Quality Certification

AISC Erector Quality Certification

Welding Procedures and Qualifications

Welding Electrodes and Rods

1.3 AISC QUALITY CERTIFICATION

Work must be fabricated in an AISC Certified Fabrication Plant, Category Std . Submit AISC fabrication plant quality certification.

Work must be erected by an AISC Certified Erector, Category ASCE. Submit AISC erector quality certification.

1.4 QUALITY ASSURANCE

1.4.1 Fabrication Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 326 and AISC 325. Fabrication drawings must not be reproductions of contract drawings. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 standard welding symbols. Any deviations from the details shown on the contract drawings must be clearly highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.4.2 Certifications

1.4.2.1 Welding Procedures and Qualifications

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests.

Conform to all requirements specified in AWS D1.1/D1.1Mand AWS D1.8/D1.8M.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide the structural steel system, including shop primer galvanizing, complete and ready for use. Structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing must be provided in accordance with AISC 360, AISC 341 except as modified in this contract.

2.2 STEEL

2.2.1 Structural Steel

Wide flange and WT shapes, ASTM A992/A992M. Angles, Channels and Plates, ASTM A36/A36M.

2.2.2 Structural Steel Tubing

ASTM A500/A500M, Grade C .

2.2.3 Steel Pipe

ASTM A53/A53M, Type E or S, Grade B, weight class .

2.3 BOLTS, NUTS, AND WASHERS

Submit the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

2.3.1 Common Grade Bolts

2.3.1.1 Bolts

ASTM A307, Grade A. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications.

2.3.1.2 Nuts

ASTM A563M, Grade A, heavy hex style.

2.3.1.3 Washers

ASTM F844.

2.3.2 High-Strength Bolts

2.3.2.1 Bolts

ASTM A325, Type 1 ASTM A490, Type 1 or 2.

2.3.2.2 Nuts

ASTM A563, Grade and Style as specified in the applicable ASTM bolt standard.

2.3.2.3 Direct Tension Indicator Washers

ASTM F959.

2.3.2.4 Washers

ASTM F436, plain carbon steel.

2.3.3 Foundation Anchorage

2.3.3.1 Anchor Rods

ASTM F1554 Gr 36 55 , Class 1A 2A.

2.3.3.2 Anchor Nuts

ASTM A563, Grade A, hex style.

2.3.3.3 Anchor Washers

ASTM F844.

2.3.3.4 Anchor Plate Washers

ASTM A36/A36M

2.4 STRUCTURAL STEEL ACCESSORIES

2.4.1 Welding Electrodes and Rods

AWS D1.1/D1.1M and AWS D1.8/D1.8M.

2.4.2 Non-Shrink Grout

ASTM C1107/C1107M, with no ASTM C827/C827M shrinkage. Grout must be nonmetallic.

2.5 GALVANIZING

ASTM F2329 for threaded parts or ASTM A123/A123M for structural steel members, as applicable, unless specified otherwise galvanize after fabrication where practicable.

2.6 FABRICATION

Fabrication must be in accordance with the applicable provisions of AISC 325. Fabrication and assembly must be done in the shop to the greatest extent possible. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member.

Compression joints depending on contact bearing must have a surface roughness not in excess of 500 micro inch as determined by ASME B46.1, and ends must be square within the tolerances for milled ends specified in ASTM A6/A6M.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Engineer of Record.

2.6.1 Markings

Prior to erection, members must be identified by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections must be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations.

2.6.2 Shop Primer

SSPC Paint 20 or SSPC Paint 29, (zinc rich primer). Shop prime structural steel, except as modified herein, in accordance with SSPC PA 1. Do not prime steel surfaces embedded in concrete, galvanized surfaces, surfaces to receive sprayed-on fireproofing, surfaces to receive epoxy coatings, surfaces designed as part of a composite steel concrete section, or surfaces within 0.5 inch of the toe of the welds prior to welding (except surfaces on which metal decking is to be welded). If flash rusting occurs, re-clean the surface prior to application of primer. Apply primer to a minimum dry film thickness of 2.0 mil.

Slip critical surfaces must be primed with a Class B coating in accordance with AISC 325. Submit test report for Class B coating.

Prior to assembly, prime surfaces which will be concealed or inaccessible after assembly. Do not apply primer in foggy or rainy weather; when the ambient temperature is below 45 degrees F or over 95 degrees F; or when the primer may be exposed to temperatures below 40 degrees F within 48 hours after application, unless approved otherwise by the Engineer of Record. Repair damaged primed surfaces with an additional coat of primer.

2.6.2.1 Cleaning

SSPC SP 6/NACE No.3, except steel exposed in spaces above ceilings, attic spaces, furred spaces, and chases that will be hidden to view in finished construction may be cleaned to SSPC SP 3 when recommended by the shop primer manufacturer. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

2.7 DRAINAGE HOLES

Adequate drainage holes must be drilled to eliminate water traps. Hole diameter must be 1/2 inch and location must be indicated on the detail drawings. Hole size and location must not affect the structural integrity.

PART 3 EXECUTION

3.1 ERECTION

a. Erection of structural steel, except as indicated in item b. below, must be in accordance with the applicable provisions of AISC 325.

b. For low-rise structural steel buildings (60 feet tall or less and a maximum of 2 stories), the structure must be erected in accordance with AISC DESIGN GUIDE 10.

After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.1.1 STORAGE

Material must be stored out of contact with the ground in such manner and location as will minimize deterioration.

3.2 CONNECTIONS

Except as modified in this section, connections not detailed must be designed in accordance with AISC 360. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Holes must not be cut or enlarged by burning. Bolts, nuts, and washers must be clean of dirt and rust, and lubricated immediately prior to installation.

3.2.1 Common Grade Bolts

ASTM A307 bolts must be tightened to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Engineer of Record for further instructions.

3.2.2 High-Strength Bolts

Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, bolts must then be fully tensioned, progressing from the most rigid part of a connection to the free edges.

3.3 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Engineer of Record.

3.4 WELDING

Welding must be in accordance with AWS D1.1/D1.1M and AWS D1.8/D1.8M. Grind exposed welds smooth as indicated. Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.

Develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using prequalified procedures. Prequalified procedures may be submitted for information only; however, procedures that are not prequalified must be submitted for approval.

3.5 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.6 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing. The Engineer of Record must be notified in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of the inspection.

3.6.1 Welds

3.6.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections.

-- End of Section --

SECTION 055000
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. This work shall consist of fabricating and/or installing the following:

1. Steel Bar Grate
2. Steel Tree Grate and Frame
3. Misc. Steel Tube, Plate and Hardware
4. Neoprene Bridging Pad

1.02 REFERENCES

A. American Architectural Manufacturers Association (AAMA)

1. 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Architectural Extrusions and Panels.
3. 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Architectural Extrusions and Panels.
4. 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels.

B. American Welding Society (AWS)

1. D1.1 - Structural Welding Code - Steel.
2. D1.2 - Structural Welding Code - Aluminum.
3. D1.6 - Structural Welding Code - Stainless Steel.

C. ASTM International (ASTM)

1. A36/A36M - Standard Specification for Carbon Structural Steel.
2. A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
3. A48/A48M - Standard Specification for Gray Iron Castings.
4. A108 - Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
5. A123/A123M - Standard Specification for Zinc (Hot-Galvanized) Coatings on Iron and Steel Products.
6. A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars.
7. A307 - Standard Specification for Carbon Steel Externally Threaded Standard Fasteners.
8. A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
9. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
10. A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
11. A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
12. A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
13. A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon,

Structural, High-Strength, Low-Alloy and High-Strength Low-Alloy with Improved Formability.

14. E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

D. Society for Protective Coatings (SSPC) Painting Manual.

1.03 SUBMITTALS AND SAMPLES

A. Submittals for Review:

1. Shop Drawings: Drawings shall show size and thickness of each member, type of material, method of connection and assembly, fabrication and erection tolerances for all connections, cuts, holes, bolts, welds, galvanizing and finishing, relation to finished grade, and layout of steel members, relationship to surrounding work by other trades, shop paint and protective coating, and other pertinent details of fabrication and installation. Shop drawings shall be based on actual field measurements. Submit shop drawings, certifications, product data, etc. as described herein to the Owner's Representative for approval prior to fabrication and installation. Submit shop drawings for the following components:

a. Steel grate deck showing all elements of the deck and chain link fence enclosure including interface of deck enclosure to existing metal fence on the existing retaining wall.

B. The fabricator shall submit a letter detailing the company's history with relevant projects, equipment and facilities, and related work experience of the staff to be assigned to the project.

C. The contractor shall submit one 12" x 12" sample of the close mesh steel grate, with final finish for review and approval by the Owner's Representative prior to beginning work on the rest of the work.

D. Warranty: Provide warranty that all materials furnished and work executed under this Section comply with Specifications and authorized changes.

E. Mock Up: If approved these mock-ups will become part of the finished work. Provide mock-ups of the following areas complete and in place:

1. Steel grating deck assembly: provide one 4' x 4' corner section of deck assembly including chain link fence enclosure structure. The mock shall include (1) typical chain link fence line post and one (1) typical chain link fence corner post each attaching to typical line post sleeve with through-bolts as shown in detail 4, 5 L7.3. Mock-up to include weld of sleeves to structural member, steel toe plate, and steel grate.

1.04 QUALITY ASSURANCE

A. The contractor shall be regularly engaged in the fabrication and installation of steel components and shall have completed successfully at least ten comparable projects within the last ten years. The Contractor shall assign mechanics from these earlier applications to this project, of which one will serve as lead mechanic.

B. Perform all work in accordance with all applicable safety codes, including ASTM and AWS standards, and accessibility codes, including ADA and MAAB (Massachusetts Architectural Access Board).

C. Contractor's facilities in which the fabrication and finish work shall be done shall meet all state and federal environmental standards.

D. There shall be a twenty year warranty on galvanizing.

E. Welding shall be in accordance with the Structural Welding Code of the American Welding Society, AWS D 1.1.

F. Where structural joints are made by welding, the details of all joints, the techniques of welding employed, the appearance and quality of welds made, and the methods used to correct defective work shall conform to requirements of the AISC and AWS codes.

G. Welds shall be made only by welders who have previously been qualified by tests as prescribed in AWS "Standard Qualification Procedure" for the type of work required.

H. Workmanship and finish shall be equal to the best practice of modern shops for each item of work. Metal fabrication shall be accomplished using the highest standards of workmanship. All work shall be executed by experienced metal workers, shall conform to the requirements of the Contract Documents, and meet the following requirements:

1. Individual metal pieces shall be saw cut and carefully fitted together.
2. Sections shall be well formed to shape and size with sharp lines and angles.
3. Exposed surfaces shall have a smooth finish and sharp, well defined lines and arises.
4. Grind all edges of bars and plates completely free from nicks and machine marks, prior to galvanizing or shop priming.
5. All surfaces and connections of metal items shall be without visible grinding marks, surface differentiation or variation.
6. All fabricated metal items shall be fine sanded throughout to produce a high standard of surface smoothness.
7. Castings shall have sharp corners and edges and shall be clean, smooth and true to pattern.
8. Welding shall be continuous and shall extend for the entire length of the joints except where specifically indicated on the Contract Documents. All exposed welds shall be ground smooth.
9. Weld with uncoated wire to prevent flux deposits. If coated wire is used, all flux residue shall be thoroughly removed and bare white metal exposed, prior to galvanization, if applicable. Where overlapping surfaces are welded, seal off contact area by welding all edges around contact area.
10. All welds shall be water tight.
11. All shop connections shall be full seam welded and ground flush and smooth.

I. Where the work of this Section must be attached to other materials or where it must be assembled and installed in the field, Contractor shall cut, drill, punch and ream, countersink and tap, or otherwise provide the required holes in the shop, unless such connections are to be welded. The sizes and locations of all such holes shall be shown on the Shop drawings.

J. All materials and workmanship under this Section shall be subject to inspection in the mill, shop or field by the Owner’s representative, or by qualified inspectors. Inspection shall be without expense to the Contractor. However, such inspection, wherever conducted, shall not relieve Contractor of his responsibility to furnish materials and workmanship in accordance with Contract requirements.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver and store work under this Section in a manner to prevent wracking or stress of components, and to prevent mechanical damage or damage by the elements. All stored materials and items shall be protected from weather, careless handling and vandalism.

B. Items which become rusted or damaged because of non-compliance with these conditions will be

rejected and shall be replaced without additional cost to the Owner.

C. Deliver work to the site in sufficient time to avoid delay in job progress and at such times as to permit proper coordination of the various parts. The Contractor shall be responsible for scheduling the delivery of all items so as to minimize on-site storage time prior to installation.

D. Deliver bolts and other small items required for erection of work under this Section bundled with their respective items.

1.06 GUARANTEE

A. The Contractor shall furnish and deliver standard written manufacturer's guarantee covering all materials and workmanship under this Section, in addition to other liabilities which the Contractor may have by law or other provisions of the Contract Documents.

B. Supplier shall pay for repairs of any damage to any part of the project caused by defects in his work and for any repair to the materials or equipment caused by replacement. All repairs are to be done to the satisfaction of the Owner's Representative.

PART 2 - PRODUCTS

2.01 MATERIALS – STEEL

A. Galvanized Steel: Materials shall be as indicated on the drawings. All stock, bar, pipe and tube shall be ASTM A35, hot dip galvanized ASTM A123.

B. Welded Connections: Fabricate steel components with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

2.02 STEEL GRATE

A. Steel grate to be press-locked plain steel bar grating with smooth surface

B. Dimensions of Steel Grating to be the following: Bearing Bar Height 1", Bearing Bar Thickness 3/16", Bearing Bar Spacing 7/16", Cross Bar Spacing 4"

C. Welded Connections: Fabricate steel grate with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

D. Close exposed ends of grate with prefabricated end plates.

E. Clips, Hardware, Fittings, and Anchors: Provide clips, hardware, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

F. Steel Grate to be manufactured by McNichols Inc. or approved equal.

2.03 TREE GRATE AND FRAME

A. Fabricator:

Tree Grate and Frame shall be as fabricated by Urban Accessories, 465 E. Fifteenth St. Tacoma, WA, (877) 487-0488 or approved equal.

B. Material for Grate: High quality 100% recycled grey iron; ASTM A48 class 35b or better, hardness 170-223 brinnell.
Material For Frame: Mild steel ASTM A36

C. Finish:
Galvanized finish

D. Grate: Grate shall be cast in two pieces. Grate at edge shall be 1 ¼" thick. Locate center opening expansion at 24 ½". No openings shall be greater than ½" in conformance with ADA Accessibility Guidelines.

E. Frame: 1/8" typical gap between grate and frame. All visible welds to be ground smooth on outside edges. Frames will be true to square or diameter. Top of grated shall be flush with grade of surrounding paving.

2.04 MISCELLANEOUS MATERIAL

A. Neoprene Bridging Pad:
Located between the steel grate and the structural beams. Thickness: ¼", Width: 6"

PART 3 - EXECUTION

3.01 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, unobtrusively located, consistent with design of component except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

F. Conceal fastenings where possible.

G. Welding
1. Use welds for permanent connections where possible. Grind exposed welds smooth.
2. Tack welds prohibited on exposed surfaces.

3.02 INSTALLATION

A. Install items in accordance with approved Shop Drawings

B. Install components plumb, level, and rigid

C. Welding: AWS D1. Grind and fill exposed welds; finish smooth and flush.

D. Install spliced components with anchoring cement

E. Adjusting

1. Clean and touch up galvanized coatings at welded and abraded surfaces in accordance with ASTM A780.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

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 the following:

1. Framing with dimension lumber.
2. Framing with timber.
3. Wood blocking and nailers.
4. Helical Piles for Deck

B. Related Sections include the following:

1. Section 033053 Cast-In-Place Concrete for nonstructural footings and foundations.
2. Section 055000 Metal Fabrications for structural steel and connection elements.
3. Section 062000 Exterior Finish Carpentry for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Exposed Framing: Dimension lumber not concealed by other construction.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. SPIB - Southern Pine Inspection Bureau.
4. WCLIB - West Coast Lumber Inspection Bureau.
5. WWPA - Western Wood Products Association.

1.4 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 wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Material Certificates:
1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.
2. For Helical Piles: Manufacturer’s information, and certification from manufacturer confirming maximum compressive bearing capacity and lateral bearing capacity of installation.

C. Shop Drawings: For Helical Piles submit shop drawings showing profiles and product components, including helix and accessories. Provide a CCMC Evaluation Report that demonstrates compliance of the product with the National Building Code 2010. Drawings should include the following information: each helical pile location, helical pile shaft diameter and length, helix diameter, installation angle below the horizontal, and the extension in the axis of the shaft length; the final installation torque on all helical piles and the final torque.

1.5 QUALITY ASSURANCE

A. Helical Pile installers must be trained and certified by the helical pile manufacturer, experienced and specialized in the installation of similar structures to those required in this project. For each installer who will work on the job site, provide evidence of certification by the manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. . Metal Framing Anchors:

1. Alpine Engineered Products, Inc.
2. Cleveland Steel Specialty Co.
3. Harlen Metal Products, Inc.
4. KC Metals Products, Inc.
5. Silver Metal Products, Inc.

6. Simpson Strong-Tie Company, Inc.
7. Southeastern Metals Manufacturing Co., Inc.
8. United Steel Products Company, Inc.

B. Helical Piles

1. Piles and components must be fabricated with steel conforming to ASTM A 500 Grade C. They shall meet standards for load testing according to ASTM D3689.
2. Piles to be protected by a hot dip galvanization coating conforming to ASTM A-123-13.
3. Helical Piles shall have:

   a. Maximum Compressive Bearing Capacity (allowable load) of 6800 lbs;
   b. Lateral Bearing Capacity (allowable load) 225 pounds;
   c. Factored Bearing Resistance (allowable load) 718 pounds per foot and an ultimate load of 1009 pounds per foot.

4. Be manufactured by Techno Metal Post of Massachusetts tel: (203) 723-9904, or approved equal.

2.2 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.
5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. All timbers shall be “ACQ Preserve” arsenic-free pressure treated lumber as provided by BB&S Lumber, P.O. Box 982, North Kingston, RI 02852, www.bbslumber.com or approved equal.

B. Application: Treat all rough carpentry, unless otherwise indicated**.**

1. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
2. Wood framing members less than 18 inches above grade.

2.4 DIMENSION LUMBER

A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

B. Framing & Sawn Lumber: All lumber to be Southern Pine (NLGA) Select Structural Grade or better, kiln dried.

2.5 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Cants.
3. Nailers.
4. Furring.
5. Grounds.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and the following species:

1. Mixed southern pine; NLGA.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: Common wire, galvanized; ASTM F 1667.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1 for all wood-to-wood and steel-to-wood connections.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers, for all wood-to-wood and steel-to-wood connections.

G. Connectors: Simpson Strong-tie or approved equal.

H. Nailing Schedule: Conform to 2009 IBC with MA Amendments, unless noted otherwise.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven fasteners.
2. Published requirements of metal framing anchor manufacturer.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

3.3 WOOD FRAMING INSTALLATION, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Do not splice structural members between supports.

3.4 HELICAL PILE INSTALLATION

A. Install where indicated and where required. Coordinate locations with landscape architect and arborist prior to installation.

B. Installation must be completed by a certified installer.

C. Provide installation equipment capable of positioning the helical pile to the desired resistance and angle. The installation equipment must be equipped with a device that provides torque readings during the installation. On request, provide access to the torque reading data to the engineer, inspector or the owner.

D. Layout the helical pile locations as designed on the drawings and ensure that the location of each pile is within the prescribed limits of the project. Establish appropriate angle, if required, at the beginning of the installation.

E. Monitor the torque readings during the entire installation process and record the final torque reading values for each helical pile. Ensure that the torque is gradual and constant in the last meter of installation. Remove all obstructions encountered or relocate and adjust screw piles as required. The installer must ensure that the helix of the pile is embedded into undisturbed soil.

F. If necessary, provide and install extensions to the lead section to make sure the pile is screwed in at the required depth or torque readings. The extensions are either welded or bolted using couplings.

END OF SECTION

SECTION 062000

EXTERIOR FINISH CARPENTRY

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 the following:

1. Exterior composite deck and bench at existing Beech Tree
2. Exterior play deck

B. Related Sections include the following:

1. Section 06100 Rough Carpentry for furring, blocking, and other carpentry work not exposed to view and for structural wood decking and framing exposed to view.
2. Section 033053 Cast In Place Concrete
3. Section 321313 Concrete Paving
4. Section 310000 Earthwork

1.3 DEFINITIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples for Verification:

1. For composite decking color range of standard color offerings and cut piece for verification of integral color.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack composite wood, plywood, and other similar materials flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.

1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

2.2 COMPOSITE MATERIAL

A. Composite material shall be Trex as manufactured by the Trex Company or approved equal.

B. Composite wood shall be Reclaimed wood and plastic with integral coloring, free from toxic chemicals and preservatives.

C. Composite wood shall be provided in sizes as shown in the drawings

D. Surface texture shall be wood grain

E. Color: Standard color to be chosen by Owner’s Representative.

F. Characteristics:

1. Abrasion resistance: 0.01 inch wear per 1000 revolutions, tested to ASTM D2394
2. Hardness 1124 pounds tested to ASTM D143
3. Self ignition temperature: 743 degrees F tested to ASTM D 1929
4. Flash ignition temperature: 698 degrees F, tested to ASTM D1929
5. Flame spreading rating 80, tested to ASTM E84
6. Water absorption, 24 hour immersion, tested to ASTM D 1037

    a. Sanded surface 4.3 percent
    b. Un-sanded surface 1.7 percent

7. Thermal expansion coefficient, 36 inch long samples

    a. width 35. 2 x 10-6 to 42.7 x 10-6
    b. length 16.1 x 10x06 to 19.2 x 10-6

8. Fastener Withdrawal, tested to ASTM D1761:

    a. Nail 163 pounds per inch
    b. screw 558 pounds per inch

9. Static coefficient of friction

    a. Dry 0.53 to .55 tested to ASTM D2047
    b. Dry .59 to .7 tested to ASTM F1679
    c. Wet .7 to .7 tested to ASTM F1679

10. Fungus resistance, white and brown rot: no decay tested to ASTM D1413
11. Termite resistance 9.6 rating, tested to AWPA E-1
12. Specific gravity .91 to .95 tested to STM D2395
13. Compression:

    a. Parallel: 1806 PSA ultimate 550 PSI design, tested to ASTM D198
    b. Perpendicular 1944 PSI ultimate 625 PSI design tested to ASTM D143

14. Tensile Strength: 854 PSI ultimate 250 PSI design tested to ASTM D198
15. Shear Strength 561 PSI ultimate 200 PSI design tested to ASTM D143
16. Modulus of rupture: 1423 PSI ultimate, 250 PSI design tested to ASTM D4761
17. Modulus of elasticity 175,000 PSI ultimate, 100, 000 PSI design tested to ASTM D4761
18. Thermal conductivity 1.57 BTU per inch per hour per square foot at 85 degrees F, tested to ASTM C177

G. Connectors, Anchors, and Accessories: Fabricate from structural-steel shapes, plates, and bars complying with ASTM A 36 (ASTM A 36M); steel bars complying with ASTM A 575, Grade M 1020; and hot-rolled steel sheet complying with ASTM A 570 (ASTM A 570M), Grade 33.

1. Hot-dip galvanize each assembly and fastener after fabrication to comply with ASTM A 123 or ASTM A 153 (ASTM A 153M).

2.3 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.

1. For pressure-preservative-treated wood, provide stainless-steel fasteners.
2. For applications not otherwise indicated, provide stainless-steel fasteners.

B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
3. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
4. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 COMPOSITE WOOD

A. Install composite wood in accordance with manufacturer’s instructions

B. Cut and drill composite wood using carbide tipped blades

C. Pre-drill fastener holes on composite wood located closer than 1 inch from edges

D. Fasten each board to each support with two fasteners.

E. Do not use composite wood as structural members

3.5 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062000

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SECTION 101400
SIGNAGE

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The conditions and general requirements of the Contract, Division 0 and applicable parts of Division 1, apply to the work under this Section.

1.02 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials, mounting requirements, and equipment necessary to complete the work of this section, including but not limited to the following:

1. Temporary construction project information sign, four feet by eight feet (4'x8')
2. Temporary "Pardon Our Appearance" construction sign, two feet by four feet (2'x4')
3. Eighteen inch by eighteen inch (18"x18") park rules signs
4 Protect and re-install existing eighteen inch by eighteen inch (18"x18") park rules signs
5. Protect and re-install existing park name/info sign
6. Twelve inch by eighteen inch (12"x18") toddler play area sign and post
7. Dedication plaque

B. Examine all other Sections of the Specifications and all Drawings for the relationship of the work under this Section and the work of other trades. Cooperate with all trades and all departments of the City of Somerville and coordinate all work under this Section therewith.

1.03 SUBMITTALS

A. Shop Drawings: Include plans, elevations, or details as needed to define typical components and proof for review of graphics prior to manufacturing. Show mounting methods, accessories, and installation details.

1.04 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction as indicated. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally.

B. All signs shall be professionally printed. The City will provide the vendor with

electronic images of all signage artwork, but it shall be the responsibility of the vendor to convert those images to the proper electronic format. The Vendor shall provide final proofs of all signs to the Owner's Representative for approval before manufacture.

C. Painting / Finishes: All Permanent signs, poles, and hardware including nuts, bolts, and welds shall be painted a dark hunter green. Signs shall be painted on front, back, and edges. Paint will include two (2) coats primer, and two (2) coats paint. Background Color will be Pantone PMS 350–hunter green. Lettering and images shall be in white. (Temporary signs shall be as specified; typically white background.)

D. Signage artwork and text may be vinyl or silk screened. If vinyl is used, the artwork and text shall have a non-yellowing, UV-resistant, urethane clear coat applied to protect the vinyl and provide a graffiti resistant coating. Vendor shall provide color samples and paint color and product specifications to the Owner's Representative upon request.

E. All signs shall have rounded corners.

2.02 TEMPORARY CONSTRUCTION INFORMATION SIGN

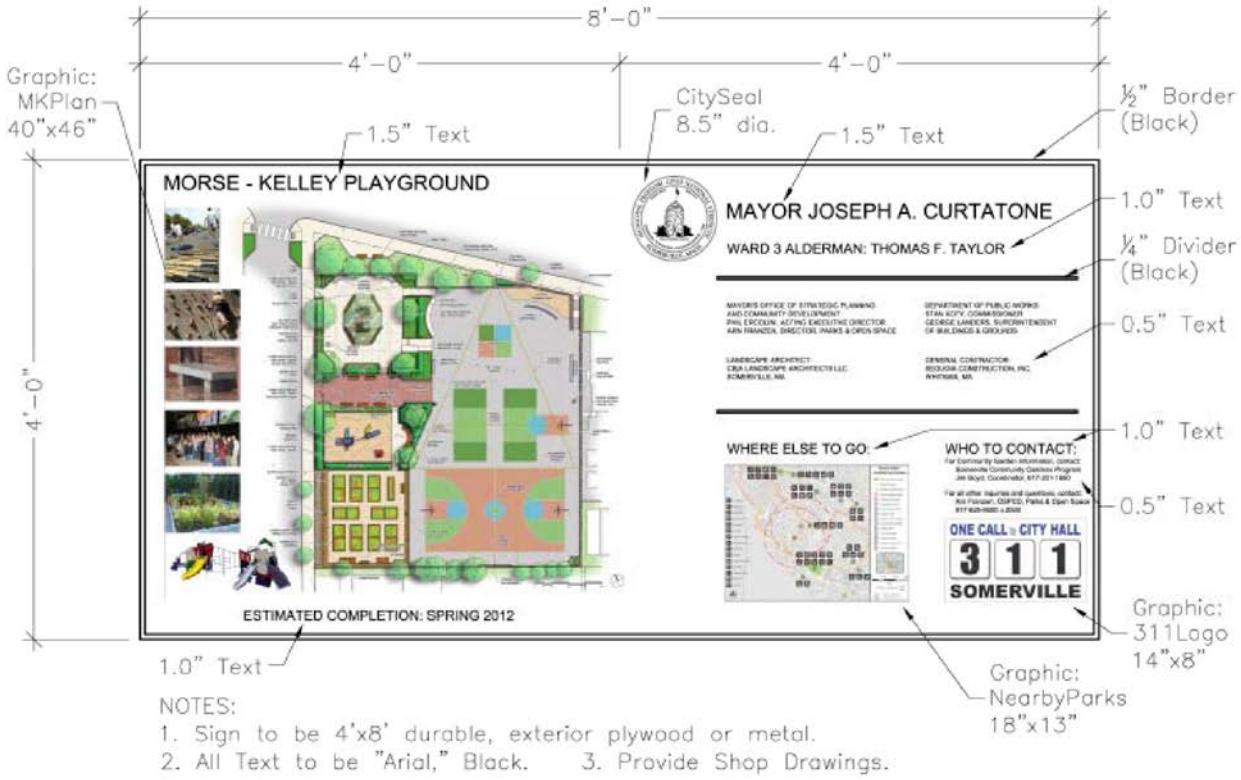
A. Sign shall be made of durable, exterior 3/4" marine grade plywood or 1/4" metal and shall be professionally printed. Electronic file with sign layout to be provided to Contractor and Owner's Representative by the Landscape Architect.

1. Submit samples of color and a Shop Drawing indicating layouts for approval prior to manufacture.

B. Sign shall be project-specific and will include a drawing of the final layout as well as the City Seal, 311 Logo and other pertinent information to be provided by the Owner's Representative. See example below.

C. Sign shall be securely mounted to 4"x4" min. wood posts with galvanized metal attachments or attached to fencing, as directed by the Owner's Representative. Sign shall be framed so as to be durable, and all attachments and mountings shall be child safe and vandal resistant.

D. See Sample Temporary Construction Information Sign for Reference on next page:



2.03 PARDON OUR APPEARANCE SIGN

A. Sign shall be made of durable, exterior 3/4" marine grade plywood or 1/4" metal and shall be professionally printed. Sign layout to be provided by Owner's Representative.

1. Submit samples of color and a Shop Drawing indicating layouts for approval prior to manufacture.

B. Sign shall be securely mounted to 4"x4" min. wood posts with galvanized metal attachments or attached to fencing, as directed by the Owner's Representative. All attachments and mountings shall be child safe and vandal resistant.

C. See Sample Pardon Our Appearance Sign below:

2.04 PARK RULES SIGNS

A. Park rules sign shall be 18”x18” exterior-grade vinyl or screenprinted sign with painted green background on 1/8” Aluminum or steel, single-sided, sign finish and lettering to be as 2.01 above.

B. The contractor shall furnish and install one new park rules sign and shall stockpile, protect, and re-install one existing park rules sign located on the existing fence. A total of two park rules signs shall be installed.

C. Text and artwork shall include the City Seal, logos, park regulations text, and park use icons indicating the uses allowed within that park. The sign layout shall be provided to the Contractor by the Owner’s Representative during construction. See image below for typical park regulatory signage dimensions and layout.

D. Signs shall include a backing plate, and tamper proof hardware as necessary to attach the signs to chain link fencing, in a location to be determined by the Landscape Architect or Owner’s Representative. Metal backing plate shall be the same material and finish as the sign and all mounting hardware shall be painted and will be nonrusting, aluminum, or stainless steel tamper proof nuts, bolts, washers as necessary.

2.05 REUSED PARK NAME/INFORMATION SIGN

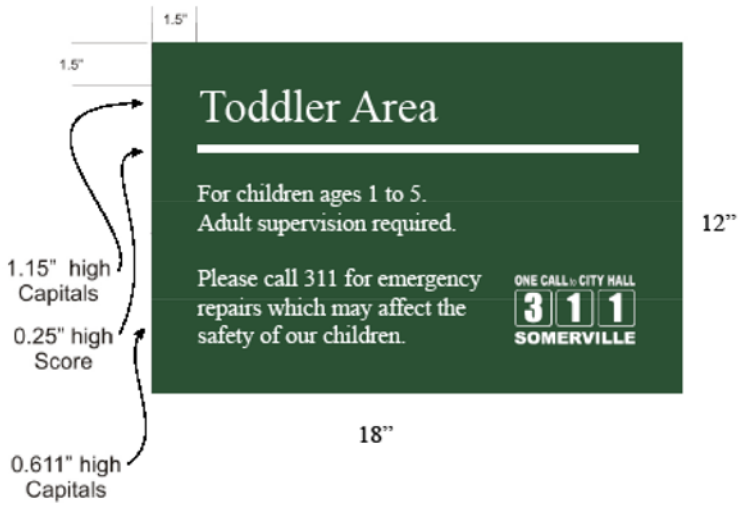
A. The Contractor shall stockpile, protect, and re-install the Park Name/Information Flag Sign and Post. Post and Sign location to be determined in the field with the Landscape Architect and Owner’s Representative.

2.06 TODDLER AREA SIGN WITH POLE

A. The Contractor shall furnish and install, on an appropriate pole per City specifications, a new double-sided Toddler Area Sign. Pole and Sign location to be determined in the field with the Landscape Architect and Owner.

B. Sign Dimensions shall be 0.90” Aluminum or Steel stock, 12’ x 18” inches. Signage artwork will include text, to be provided by the Owner’s Representative or Landscape Architect. Toddler area sign finish and lettering to be as 2.01 above.

C. See sample Toddler Area Sign for reference on following page:



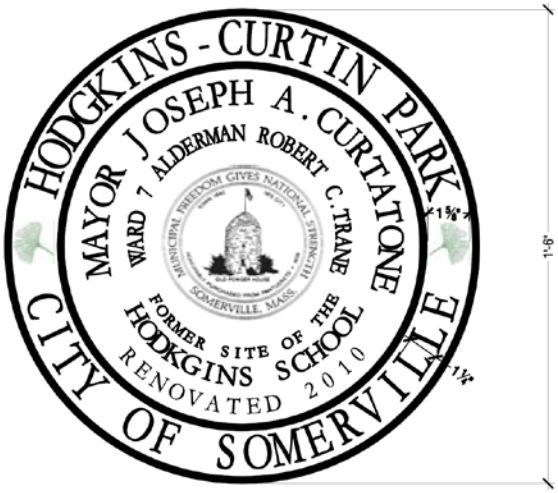
2.07 DEDICATION PLAQUE

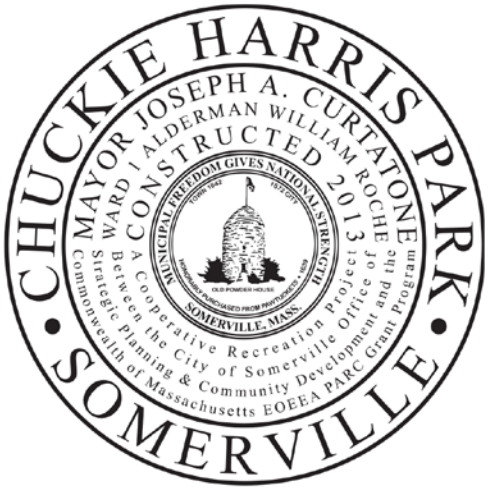
A. Plaque shall be a ¼" thick, 18" round bronze plaque with reverse-etched lettering and artwork, of the size and approximate design shown on the Drawings. Raised lettering and details shall have a brushed satin finish; the background shall be sandblasted with paint fill per City standards. Plaque fabrication and finish shall be ADA compliant.

B. The design shown below is a representative design showing the approximate complexity and detailing of the plaque. The final design will be as supplied to the Contractor by the Owner and Landscape Architect. The size of the plaque will remain unchanged. Manufacturer shall provide a proof of the plaque graphic for approval prior to manufactur

C. The plaque shall have four (4) anchor rods affixed to the back side, suitable for setting into a concrete slab. Pins shall be cast or grouted in place.

D. See sample Commemorative Plaque for reference below:





2.08 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Furnish inserts, as required, to be set into concrete or masonry work.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items provided under other sections of work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

B. Temporary Signs shall be installed facing the street or access point to the construction area so as to be visible and inform the general public. Where possible, the signs should be located so as not to conflict with construction activity nor to require moving during the construction process.

C. The temporary construction information sign shall be maintained in satisfactory condition during construction and then removed and disposed of legally by the Contractor just prior to the final acceptance of the work.

D. The Pardon Our Appearance sign shall be be maintained in satisfactory condition during construction and then delivered to the Owner's Representative for re-use upon final acceptance of the work.

3.03 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by the Landscape Architect.

END OF SECTION

SECTION 11 68 00
PLAY EQUIPMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Coordinate the work of this section with Bidding and Contract Requirements; Conditions of the Contract; Division 1 – General Requirements, Technical Specifications, Division 2 and the Contract Drawings.

B. Examine all other Sections of the Specifications for requirements that affect work under this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 SUMMARY OF WORK

A. Provide all labor and materials to furnish and install play equipment as shown in the Drawings and specified herein. The work includes the following:

1. 2-5 Play Tower
2. Post & Rope
3. Log Steppers (ADD ALT. #1)
4. Log Jam
5. Spring Rocker
6. Seesaw
7. 2-5 Spinner
8. 5-12 Lumberjack Climber (includes Base Bid option & Add Alt option for ADD ALT. #2)
9. Monkey Bars
10. 5-12 Spinner
11. Swings

B. See Drawings for locations.

C. Provide cast-in-place concrete footings per manufacturer’s installation details provided in Appendix A, at the end of this specification.

1.03 QUALITY ASSURANCE

A. Playground equipment design, layout, and installation shall comply with the following standards and guidelines as applicable.

1. CPSC - Consumer Product Safety Commission Guidelines for Playground Safety, latest edition.

2. ASTM - American Society for Testing and Materials, Designation: F1487, Standard Consumer Safety Performance Specification for Playground Equipment for Public Use, latest edition.

3. ANSI - American National Standards Institute.

4. AASHTO - American Association of State Highway and Transportation Officials (tests of specifications).

5. MAAB - Massachusetts Architectural Access Board

B. Requirements not specifically set forth herein, but required by the agencies listed in above shall be understood to be a requirement of this contract since these standards of quality and safety are established as the industry standard(s). Any conflicts between the agency standards and the contract documents shall be brought to the attention of the Landscape Architect, and unless otherwise directed in writing, the agency standards shall be the minimum requirement to be followed.

1.04 RELATED WORK UNDER OTHER SECTIONS

A. Section 033053 Cast In Place Concrete

B. Section 310000 Earthwork

C. Section 321816 Poured in Place Rubber Resilient Surfacing

D. Section 321817 Engineered Wood Fiber Surfacing

1.05 SUBMITTALS

A. Provide complete Shop Drawings and/or samples and cut sheets for all items called for on the Drawings and as specified.

B. Provide a copy of the inspection certificate from each manufacturer's representative demonstrating that the new equipment has been properly installed and is in compliance with the latest editions of ASTM F-1487 and the CPSC Public Playground Safety Handbook, and all other applicable standards.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original unopened and undamaged packages with labels legible and intact.

B. Store materials in unopened packages in a manner to prevent damage from the environment and construction operations.

C. Handle in accordance with manufacturer's instructions.

D. The Contractor shall be solely responsible for all materials stored on the site once delivered. Any materials left unsecured at the job site shall be solely at the contractor’s own risk.

PART 2 - PRODUCTS

2.01 2-5 PLAY TOWER

A. 2-5 Play Tower shall be custom Robinia wood structure as manufactured by Earthscape of Wallenstein, ON, Canada or Approved Equal.

B. 2-5 Play Tower shall include the following components:
   1. Accessible ramp with handrails to meet pathway
   2. Central Platform and Upper Platform connected with a ladder
   3. Plastic Slide from Upper Platform (at 9' ht.)
   4. Plastic Slide from Central Platform (at 4' ht.)
   5. Climbing Wall
   6. Steel Core Rope Climbing Net

C. Concrete slab foundation shall be per manufacturer's specifications (See Tower specification sheets, Appendix A).

2.02 POST & ROPE

A. Post & Rope shall be custom Robinia wood structure designed for installation on a slope as manufactured by Earthscape of Wallenstein, ON, Canada or Approved Equal.

B. Post & Rope shall include the following components:
   1. Robinia Posts
   2. Robinia Steppers
   3. Steel Core Rope

C. See Log Jam specification sheet (Appendix A) for concrete foundations for Robinia posts.

D. See Log Stepper detail (Appendix A) for stepper installation in compacted gravel.

2.03 LOG STEPPERS (ADD ALT. #1)

A. Log steppers shall be custom Robinia wood structure as manufactured by Earthscape of Wallenstein, ON, Canada or Approved Equal.

B. Log steppers shall include the following components:
   1. Robinia Posts
   2. Robinia Steppers

C. See Log Jam specification sheet (Appendix A) for concrete foundations for Robinia posts.

D. See Log Stepper detail (Appendix A) for stepper installation in gravel.

2.04 LOG JAM

A. Log jam shall be custom Robinia wood structure as manufactured by Earthscape of Wallenstein, ON, Canada or Approved Equal.

B. Log jam shall include the following components:
   1. Connected vertical, angled, and horizontal Robinia members

C. See Log Jam specification sheet (Appendix A) for concrete foundations for vertical Robinia posts.

2.05 SPRING ROCKER

A. Spring rocker shall be Mule – NRO101 as manufactured by Kompan or Approved Equal.
B. Spring rocker shall be consist of Robinia wood and metal components.

C. See specification sheet and manufacturer's instructions (Appendix A) for installation.

2.06 SEESAW

A. Seesaw shall be 4-seat Seesaw, model #148637 as manufactured by Landscape Structures or Approved Equal.

B. Seesaw shall be spring-centered to prevent abrupt contact with the ground if one child dismounts suddenly. The seesaw design shall be certified by the manufacturer as appropriate for use by the 2-5 age group.

C. Contractor shall assume concrete foundation set 12" below surfacing and reaching to 48" below grade is required. Install per manufacturer's instructions.

D. Color shall be selected by Landscape Architect from manufacturer's standard colors.

2.07 2-5 SPINNER

A. 2-5 Spinner shall be Junior Spica – ELE400158 as manufactured by Kompan or Approved Equal.

B. 2-5 Spinner and associated use zone shall require no greater area than a circle of 13'-4" diameter.

C. See specification sheet and manufacturer's instructions (Appendix A) for installation.

2.08 5-12 LUMBERJACK CLIMBER

A. 5-12 Lumberjack Climber shall be custom Robinia wood structure designed for installation on a slope as manufactured by Earthscape of Wallenstein, ON, Canada or Approved Equal.

B. 5-12 Lumberjack Climber shall include the following components:
1. Robinia Posts
2. Horizontal and Angled Robinia members
3. Steel Core Rope

C. See Lumberjack Climber - Base Bid & Lumberjack Climber - Add Alt (for ADD ALT. #2) specification sheets (appended to this Section).

D. Note: ADD ALT 2 – 5-12 Lumberjack Climber – Add Alt adds additional horizontal and angled Robina members and two sets of Stainless Steel slider bars.

E. See Log Jam specification sheet (Appendix A) for concrete foundations for vertical Robinia posts.

2.09 MONKEY BARS

A. Monkey Bars shall be custom Robinia wood and stainless steel structure as manufactured by Earthscape of Wallenstein, ON, Canada or Approved Equal.

B. Monkey bars shall include the following components:

1. Connected vertical and horizontal Robinia members
2. Stainless Steel climbing bars and horizontal bars

C. See Log Jam specification sheet (Appendix A) for concrete foundations for vertical Robinia posts.

2.10 5-12 SPINNER

A. 5-12 Spinner shall be Spica 2 – GXY8015 as manufactured by Kompan or Approved Equal.

B. 5-12 Spinner and associated use zone shall require no greater area than a circle of 13'-8" diameter.

C. See specification sheet and manufacturer's instructions (Appendix A) for installation.

2.11 SWINGS

A. Swings shall be DX-3175-A3 Dynamo Playgrounds of Rockland, ON, Canada or Approved Equal.

B. Swings shall include the following components:
1. Three connected bays for swings constructed from powdercoated steel posts
2. Two belt swings
3. Two bucket/tot swings
4. One dish/basket swing with rubber bumper

C. Swings and associated use zone shall be contained within the area of engineered wood fiber surfacing shown on the Drawings.

D. See specification sheet and manufacturer's instructions (Appendix A) for installation and required concrete footings.

2.12 MAINTENANCE KIT

A. At the completion of construction, the Contractor shall provide to the City Department of Public Works, Parks Maintenance Division, a Maintenance Kit containing all touchup paint, maintenance instructions, spare parts, and other maintenance materials provided by the manufacturers of all play equipment.

B. The Maintenance Kit shall be delivered in a single container clearly labeled with the Park Name, and each item shall be identified as to the source.

PART 3 - INSTALLATION

3.01 PROJECT CONDITIONS

A. Work notification: Notify Architect at least 24 hours prior to initiating work.

B. Establish and maintain required lines and grade elevations.

C. Protect adjacent work.

D. Install all materials in strict accordance with manufacturer's recommendations and instructions. The installation shall be done by a factory certified installer (Certification to be submitted to owner).

3.02 PREPARATION

A. Compaction of Subbase and Base will be as specified in Section 310000 Earthwork.

B. Examine subgrades and installation conditions. Do not start work until unsatisfactory conditions have been fixed.

3.03 CAST-IN-PLACE CONCRETE FOOTINGS

A. Concrete footings shall be as specified in Section 03 30 53, Cast-In-Place Concrete.

B. Install all footings plumb and true.

C. Embedments into footings shall be cast-in-place, cored and embedded, or sleeved and embedded. Cored or sleeved items shall be securely anchored in place with a non-shrink, non-metallic waterproof grout suitable for buried use. Other types of anchoring shall be available upon request from the manufacturer (if so specified on the Drawings).

1. All corings shall be done in such manner as to avoid damage to the cast footing. Where feasible, sleeved embedments or cast-in-place embedments are preferred.

D. The Contractor shall do all necessary excavation required for the installation of the play equipment. Excavation shall be defined as the digging of all required footings and the removal of all materials encountered (footings, pavements, earth, boulders, broken concrete pieces, etc.) while digging those footings.

E. The depth of the top of the footing depends on the safety surfacing specified. See Drawings.

3.04 INSTALLATION OF PLAY EQUIPMENT

A. All play equipment shall be assembled and installed under the supervision of an approved Supervisor according the manufacturer's directions and specifications, the Contract Drawings, and in compliance with all applicable standards.

B. Equipment shall be assembled to conform to the approved drawings and the installation instructions provided by the manufacturers. All fastenings shall be made as shown on the drawings and shall be securely tightened. All work shall be done so that no hazardous projections are left on the finished work.

C. The Contractor shall locate the structures to the lines and grades specified in the drawings and according to the specifications of the manufacturer of the equipment. Adjust all equipment to suit site gradients; no sloping platforms, tracks, or members intended to be horizontal shall be accepted.

D. The equipment shall be located and brought to the heights as shown in the drawings and as recommended by the manufacturer with vertical and horizontal members set plumb and then braced to be held in place.

E. Where concrete foundations are required, the concrete shall be poured around the supporting pieces of the equipment as detailed. The concrete shall be as specified in Item 3.03, above. Slope tops of footings to drain; set bottom of vertical members into gravel base to ensure drainage; do not encase bottom in concrete. After the specified cure period of the concrete foundations has passed, the bracing may be removed.

F. The fills and surfaces shall then be placed and brought to the grades shown in the Contract Drawings and in accordance with Sections 321816 poured in Place Rubber Surfacing and 321617 Engineered Wood Fiber Surfacing of these Specifications.

G. Contractor to repair any damage to surfaces and finishes per manufacturer's instructions after installation is complete.

H. Contractor shall submit written certification from Manufacturer's Representatives that all new play elements have been installed in accordance with their prescribed standards.

3.05 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment and dispose of properly. Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.

PART 4 - WARRANTY

4.01 Contractor shall provide Owner all paperwork and documentation from manufacturer's regarding all warranty information.

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TABLE OF CONTENTS

SECTION 260000

ELECTRICAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General and Supplementary Conditions and the General Requirements, are hereby made a part of the work of this section - where paragraphs of this section conflict with Division-1 and/or Division-0, the more stringent requirements shall govern.

B. All work shall comply with all federal, state and local codes and any other authorities having jurisdiction including any special requirements of the owner and/or architect.

1.02 SUMMARY

A. Provide all materials, labor and equipment required to perform the work of this section as shown on the Contract Documents, or as specified herein, or to satisfy a complete working system whether specified or implied.

B. Scope shall include the following items:

1. Conduit and Raceways, Wireways, Surface-Mounted Raceway
2. Wire and Cable (600V)
3. Boxes: Outlet Boxes, Junction and Pull Boxes
4. Electrical Identification
5. Lighting Fixtures, Lamps and Ballasts
6. Loadcenters
7. Grounding
8. Testing
9. Shop Drawings, Operation & Maintenance Manuals, Coordination Drawings, and Record Drawings.

C. This contractor shall perform all work in accordance with all governing codes and regulations, including local, state and federal codes (including energy codes), NEC (including Massachusetts amendments), NFPA, ANSI, ASTM, ASME, ASHRAE, UL and OSHA. All systems must be installed by contractors licensed to perform that category of work within the state.

D. The code establishes minimum requirements for the project. The contracts documents may require installations that exceed minimum code compliance

E. This contractor must obtain all permits and applications and pay all fees prior to performing the work.

F. If this work is covered before inspection and approval, this contractor shall pay the cost of uncovering and reinstalling the covering whether the installation is found to meet the contract requirements or not.

1.03 SUBMITTALS

A. Only submittals received from and bearing the stamp of approval of the Contractor will be considered for review by the Engineer. Submittals shall be accompanied by a transmittal notice stating the: Project Name, Date of Submittal, "To", "From" (Contractor, Subcontractor, Installer, Manufacturer, Supplier), Specification Section, or Drawing No. to which the submittal refers, purpose (first submittal, resubmittal), description, remarks, distribution record, and signature of transmitter.

B. Provide submittal information for equipment/devices and systems listed in SUMMARY Section 1.02 B.

C. All deviations must be requested individually - in writing. If such letters are not submitted, the engineer, his consultants and the owner shall be held harmless for any and all adverse consequences resulting from the deviation(s) implemented. This will be strictly enforced and applied regardless of whether the engineer has reviewed or approved the shop drawings containing the deviation. Note, approval of deviations shall be made at the discretion of the engineer.

D. Product Data, including catalog cuts, specification, and samples required to demonstrate the quality of the proposed product must be furnished for review prior to procurement. All product shop drawings must illustrate performance, dimensions, weights and colors.

1. The scheduled equipment is specified to establish a standard for that item. Substitutions are allowed provided they comply with the requirements outlined in the contract documents. All substitutions must be issued for approval within 30 days of receipt of contract. Substituted equipment shall not create additional work or hardship for other trades. This contractor shall bear the cost of any changes necessitated as a result of said change. All equipment listed as new must be new.

2. Substituted equipment must meet all performance criteria, must fit within the available space without modification, must be capable of being supported by the proposed structure and must meet all architectural considerations. This contractor must confirm that substituted materials or equipment meet these criteria prior to submission.

3. The Contractor shall transmit each submittal to the Engineer sufficiently in advance of performing related Work or other applicable activities so that the installation is not delayed by processing times, including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery, and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Engineer in advance of the Work.

4. Shop drawings are reviewed for the purpose of verifying the general compliance of the submitted equipment or system with the project’s requirements. The contractor retains full responsibility for verifying that submitted equipment or systems comply with the contract documents. Contractor responsibilities include, but are not limited to the confirmation of: dimensions, quantities, supports, access, clearances, and performance requirements. This contractor shall

coordinate with all trades and shall verify product's compatibility with installation techniques. Note, an engineer's review of a shop drawing does not relieve the contractor from his responsibility to purchase and install the specified equipment. The contract obligation will in no way be limited or reduced by errors in the engineer's review of the shop drawings.

5. If the contractor furnishes or installs materials or systems without prior approval and those materials or systems fail to meet the requirements of the contract documents, those materials and systems shall be removed and replaced at no cost to the owner.

1.04 COORDINATION DRAWINGS

A. Coordination Drawings, showing proposed layout of equipment (with clearances), piping, ducts, registers etc. shall be submitted for review by the engineer. The intent of the coordination drawings is to identify conflicts before they occur and interfere with the work to be performed by this or any other trade.

1. The engineer's review of shop drawings does not relieve the contractor of his responsibility to properly coordinate the work. 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.

1.05 RECORD DRAWINGS

A. Maintain on-site one set of record documents. At the end of each day legibly mark each item in colored pencil to record the installed conditions. The record drawings will be periodically inspected at the site. Applications for monthly payment will not be approved until record drawings have been inspected.

1. Before the completion of the project, record as-built conditions electronically in .DWG AutoCAD format. Submit the documents to engineer for final approval. No approval for final payment will be provided until accurate as-built drawings have been submitted.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Prior to the completion of all work and the final inspection of the installation by the owner, submit three (3) copies of Operation and Maintenance manuals to the owner and engineer for review and approval. Manuals shall be in booklet form and shall be indexed. All written materials shall be typewritten or printed. Data shall be submitted on 8-1/2" x 11" pages with durable plastic covers. Prepare binder cover with printed title "OPERATION AND MAINTENANCE DATA". The cover sheet should include a directory listing names, addresses and telephone numbers of architect/engineer, contractor, subcontractors and major equipment suppliers. Internally subdivide the binder's contents and provide a table of contents. At a minimum, the O&M manuals should contain the following:

1. Design Criteria

2. Maintenance Instructions

3. Parts Lists

4. Operating Instructions

5. Equipment List

6. Shop Drawings

7. Certificates of Approval

8. Warranties

1.07 GUARANTEE

A. Except as otherwise specified, all work, materials and equipment shall be guaranteed against defects resulting from the use of inferior materials, equipment, or workmanship for one year from the date of final completion of the contract, or from full acceptance by the Owner, whichever is earlier. All parts and labor shall be included.

B. If, within any guarantee period, repairs or changes to guaranteed work are required as a result of the use of defective materials or equipment, inferior workmanship or work that is not in accordance with the terms of the contract, and upon receipt of notice from the Owner, the following shall be done without expense to the owner.

C. Place in satisfactory condition in every particular all of such guaranteed work and correct all defects therein.

D. Repair all damage to the building or site/equipment or contents thereof which is the result of the use of defective materials or equipment or inferior workmanship, or of work not in accordance with the terms of the contract.

E. Make good any work or materials, or the equipment and contents of said building or site disturbed in fulfilling any such guarantee.

F. In fulfilling the requirements of the contract or of any guarantee embraced in or required thereby, any work guaranteed under another contract is disturbed, restore such disturbed work to original condition and guarantee such restored work to the same extent as it was guaranteed under such other contract.

G. If upon failure to proceed promptly after notice to comply with the terms of the guarantee, the Owner may have the defects corrected and Contractor and his surety shall be liable for all expenses incurred.

H. This Contractor shall obtain in the General Contractor's and Owner's name, the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities, which the Contractor may have by law or other provisions of the Contract Documents. The guarantee shall be for a period of one (1) year minimum from the date of acceptance or final payment.

I. This contractor shall guarantee that all systems or equipment meet performance requirements specified in the contract documents.

J. Any equipment requiring excessive service shall be replaced at no cost to the owner.

1.08 COORDINATION

A. This contractor is responsible for all work, materials and labor to satisfy a complete working system whether specified or implied.

B. Before submitting a proposal this contractor shall examine the site and shall determine for himself the conditions that may affect the work. This contractor shall also field verify all dimensions and existing conditions prior to proceeding.

1. Where discrepancies or conflicts occur between these documents and the existing conditions, the discrepancy shall be reported (in writing before the award of contract) to the owner and/or engineer for expediting and resolve. Absolutely no claims for additional compensation will be considered for conditions reasonably visible upon examination of either the site, or the documents.

C. If the documents do not coincide with manufacturer's recommended installation procedures, or applicable codes this contractor shall report these findings to the engineer.

D. If there is a conflict within the documents this contractor shall install the material, equipment, systems or methods of the higher standard.

E. All work shall be performed as fast as the building's conditions permit. Coordinate scheduling, submittals, and work of the various sections of the project documents to ensure efficient and orderly sequence of installation of interdependent construction elements. Include provisions for accommodating items installed later. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to and placing in service such equipment. Coordinate space requirements, supports and installation of mechanical and electrical work which are indicated diagrammatically on documents.

1.09 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. The drawings show the layout of the electrical systems and indicate the approximate locations of conduit and equipment. Conduit and cable tray route(s) shown on the drawings are schematic only. The exact routing conduit and/or cable tray shall be determined by the structural conditions and possible obstructions. This shall not be construed to mean that the design of the systems may be changed, but refers only to exact runs between given points. The Engineer reserves the right to revise the drawings from time to time to indicate changes in the work.

B. This Contractor shall consult and review all contract and reference drawings, which may affect the location of electrical equipment to avoid any possible interference and permit full coordination of all work. The right to make any reasonable change in location of electrical equipment up to the time of rough-in is reserved by the Engineer, and such change shall be made without additional expense to the Owner.

C. It shall be the responsibility of this Contractor to see that all electrical equipment that may require maintenance and operation from time to time is made readily accessible. Although the equipment may be shown on the drawings in certain locations, the construction may disclose the fact that such locations do not make its position readily accessible. In such cases this Contractor shall call the attention of the Engineer to the condition before advancing the construction to a state where a change will reflect additional expense to the owner.

D. This contractor is responsible for all work, materials and labor to satisfy a complete working system whether specified or implied. Items or systems mentioned in the specification, but not shown on the drawings (or vice versa) must be supplied, be

completed in all respects and made fully operational without additional expense to the owner.

1.10 MATERIAL AND EQUIPMENT

A. Transport and handle Products in accordance with manufacturer's instructions. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

B. Each piece of equipment shall be provided with a nameplate bearing the manufacturer's name, address, type or style, model number, catalog number and serial number securely fixed in a conspicuous place

C. Store and protect Products in accordance with manufacturers' instructions. Store with seals and labels intact and legible. Store sensitive Products in weather tight, climate controlled, enclosures in an environment favorable to Product. For exterior storage of fabricated Products, place on sloped supports above ground. Provide off-site storage and protection when site does not permit on-site storage or protection. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.

D. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

E. No materials should be delivered to the site before the approval of shop drawings.

F. Items that may cause harm to personnel must be covered or enclosed.

1.11 PROTECTION

A. Provide security and facilities to protect Work, and existing facilities, and Owner's operations from unauthorized entry, vandalism, theft or fire. All materials that are damaged or stolen shall be replaced at no cost to the owner. Remove all damaged materials from the site immediately.

1.12 BIDDER'S REPRESENTATION

A. By the act of submitting a bid for the proposed contract, the Bidder represents that:

1. The Bidder and all subcontractors the Bidder intends to use have carefully and thoroughly reviewed the drawings, specifications and other construction contract documents and have found them complete and free from ambiguities and sufficient for the purpose intended.

2. The Bidder and all workmen, employees and subcontractors the Bidder intends to use are skilled and experienced in the type of construction represented by the construction contract documents bid upon.

3. A licensed supervisor with 5-years experience shall be in charge of the work described in the contract documents and shall be present as required to properly perform his duties

4. Neither the Bidder nor any of the Bidder's employees, agents, intended suppliers or subcontractors have relied upon any verbal representations, allegedly authorized or unauthorized from the Owner, or the Owner's employees or agents including architects, engineers or consultants in assembling the bid figure; and further that, the bid figure is based solely upon the construction contract documents and properly issued written addenda and not upon any other written representation.

5. All work shall be completed with within OSHA and Owner safety requirements.

1.13 HOISTING, SCAFFOLDING AND PLANKING

A. This contractor is responsible for all hoist, lifts, planks, cranes, or other means of material transfer (including furnishing and set-up procedures) required to complete the work described in the contract documents.

1.14 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

A. This contractor shall provide all supplemental steel, channels and supports required to complete the work shown in the contract documents. Install all supplemental steel in a neat and workmanlike manner – parallel/perpendicular to floors, walls and ceiling construction. Supplemental steel shall be installed by means and methods established by this contractor. Supplemental steel, channels and supports shall be as manufactured by Unistrut, Powerstrut, ERICO or approved equal.

1.15 HAZARDOUS MATERIALS

A. This contractor shall dispose of all hazardous material in accordance with State and Federal laws. Maintain a hazardous waste manifest documenting all disposals. Handle hazardous materials in accordance with EPA procedures.

1. Hazardous materials include, but are not limited to: batteries, fluorescent lamps, HID lamps, and ballasts manufactured prior to 1979. A licensed asbestos abatement professional must perform all abatement of asbestos containing materials.

1.16 ACCESSIBILITY

A. Assure and be responsible for the adequacy of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of the work. Cooperate with all other trades whose work is in the same space. Such spaces and clearances shall, however, be kept to the minimum size required.

B. Locate all equipment, which must be serviced, operated, adjusted or maintained in fully accessible positions. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility, and the engineer shall approve any change.

C. Provide access panels for installation in concrete block walls or gypsum wallboard ceilings and partitions in locations, which require access for service to the items located behind the permanent gypsum wallboard or concrete block finish.

D. Access panels shall be installed where required to gain access to valves, dampers, controls, etc. Panels shall be flush, insulated, contain continuous steel hinge and

screwdriver operated latch. Panels shall be rated equal to the assembly that they are being installed in panels shall be UL listed.

E. Access panels located in fire rated partitions shall be fire panels. The frame and panel assembly of these fire panels shall be manufactured under the Factory Inspection Service of the Underwriters' Laboratories, Inc., and shall bear a label reading: "Frame and Fire Panel Assembly, Rating 2 hours. (B) Temperature Rise 30 Minutes, 250° F. Maximum." Rated panels shall be equipped with automatic closing mechanism and be self-latching.

F. Panels shall be provided with screwdriver operated flush cam locks.

G. Panel size shall be 12 inches x 12 inches except furnish a larger size if required to service a particular item. The exact location and size of each access panel shall be reviewed with, and approved by, the Engineer.

1.17 PROJECT CLOSEOUT

A. Prior to requesting Substantial Completion this Contractor shall make a thorough inspection of the Work. During this inspection this Contractor shall prepare a comprehensive list of all items remaining to be completed or corrected. This list shall include all remaining items to be provided under the Contract Documents.

B. Upon completion of the items noted on the list this Contractor shall notify the Engineer that the Work is Substantially Complete. The Engineer shall then conduct a site visit and prepare a punch list, setting forth in accurate detail any items on the Contractor's list and additional items that are not acceptable or incomplete. This Contractor shall coordinate to achieve prompt completion of the punch list.

C. This Contractor shall not be relieved of the responsibility to provide Contract items left off of the Engineer's punch list.

D. The Engineer may revise the punch list, from time to time, to ensure that all items of Work are properly completed.

E. If the Engineer finds that the work is not substantially complete, he will report in the general deficiencies and explain why the work is not substantially complete. The contractor shall be responsible for the Engineer’s re-observation fee.

F. Upon completion of all work, and after receipt of all appropriate marked up As Built Drawings, Operation & Maintenance Manuals, Warranties, Guarantees, Testing Reports, Contractor’s Project Completion Certificate and Spare Parts required by the Contract Documents, the Engineer shall prepare the Construction Completion Certificate.

G. An individually signed and dated punchlist shall acknowledge the completion of all punchlist items.

H. The contractor’s Project Completion Certificate shall state that all work has been installed as described in the construction documents and that the installation was completed in conformance with all local, state and federal regulations.

PART 2 - PRODUCTS

2.00 CONDUIT AND RACEWAYS

A. Electrical Metallic Tubing (EMT)

1. EMT shall be provided in nominal trade sizes ¾" to 4" in nominal 10'-0" lengths as indicated on the drawings. Minimum size shall be ¾" unless noted otherwise. EMT elbows shall be standard radius unless special/large radius elbows specifically noted.

2. EMT shall be zinc-coated galvanized steel, and shall be manufactured in accordance with the latest edition of ANSI C80.3, UL 797, and Federal Specification WW-C-563.

3. EMT set-screw connectors and couplings shall be steel/zinc-electroplated. Fittings shall be dual set-screw for trade size 2" and larger.

4. EMT shall be as manufactured by Wheatland Tube Company, or approved equal.

B. Galvanized Rigid Metal Conduit (RMC)

5. RMC shall be provided in nominal trade sizes ¾" to 4" in nominal 10'-0" lengths as indicated on the drawings. Minimum size shall be ¾" unless noted otherwise. EMT elbows shall be standard radius unless special/large radius elbows specifically noted.

6. RMC shall be zinc-coated galvanized rigid steel, and shall be manufactured in accordance with the latest edition of ANSI C80.1, UL 6, and Federal Specification WW-C-561. RMC shall be threaded in conformance with ANSI/ASME B1.20.1. Threadless RMC is not allowed.

7. Rigid conduit fittings, nipples and close nipples shall be threaded malleable iron/zinc-electroplated.

8. RMC shall be as manufactured by Wheatland Tube Company, or approved equal.

B. Rigid Nonmetallic Conduit (RNC)

1. RNC shall be provided in nominal trade sizes ¾" to 4" in nominal 10'-0" lengths as indicated on the drawings. Minimum size shall be ¾" unless noted otherwise. RNC elbows shall be standard radius unless special/large radius elbows specifically noted.

2. Schedule-40 Polyvinyl Chloride (PVC) RNC and Schedule-80 PVC RNC shall be manufactured in accordance with the latest edition of NEMA TC-2, UL 651, and Federal Specification WC1094A. RNC shall be resistant to sunlight and listed for use outdoors.

3. Schedule-40 and Schedule-80 PVC RNC fittings shall be manufactured in accordance with the latest edition of NEMA TC-3, UL 514b, and Federal Specification WC1094A.

4. RNC, associated fittings, and solvent cement shall be produced by the same manufacturer to assure system integrity.

5. RNC, associated fittings, and solvent cement shall be as manufactured by Carlon, or approved equal.

B. Miscellaneous Conduit Fittings

1. Expansion Fittings

   a. RMC expansion fittings shall be hot-dip galvanized, and shall allow a maximum of 8" conduit movement, (4" in either direction). RMC expansion fittings shall be equipped with an external bonding jumper – 24" minimum. Provide O-Z/Gedney Type EX, or approved equal.

2. Insulated Bushings

   a. Insulated bushings for RMC shall be threaded steel/zinc-plated with conduit end stop and integrally molded noncombustible phenolic insulated surface rated 150°C. Provide O-Z/Gedney Type B, or approved equal.

3. Insulated Grounding Bushings

   a. Insulated grounding bushings for RMC shall be threaded steel/zinc-plated with tin-plated copper lay-in ground lug and integrally molded noncombustible phenolic insulated surface rated 150°C. Provide O-Z/Gedney Type BLG, or approved equal.

2.01 WIRE AND CABLE (600V)

A. Conductors shall be annealed (soft) copper with insulation rated 600V, 75°/90°. Size shall be American Wire Gauge (AWG) as indicated on the drawings. Minimum conductor size shall be #12 AWG unless noted otherwise. Conductors shall be as manufactured by Southwire, or approved equal.

   1. Aluminum conductors are not allowed.

   2. Conductors size #12 AWG and smaller shall be solid. Conductors size #10 AWG and larger shall be stranded.

   3. Conductors size #10 AWG and smaller shall have Type THHN-THWN insulation.

   4. Conductors size #8 AWG and larger shall have Type XHHW insulation.

B. Conductor insulation shall be color coded to correspond to code-defined identification requirements.

   1. Phase conductor insulation size #12 AWG or #10 AWG shall be Black-Red-Blue via a factory applied coating. Phase conductor insulation size #8 AWG and larger shall have a factory applied coating color other than white, green or gray with phase/color identification via flame retardant vinyl tape.

   2. Grounded conductors (Neutrals) shall be white or gray except where colored stripe indentification is required by code.

   3. Grounding conductors (Equipment Grounds) shall be green except where colored stripe identification is required by code.

C. Splices

   1. Splices of conductors size #10 AWG and smaller shall be made with UL-Listed free-spring wire connectors rated 600V.

2. Splices of conductors size #8 AWG and larger shall be made with UL-Listed compression style splice barrels rated 600V, 90°C. Provide Burndy Type YS-L, or equivalent.

3. All connectors utilized for splices shall have an ampacity and temperature rating equal to, or greater than the associated conductors.

D. Terminations

1. Stranded conductors, (size #10 AWG and smaller), scheduled to be terminated on screw terminals shall be equipped with UL-Listed compression style PVC-insulated locking fork tongue terminals rated 600V, 105°C. Provide Burndy Type TP-LF, or equivalent.

2. Terminations for stranded conductors, (size #8 AWG to #4/0 AWG), shall be made with UL-Listed compression style standard barrel one-hole terminal lugs rated 600V, 90°C. Provide Burndy Type YA-L, or equivalent.

3. Terminations for stranded conductors, (size #250kcmil and larger), shall be made with UL-Listed compression style long barrel two-hole terminal lugs rated 600V, 90°C. Provide Burndy Type YA-2N, or equivalent.

E. Provide UL-Listed nylon cable ties rated for use in temperatures ranging from 185°F to -40°F to facilitate bundling of conductors. Provide Ty-Rap cable ties as manufactured by Thomas & Betts, or equivalent.

F. Wire pulling lubricants shall be UL-Listed, non-toxic suitable for use with the specified conductor insulation and conduit system. Pulling lubricant shall be rated for use in temperatures below 32°F to accommodate installation conditions where applicable.

2.02 BOXES

A. Outlet Boxes

1. Provide outlet boxes with depth sufficient to accommodate code required volume allowance for the specified installation. Through-wall boxes are not allowed.

2. All outlet boxes shall be provided with at least one 10/32 x 3/8” slotted hexagon head green ground screw.

3. Outlet boxes scheduled for concealed work shall be 4” square galvanized steel. Provide with galvanized steel device cover to facilitate flush finish with wall or ceiling material. Provide outlet boxes as manufactured by Thomas & Betts/Steel City, or equivalent.

4. Outlet boxes scheduled for concealed applications in masonary or concrete shall be UL-Listed as suitable for the application. Provide outlet boxes as manufactured by Thomas & Betts/Steel City, or equivalent.

5. Outlet boxes shall be cast malleable iron – Appleton Type FD, or approved equivalent where scheduled for use in the following applications:

a. Interior surface mounted below 8’-0” AFF.

b. Interior surface mounted where RMC conduit is specified.

c. Interior surface mounted where exposed to and/or adjacent to moisture, water or steam.

d. Interior surface mounted where indicated as weatherproof on the drawings.

e. All exterior surface mounted applications.

6. Device covers for cast malleable iron outlet boxes shall be gasketed malleable iron with stainless steel fasteners.

B. Junction and Pull Boxes

1. Junction and pull boxes shall be constructed of 16-gauge galvanized steel minimum. Provide junction and pull boxes as required to facilitate installation of specified circuitry. Junction and pull boxes shall be sized in accordance with code requirements.

2. Finish shall be ANSI 61 gray polyester powder paint finish inside and out, over galvanized steel.

3. Provide NEMA 1 enclosure with removeable screw cover for dry/interior locations, and NEMA 3R enclosure with hinged/gasketed door for wet/exterior locations. Hardware and hinges associated with doors and covers shall be corrosion resistant.

4. Junction and pull boxes shall be as manufactured by Hoffman, or approved equal.

2.03 WIRING DEVICES AND DEVICE PLATES

A. Straight Blade Receptacles

1. Receptacles shall be heavy-duty specification grade rated 20A, 125V (NEMA 5-20R) as manufactured by Hubbell, or approved equal by Pass & Seymour, or Leviton. Provide all receptacles from the same manufacturer. Catalog numbers listed below indicate the level of quality required. Substitutions shall be equivalent to devices specified.

a. GFCI Duplex Receptacle: Hubbell HBL GFR5362SGW (White) Listed TR/WR

2.04 ELECTRICAL IDENTIFICATION

A. Equipment Nameplates

1. Equipment nameplates shall be BLACK – 1/16” thick plastic with white center lamination. Engraved verbiage/text shall be white. Text letters shall be ¼” tall minimum.

a. Nameplates shall be attached to equipment located in dry/interior locations with high strength adhesive cement.

b. Nameplates shall be attached to equipment located in wet/exterior locations with galvanized steel or brass screws.

2. Flash protection warning labels shall be vinyl pressure sensitive adhesive sticker/label as manufactured by Thomas & Betts LB 94913, or equivalent.

3. See the Equipment Nameplate and Label Detail on the drawings for additional information.

2.05 LIGHTING FIXTURES

A. General Requirements

1. Provide lighting fixtures as specified herein and as shown on the drawings. Refer to Scheduled of Lighting Fixtures on the drawings for additional information.

2. Lighting fixtures shall be provided with all approved/UL-Listed appurtenances and hangers for a complete and operational lighting system.

3. Refer to the Schedule of Lighting Fixtures for specific lamp and driver / ballast requirements which may deviate from this specification.

B. Lamps

1. Refer to the Schedule of Lighting Fixtures for specific lamp type, wattage, color rendering index (CRI), and correlated color temperature (CCT) in degrees Kelvin.

2. Lamps shall be as manufactured as indicated on drawings.

   a. Lighting fixtures of the same type shall be provided with lamps from the same manufacturer to maintain consistency and uniformity.

2.06 PANELBOARDS

A. General Requirements

1. Provide panelboards as specified herein, and as shown on the drawings. The panelboards and all associated components shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA and UL – NEMA PB1, UL 50 and UL 67.

2. Panelboards shall be provided with an UL Service Entrance Label where used as service entrance equipment. Panelboards used as service entrance equipment shall be equipped with incoming line isolation barriers and a removeable neutral bond-to-ground to accommodate solidly grounded wye systems.

3. Panelboard enclosures shall be at least 20” wide made from galvanized steel. Provide minimum gutter space in accordance with the Massachusetts Elecrical Code, (MEC). At least four interior mounting studs with adjustable nuts shall be provided.

   a. Enclosures for designated double-section panelboards shall be bolted together to form one unit, unless shown otherwise on floorplans.

4. Trims for branch circuit panelboards shall be supplied with a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall have a semi-flush cylinder lock and catch assembly. Doors over 48” in height shall have auxiliary fasteners.

5. Distribution panelboard trims shall cover all live parts. Overcurrent protective device handles shall be accessible.

6. Surface mount panelboard trims shall be same height and width as enclosure. Flush mount panelboard trims shall overlap the enclosure by 3/4 of an inch on all sides.

    a. Trims for designated double-section panelboards shall be two-piece construction with doors of equal size over each section.

7. Surfaces of the trim assembly shall be cleaned, primed, and finished with ANSI 61 light gray enamel.

8. Provide an engraved nameplate for each panelboard and/or panelboard section.

9. A circuit directory card with a clear plastic protective cover shall be supplied and mounted on the inside of each door.

10. All panelboard locks shall be keyed alike.

B. Bussing

1. Main bus bars shall be copper sized to carry the full panelboard rating as specified on the drawings.

2. A separate equipment ground bus shall be provided for each panelboard.

    a. For isolated ground applications, provide an additional isolated ground bus insulated from the panelboard enclosure and equipment ground bus.

3. A full-size 100% rated insulated neutral bus – with rated capacity equal to the phase bus, shall be included for all panelboards shown with a neutral connection.

    a. Neutral bus shall be 200% rated where oversized/double neutral conductors are specified and/or where the panelboard is supplied via a K-Rated transformer.

C. Ratings

1. Panelboards rated 240V AC or less shall have short circuit ratings as shown on the drawings, but not less than 22kA RMS symmetrical.

2. Panelboards shall be labeled with an UL short circuit rating.

3. Series Ratings are not allowed.

D. Lighting and Appliance Branch Panelboards

1. Panelboards shall be Eaton Cutler-Hammer Type PRL1a for 120/240V applications. Approved equal panelboards as manufactured by General Electric, Siemens or Square D will also be considered.

E. Overcurrent Devices

1. Circuit breakers shall be bolt-on thermal magnetic type with common trip handle for all multiple-pole circuit breakers.

    a. Multiple-pole circuit breakers shall have internal common trip crossbars to enable simultaneous tripping of each pole.

2. Circuit breakers shall have handle trip indication and/or a trip indicator in the window of the circuit breaker housing.

3. Circuit breaker accessories shall be UL-Listed for field installation.

2.07 HANDHOLES

1. Handholes and associated covers shall be constructed of polymer concrete consisting of aggregate matrix bound together with a polymer resin. Internal reinforcement may be provided by means of steel and/or fiberglass.

2. Material shall have the following properties:

   a. Compressive strength: 9000 psi

   b. Flexural strength: 6000 psi

   c. Tensile strength: 800 psi

3. The installed enclosure shall be rated for a minimum test load of 8000 pounds distributed over a 10” x 10” area, and intended for non-deliberate vehicular traffic only.

4. The boxes and covers shall be gray. Covers shall be provided with stainless steel bolts at each corner. The logo shall specifically identify the service inside, “Electrical”, “Communications”, “Lighting”, etc. The logo shall be permanently recessed in the cover. Non-metallic covers shall be provided with electronic markers encased in the polymer concrete for ease in locating buried handholes.

5. Precast handholes shall be equal to Quazite composolite or approved equal by Concast Inc. or Jensen Precast. Equal construction in precast or cast in place concrete will be accepted.

PART 3 - EXECUTION

3.01 CONDUIT AND RACEWAYS

A. General Requirements

1. Conduit and raceways shall be sized in accordance with the requirements of the Massachusetts Electrical Code (MEC) unless oversized conduit and raceways are shown on the drawings. Minimum conduit size shall be ¾” for all systems.

2. Conduit and raceways shall be installed concealed unless noted otherwise on the drawings. Concealed conduit and raceways shall be routed parallel/perpendicular to building lines in as direct a route as possible to minimize the number of bends.

3. Conduit and raceways may be installed exposed on unfinished walls and ceilings with exposed structures, in electrical/mechanical rooms, attics, and roof/penthouse spaces. Exposed conduit and raceways shall be routed parallel/perpendicular to building lines in as direct a route as possible to minimize the number of bends.

4. Conduit and raceways shall be mechanically/electrically continuous from source-supply to outlet.

B. Conduit shall be secured to metallic enclosures with lock nut and bushing inside. Bushings shall be bonding type for conduit connections to metallic enclosures with concentric or eccentric knockouts.

C. Lock nuts and bushings shall not be required where conduits are screwed into threaded hubs.

1. Conduit and raceway support system shall be attached to the building structure utilizing galvanized corrosion resistant components suitable for use with the conduit and raceway system.

a. Stand-off conduit support clips shall be provided for conduits scheduled to be installed on exterior locations, and/or on interior/wet locations.

2. Conduit cutting, bending and/or threading shall be performed with the appropriate tools. All cut edges shall be reamed/finished to remove rough edges.

3. Conduit systems shall be installed complete prior to the installation of conductors. Conduit runs shall be protected from the entrance of dirt and debris throughout construction. Both horizontal and vertical conduit runs shall be blown-through and cleaned before conductors are installed.

4. Conduits designated as spare shall be sealed with a bushing and appropriate insert to prevent the entrance of dirt and debris.

D. Provide an adhesive label (equivalent to P-Touch) for each spare conduit with the verbiage:

1. SPARE CONDUIT FROM "*(origin)*" TO "*(destination)*"

a. Provide label at each end of conduit run, as well as at the entry/exit of junction and pull boxes.

E. Electrical Metallic Tubing (EMT)

1. EMT shall be provided in the following locations unless noted otherwise on the drawings:

a. Concealed above acoustical tile ceilings and/or within metal stud wall partitions.

b. Concealed within masonary walls.

c. Exposed within mechanical / electrical / telecommunications rooms.

d. Exposed within mechanical / electrical utility chases and closets.

e. Exposed locations routed along ceilings and/or walls above 8'-0" AFF, and not subject to damage.

2. EMT shall not be provided in the following locations:

a. Exposed applications below 8'-0" AFF – except within electrical and telecommunications rooms.

b. Exterior, and/or damp / wet / corrosive locations.

c. Underground below grade, and/or within concrete floor slabs.

d. Within hazardous/classified areas.

3. EMT shall not be utilized for circuits rated greater than 600V.

4. EMT shall be utilized for the following systems/circuitry where applicable:

a. Lighting and receptacle branch circuitry

b. Power distribution feeder circuitry

F. Galvanized Rigid Metal Conduit (RMC)

1. RMC may be provided for all conduit applications specified for EMT.

2. Provide RMC for the following locations:

a. Exposed applications below 8'-0" AFF – except within electrical and telecommunications rooms where EMT is permissible.

b. All above grade exterior and/or damp/wet locations.

c. Within hazardous/classified areas.

d. RMC shall be utilized for circuitrs rated greater than 600V.

G. Rigid Nonmetallic Conduit (RNC)

1. All RNC connections shall be made with solvent cement in accordance with the manufacturers instructions.

2. RNC shall not be utilized for penetrations of concrete slabs, or building walls/foundations. RNC shall transition to RMC at each building entry/exit point, (floor and/or wall penetration).

a. Transition from RNC to RMC for floor slab penetrations shall be made underground prior to the conduit elbow.

H. Miscellaneous Conduit Fittings

1. Expansion Fittings: Provide an expansion fitting for conduit in the following applications:

a. Conduit buried, or rigidly secured on opposite sides of building expansion joints.

b. Runs of exposed conduit subject to expansion and contraction due to variations in temperature.

2. Conduit and raceways shall cross building expansion joints at right angles.

3. Through Wall and Floor Seals: Provide a sealing fitting for applications where conduits pass from warm (interior) to cold (exterior) locations.

3.02 WIRE AND CABLE (600V)

A. Homerun designations shown on the drawings are diagrammatic. Provide branch/feeder circuitry from source to load as required for a complete system.

B. Branch circuits shall be provided with a separate neutral conductor unless noted otherwise on the drawings.

1. Branch circuits with shared/common neutral conductor shall only be provided where specifically shown on the drawings.

2. Branch circuits with shared/common neutral conductor shall not be connected to the same phase to ensure cancellation of the return current in the neutral conductor.

C. Voltage drop for branch circuits shall be less than 3%. Branch circuits longer than 75'-0" for 120V applications – measured from the source to the last outlet, shall be increased one size above the conductor size shown on the drawings minimum unless noted otherwise.

D. Conductor sizes shown on the drawings are based on no more than three (3) current-carrying conductors in a conduit.

1. Installation of no greater than twelve (12) current-carrying conductors, (up to six branch circuits), in a single conduit may be allowed if the conductor size is increased/adjusted to the required ampacity to accommodate derating factors listed in the MEC.

E. Conductor color code shall be as follows:

1.	**Phase**	**120/240V**
2.	A	Black
3.	B	Red
4.	Neutral	White
5.	Ground	Green

F. Type MC Metal Clad Cable

1. Type MC Metal Clad Cable may be used in concealed locations for branch circuit wiring where specifically noted on the drawings.

G. Splices / Terminations

1. Cut back/remove insulation with appropriate tools to ensure conductors are not nicked and/or damaged.

2. Utilize an appropriate compression tool to faciliate installation of compression style splice barrels, and/or terminal lugs.

3. No more than twelve (12) splices of current-carrying conductors, (up to six branch circuits), shall be allowed in a single junction box or enclosure.

4. Terminations shall not be stacked and/or bent unless specifically listed as suitable for the application.

H. Cable Pulling

1. Utilize wire-pulling lubricant to reduce friction in accordance with manufacturer's instructions.

2. Circuit conductors shall be pulled into conduit and raceways at the same time. New conductors shall not be pulled into conduit and raceways with existing conductors already installed.

3. Cable pulls assisted by mechanical means shall utilize appropriate equipment such as ropes and pulleys. Attach ropes to conductors with basket-weave grips on pulling eyes. Pulling tension shall be monitored / measured throughout the entire pull.

4. Prepare cable-pulling calculations and submit for approval prior to mechanically assisted pulls.

3.03 BOXES

A. Outlet Boxes

1. Single-gang and double-gang outlet boxes shall be attached to metal studs with two self-tapping screws minimum. Three-gang or greater outlet boxes shall be fastened to studs on both sides of the box.

2. Hardware/fasteners utilized for mounting outlet boxes in wet/damp locations shall be galvanized and corrosion resistant.

3. Outlet boxes shall not be installed back-to-back. Installation of outlet boxes shall be staggered along adjacent studs.

4. Provide internal metal barrier(s) within outlet boxes to separate lighting switches where voltage between adjacent switches exceeds 300V.

5. Lighting switches shown together on the drawings shall be provided in a multiple-gang arrangement with an associated multiple-gang device plate unless noted otherwise.

6. The installation of floor outlet boxes in above grade concrete floor slabs shall be approved by the structural engineer and/or architect prior to rough-in. The use of floor outlet boxes shall not degrade the structural integrity or fire-rating of the floor slab.

B. Junction and Pull Boxes

1. Covers of junction and pull boxes shall be accessible. Junction and pull boxes shall not be installed above ceilings except where ceiling is removable, and/or where an access panel is provided.

2. The covers of junction and pull boxes utilized in the routing of concealed conduit runs shall be installed flush with the finished wall or ceiling.

3. Conductors shall be secured within junction and pull boxes via non-conductive/non-combustible appurtenances. Conductors shall not come into contact with the cover of the box. No conductor shall be unsupported for more than 30”.

4. Maintain a minimum distance of 24” between pull boxes.

5. Prepare pull box sizing calculations and submit for approval prior to installation to ensure pull box size/dimensions are in accordance with MEC requirements.

6. Equipment nameplates scheduled to be installed on junction and pull boxes shall include verbiage indicating power source, voltage, phase and load.

3.04 WIRING DEVICES AND DEVICE PLATES

A. General

1. Utilize the integral attachment screws, or back-wiring chambers which utilize screws for compressing the connection on the wire to facilitate attachment of branch circuitry.

2. Quick-stab connections that do no require/utilize a screw-on attachment of the conductor are not acceptable.

3.05 ELECTRICAL IDENTIFICATION

A. Equipment Nameplates: Provide equipment nameplates on the following:

1. Loadcenters

2. Junction and Pull Boxes

B. Equipment nameplates shall indicate the equipment tag as shown on the drawings, load description, electrical rating – voltage, phase and/or circuit number, and power source. See the Equipment and Label Detail on the drawings for additional information.

C. Prepare a list of proposed nameplates and submit for approval prior to order.

3.06 LIGHTING FIXTURES

A. General Requirements

1. Installation and support of lighting fixtures shall be in accordance with the requirements of the MEC and respective manufacturer's recommendations.

2. Lighting fixtures shall not be installed until work of other trades that could potentially damage fixtures is complete.

3. All lighting fixture reflectors shall be handled/installed with gloves to avoid finger markings on reflective surface. Reflectors determined to have fingerprints shall be cleaned/wiped down free of dust and dirt in accordance with manufacturer's recommendations for cleaning.

4. Provide all lighting fixture mounting accessories including, but not limited to brackets, straps and mounting plates as required for proper installation.

B. Lamps

1. All lamps shall be handled/installed with gloves to avoid finger markings. Lamps determined to be dirty, or with fingerprints shall be cleaned/wiped down free of dust and dirt.

2. Lamps shall not be operated during construction other than for initial testing. If it is determined lamps have been operated for an extened period, the contractor shall provide replacement lamps at no additional cost to the Owner prior to project close-out.

3.07 PANELBOARDS

A. Factory Testing

1. Standard manufacturer testing shall be performed on all panelboards and associated components. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

B. Storage

1. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at the time of shipment.

2. Panelboards shall be stored on-site in a clean dry space. Equipment shall be covered and suitably protected to keep out dirt, construction debris, and water.

3. The storage area shall be well ventilated, free from excess dust/dirt/humidity, and away from hazardous materials.

4. The storage area and/or the equipment enclosure(s) shall be heated to prevent possible condensation on interior components.

C. Installation

1. Install all Panelboards per manufacturer's recommendations as listed in the manufacturer's installation and maintenance manuals.

2. Panelboard interiors shall be cleaned and vacuumed to remove construction dust and debris prior to energizing.

3. All circuit breakers and/or fusible switches, and associated enclosure doors shall be adjusted to ensure free mechanical operation in accordance with manufacturer's installation instructions.

4. All electrical connections shall be tightened/made with a calibrated torque wrench in accordance with the minimum acceptable values listed in the manufacturer's installation instructions.

5. Panelboards scheduled for installation at exterior building perimeter walls below grade shall be provided with mounted to 1 5/8" galvanized steel channel support system to establish air space behind the equipment.

6. Circuit breakers equipped with a lockable handle shall have a locking mechanism that will not prevent or inhibit the circuit breaker from performing its protective function. Provide circuit breaker with lockable handle for the following:

   a. Where the circuit breaker is used as a motor disconnecting means, and is not in sight of the motor / driven machinery.

   b. Where the circuit breaker supplies fire alarm equipment, (e.g. FACP, Power Supply), - handle shall be capable of being locked in the ON position.

   c. Any other loads noted on the schedules – refer to drawings for additional information.

7. Circuit breaker trip and time delay settings shall be adjusted in the field to the values determined by the short circuit and coordination study where applicable.

8. Circuits identified as SPARE shall be left in the OFF position. Unused openings for future circuit breakers and switches shall be closed using identified panel filler pieces.

9. Provide a typed circuit directory card for each panelboard. Each circuit shall be identified to indicate the area and load served. The identification shall include sufficient detail to allow each circuit to be distinguished from all others.

10. Provide an equipment nameplate for each Panelboard, as well as each circuit breaker and/or fusible switch for each Distribution Style Panelboard. Refer to the Electrical Identification section of this specification for additional information.

11. Collect all panelboard keys and turn over to the Owner at the completion of the project.

3.08 HANDHOLES

A. Handholes

1. Do not construct or set manholes until final conduit grading has been determined, including field changes required by underground interferences. Set frames and covers to final grade.

2. Commercial precast assemblies shall be set on six (6) inches of level, 90 percent compacted granular fill, ¾ inch to one (1) inch size, extending twelve (12) inches beyond the manhole on each side. Granular fill shall be compacted by a minimum of four passes with a plate type vibrator.

3. Cast-iron frames and covers not buried in masonry shall be cleaned of mortar, rust, grease, dirt and other contaminants, and given a coat of bituminous paint. Steel frames not buried in masonry and steel covers shall be cleaned of mortar, dirt and grease by an approved blasting process. Surfaces that cannot be cleaned satisfactorily by blasting shall be cleaned to bare metal by wire brushing or other mechanical means. Surfaces contaminated with rust, dirt, oil, grease, or other contaminants shall be washed with solvents until thoroughly cleaned. Immediately after cleaning, surfaces shall be coated with a pretreatment coating or be given a crystalline phosphate coating. As soon as practicable after the pretreatment coating has dried, treated surfaces shall be primed with a coat of primer and one coat of synthetic exterior gloss enamel.

END OF SECTION

SECTION 310000

EARTHWORK

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The work of this section includes but is not necessarily limited to the following:

1. Excavating, filling, grading, and backfilling.
2. Providing, placing, and compacting of backfill materials.

1.2 RELATED SECTIONS

A. Site Preparation and Demolition, Section 024100

B. Concrete Paving, Section 321313

C. Cast-in-Place Concrete, Section 033053

D. Permeable Precast Unit Paving Section 321413

E. Flexible Porous Pavement 321243

F. Poured in Place Rubber Resilient Surfacing Section 321816

G. Irrigation Section 328400

1.3 SUBMITTALS

A. Soil Materials: Submit 25-lb samples and results of recent (within previous month) grain size analyses for each soil material at least three weeks prior to use and no more than 6 months prior to use.

B. Synthetic Materials: Submit manufacturer's information for synthetic materials at least three weeks prior to use.

C. Provide submittals to the Owner's Representative at least 30 days before installation. Submittals are for the record and do not relieve the Contractor of his sole responsibility for means and methods of construction.

1.4 EXISTING CONDITIONS

A. Site Information:

1. The Contractor may perform test borings and other explorations at no cost to Owner.

B. Existing Utilities:

1. Locate existing underground utilities in areas of work. Provide adequate means of support and protection during earthwork operations.

2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during

excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

3. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Owner and then only after acceptable temporary utility services have been provided.

    a. Provide minimum of 48-hour notice to Owner, and receive written notice to proceed before interrupting any utility.

C. Protection of Existing Structures: Provide bracing, shoring, sheeting, underpinning or other retaining structures necessary to prevent movement or settlement of existing or new construction, utilities, paving, light standards, piping or conduit. Responsibility for the strength and adequacy of retaining structures, and for the safety and support of construction, utilities, or paving, and for any movement, settlement, or damage thereto shall be the Contractor's responsibility. In exercising this responsibility, the Contractor shall, if required, retain a qualified consultant who is a licensed Professional Engineer registered in the Commonwealth of Massachusetts to design, check, and approve all temporary retaining structures and other items pertinent to this work.

1.5 LAYOUT AND GRADES

A. Layout work, establish and maintain necessary markers, bench marks, grading stakes, and other stakes as required. Establish permanent benchmarks by employment of a registered land surveyor or professional civil engineer. Bring any deviations from the locations and elevations indicated on the Drawings to the attention of the Owner’s Representative immediately.

B. Verify all existing ground surface elevations within the contract limits.

C. The Owner’s Representative may make such adjustments in the field in grades and alignments as are found necessary in order to avoid interference with any special conditions encountered.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Ordinary Borrow: Granular soil, free from debris, organics, or frozen materials. Ordinary Borrow shall have less than 20% by weight passing the No. 200 sieve and shall contain no stones larger than 6 inches in maximum dimension. On-Site Fill may be used with the approval of the Owner’s Representative and does not necessarily need to meet the above requirements for ordinary borrow.

B. On-Site Fill: On-Site Fill may be used in lieu of Ordinary Borrow with the approval of the Owner’s Representative. Screen and remove all asphalt, cobbles, and boulders larger than 6 inches from the On-Site Fill.

C. Crushed Stone: Conform to the requirements of Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, Section M2.01.4 or M2.01.5 (3/4 inch or 1/2 inch stone).

D. Dense Graded Crushed Stone: Conform to the requirements of Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, Section M2.01.7 (1-1/2 inch stone).

D. Clean Washed Crushed Stone: Conform to the requirements of Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, Section M2.01.1, M2.01.2, M2.01.3, or M2.01.4 (3/4 inch to 1-1/2 inch stone) and shall be clean and washed.

H. Sand Bedding: MHD Section M1.04.0 Type B.

I. Structural Fill: Well-graded natural sand and gravel free from deleterious materials conforming to following gradation:

Opening or Sieve No.	Percent Passing by Weight
3 inches	100
1/2 inch	50-100
No. 4	35-85
No. 16	20-65
No. 50	5-40
No. 200	0-8

A. #57 Stone: See Permeable Precast Unit Paving Section 321413

2.2 SYNTHETIC MATERIALS

A. Stabilization Non-woven Geotextile: Non-woven, needle-punched, meeting the requirements of AASHTO M 288 for Stabilization Geotextile.

B. Stabilization Woven Geotextile: Woven, meeting the requirements of AASHTO M 288 Class 1 for Stabilization Geotextile. Use stabilization geotextile as shown on the drawings at each inlet row of the subsurface detention system to prevent scouring of the foundation stone

D. Separation Non-woven Geotextile: Non-woven, needle-punched, meeting the requirements of AASHTO M 288 Class 2 for Separation Geotextile. Use separation geotextile as shown on the drawings.

E. Select Fill: Same requirements as Structural Fill except the percent passing the No. 200 sieve shall be 0-4 percent.

D. Perforated PVC Pipe:
1. Perforated Pipe shall conform to ASTM D 2729. Orientation of perforations shall be coordinated with the Engineer.
2. PVC Pipe shall be supported by compacted-screened gravel (as per Section A3). No pipe or fitting units shall be supported on saddles, blocking or stones.

2.2 USE OF SOIL MATERIALS

A. Use Crushed Stone, Dense Graded Crushed Stone, or Select Fill (at the Contractor's option) below all exterior slabs-on-grade, and as indicated on the Drawings.

B. Use Structural Fill as backfill in the following locations:

1. As shown on the drawings.

2. Below footings, where fill is required.

C. Use Ordinary Borrow if additional fill is required and other fill materials are not specified otherwise. Use On-Site Fill at locations approved by the Owner's Representative.

2.3 SYNTHETIC MATERIALS

A. Separation Non-woven Geotextile: Non-woven, needle punched, meeting the requirements of AASHTO M288 Class 2 for Separation Geotextile. Use separation geotextile as shown on the drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. Protect existing structures, utilities, sidewalks, pavements, and other facilities from damage by equipment, settlement, undermining, washout, and other hazards created by earthwork operations.

B. Perform excavation work in compliance with OSHA guidelines and regulations.

C. Keep excavation continuously free of water from all sources without extra cost to the Owner. Should surface, rain or ground water be encountered during the operations, the Contractor shall furnish and operate pumps or other equipment, and provide all necessary piping to keep all excavations clear of water at all times and shall be responsible for any damage to work or adjacent properties from such water. All piping exposed above surface for this use shall be properly covered to allow foot traffic and vehicles to pass without obstruction.

3.2 EXCAVATION

A. Excavation includes removal and placement (cut and fill) of materials to subgrade elevations indicated, or required to accommodate new construction, regardless of character and obstructions encountered and shall be understood to include rock, earth, fill, foundations, pavements, curbs, piping and debris.

B. Unauthorized Excavation: When suitable bearing material is encountered at subgrade elevations shown and excavation is made to greater depth, backfill the overexcavation with 3,000 psi concrete, at no additional cost. Select Fill may be used if approved by the Owner's Representative.

C. Material Storage: Segregate and stockpile excavated materials until required for reuse, backfill, or off-site disposal.

D. Subgrade Preparation in Granular Soil: For footings, slabs, and other foundation structures, remove loose or disturbed soil and compact subgrade with a minimum of five passes with a vibrating roller or plate weighing at least 250 pounds and imparting an impact load of at least 2.5 tons.

E. Subgrade Preparation in Clayey Soil: For footings, slabs, and other foundation structures, make final excavation using a smooth-bladed bucket to avoid disturbing the excavation subgrade. Immediately cover the subgrade with a geotextile and 6 inches of crushed stone to protect the subgrade from disturbance. Alternatively, place a 4-inch-thick concrete mud mat over the subgrade to protect it.

F. Subgrade Preparation on Slopes: Where embankment is to be placed against existing earth slopes steeper than 3 to 1, the slope shall be broken up into steps as the fill is placed in order to provide a suitable bond between the existing ground and the new embankment. Both the material cut out and the bottom of the area cut shall be compacted along with and to the same

degree as the material being placed in the embankment. An exception to this is where existing stone on the reservoir slopes is kept in place.

3.3 EXCAVATION SUPPORT

A. Slope sides of excavations to comply with OSHA regulations. Shore and brace, or use trench boxes, where sloping is not feasible because of space restrictions or slope instability.

B. Do not excavate below a line drawn downward at 2 horizontal on 1 vertical from the underside of the closest edge of any proposed or in-place footing or utility at a higher elevation without providing adequate shoring and bracing to prevent loss of support of the footing or utility.

3.4 COMPACTION

A. Compact soil to not less than the following percentages of maximum dry density determined in accordance with ASTM D1557, Method C. Compact soil using the lift thicknesses indicated.

1. Crushed Stone: Compact to an unyielding surface or until further compaction results in no additional densification.
2. Pavement Subbase: 95% compaction in 9-inch lifts.
3. Ordinary Borrow and On-Site Fill: 90% compaction in 12-inch lifts (9-inch lifts above utilities and for compactors weighing less than 500 pounds).

B. Moisture Control: Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content for all soils.

3.5 BACKFILL

A. Place acceptable soil material in layers to required subgrade elevations for each area classification shown in the drawings.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Inspection, testing, approval, and recording locations of underground utilities.
2. Removal of concrete formwork.
3. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.

C. Placement of Fill:

1. Do not place fill on surfaces that are muddy, frozen, or contain frost or ice.
2. Place fill evenly adjacent to structures to required elevations. Take care to prevent wedging action of fill against structures by carrying material uniformly around structure to approximately same elevation in each lift.
3. Brace subgrade walls before placing fill against the walls.

3.6 FROST PROTECTION

A. Do not excavate to full depth when freezing temperature may be expected unless intended improvements can be accomplished immediately after the excavations have been completed. Protect subgrades from frost if progress is delayed. Do not install foundations, slabs, or utilities on frozen ground. Protect the subsurface of in-place foundations from frost. Should protection fail, remove frozen materials and replace with concrete or Structural Fill as

directed at no cost to the Owner.

B. Keep the site clear and free of accumulations of snow as necessary to carry out the work.

C. Do not use fill materials containing snow, frost, or frozen soil, and do not backfill over frozen material.

D. Protect the underside of all in-place construction from frost penetration. Provide frost protection for all in-place foundations, slabs, and utilities during all periods of freezing temperatures until such time as the entire project is complete. Provide, as a minimum, frost protection consisting of a 3.5-foot thickness of earth or equivalent in insulating properties.

3.7 UTILITIES

A. Subgrade: Remove loose and disturbed soil. Compact subgrade with a vibratory compactor weighing at least 250 pounds. If subgrade “pumps” due to compaction, then either use static compaction or stop compaction, as directed by the Owner’s Representative

D. Install plastic warning tape directly above utilities, 12 inches below finish grade.

3.9 GRADING

A. Rough grading shall include the shaping, trimming, rolling, and refinishing of all surfaces of the subbase, shoulders, and earth slopes, and the preparation of grades as shown on the Drawings. Rough grade shall be the top surface of gravel, crushed stone and ordinary borrow ready to receive the final surface material application.

B. Unless stated otherwise, all rough grades shall represent compacted material depths, as specified herein. Slope finish grades to drain surface water away from buildings. Slope finish grades to drain surface water away from walks, paving, pools, or fountains unless otherwise shown on drawings. Generally, grade with uniform slope between points where elevations are given or between points and existing grades.

C. In the case of planting areas, compaction requirements for subgrades and fills shall be considered minimums and maximums within the density percentages called for, and any over-compaction of subgrades or fills which would be detrimental to planting objectives shall be corrected by loosening subgrades or fills through tilling or other means and re-compacting to specified compaction limits.

3.10 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow Owner’s Representative to test and observe subgrades and backfill layers before further construction work is performed.

B. If, in opinion of Owner’s Representative based on testing and observation, fills have been placed below specified percent compaction, provide additional compaction at no additional expense.

3.11 PROTECTION AND REPAIR

A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

C. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required percent compaction prior to further construction.

3.12 DISPOSAL OF EXCESS SOILS AND WASTE MATERIALS

A. Legally dispose of excess soil and other waste materials off site.

END OF SECTION

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SECTION 321216
BITUMINOUS CONCRETE PAVEMENT & PAVEMENT MARKINGS

PART 1 – GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 DESCRIPTION OF WORK

A. Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Preparation of subgrade
2. Preparation of compacted gravel base course
3. Bituminous Concrete Paving
4. Acrylic Resurfacer for under Color Coating
5. Color coating for bituminous concrete
6. Line Paint

1.03 REFERENCE STANDARDS

A. The following standards are applicable to the work of this Section to the extent referenced herein:

1. Commonwealth of Massachusetts, Massachusetts Highway Department (MHD), Standard Specifications for Highways and Bridges, latest English Edition with amendments, hereinafter referred to as the “Standard Specifications.”. References made to particular sections or paragraphs in the Standard Specifications shall include all related articles mentioned therein.

2. ASTM: American Society for Testing and Materials.

3. AASHTO: American Association of State Highway and Transportation Officials.

1.04 SUBMITTALS

A. Provide Product Data, Test Reports and Certificates of Compliance for all materials provided under this section.

1.05 EXAMINATION OF SITE AND DOCUMENTS

A. The Contractor shall fully inform him/herself of existing conditions of the site

B. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best of the Owner’s Representative's knowledge.

1.06 QUALITY ASSURANCE

A. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

B. Layout and Grading: After staking out the work, and before beginning final construction, obtain the Owner's Representative's approval for layout and grades.

1.07 PROJECT CONDITIONS

A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50°F (10°C), and when temperature has not been below 35°F (1°C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphaltic concrete base and surface courses when ambient temperature is above 40°F (4°C) and rising.

PART 2 - PRODUCTS

2.01 COMPACTED GRAVEL BASE COURSE AND SUBBASE PREPARATION

A. Compacted gravel shall be used as a base course material under pavements.

B. Compacted gravel shall consist of inert material that is hard, durable stone and coarse sand free from loam, clay, surface coatings, other organic material and deleterious materials. The maximum size of stone gravel shall be three (3) inches in the largest dimension. The materials shall meet the Massachusetts DOT Standard Specifications for "Gravel Base Course".

C. Reuse of existing gravel base course materials shall be permitted if the existing material meets the Massachusetts DOT Standard Specifications for "Gravel Base Course".

D. Compacted subbase shall conform to Section 310000 – Earthwork.

2.02 BITUMINOUS CONCRETE PAVING

A. General: Use locally available materials and gradations that exhibit a satisfactory record of previous installations.

B. Coarse Aggregate: Sound, angular crushed natural rock complying with Section M3.11.04 of the Standard Specifications.

C. Fine Aggregate: Natural sand, stone sand, blend of sand and stone screenings or, blend of natural sand and stone sand complying with Section M3.11.04 of the Standard Specifications.

D. Mineral Filler: Rock dust, slag dust, hydrated lime, hydraulic cement, or other inert material complying with Section M3.11.05 of the Standard Specifications and ASTM D242.

E. Asphalt Cement: Complying with Section M3.01.0 of the Standard Specifications and ASTM D3381 for viscosity-graded material.

F. Prime Coat: Cut-back asphalt type, complying with Section M3.02.0 of the Standard Specifications and ASTM D2027, MC-30, MC-70 or, MC-250.

G. Tack Coat: Emulsified asphalt, complying with Section M3.03.0 or M3.03.1 of the Standard Specifications and ASTM D977 or ASTM D2397; SS-1, SS-1h, CSS-1 or CSS-1h.

H. Provide plant-mixed binder course and top course mixtures complying with Section M3.11.00 of the Massachusetts Standard Specifications.

2.03 ACRYLIC RESURFACER FOR UNDER COLOR COATING

A. Acrylic Resurfacer for Bituminous Concrete shall be applied under the Color Coating play graphics.

B. Acrylic resurfacer shall be manufactured or supplied by Nova Sports USA; California Paint Products; Deco; Or Streetprint/Integrated Paving Concepts; or Approved Equal.

C. Sand shall be clean, dry sand with 100% passing through a #80 mesh sieve.

D. Water shall be clean and potable.

2.04 COLOR COATING FOR BITUMINOUS CONCRETE

A. An acrylic color surfacer manufactured by the same company that manufactures the acrylic resurfacer shall be used. The acrylic color surface system shall be designed for high traffic athletic area use. All coatings shall be pure acrylic containing no asphaltic or tar emulsions nor any vinyl, alkyd or non-acrylic resins. The color system shall be factory mixed compounds requiring only the addition of water at the job site except for the addition of sand to the surfacing layer. All materials shall be delivered to the job site in sealed containers with the manufacturer's label affixed. Color to be selected by Landscape Architect.

B. Sand shall be clean, bagged sand (50 to 60 mesh).

C. The paint shall be suitable for use over all types of bituminous surfaces. When applied over emulsified asphalt, it shall not cause lifting, crazing, peeling, or other damage to the base.

D. Paint colors available for color selection shall include each of the following from one manufacturer's source: red, green, light green, sky blue, dark blue, brown, tan, yellow, orange, purple, gray, black, and white. Specific colors to be selected by Landscape Architect.

2.05 LINE PAINT

A. Line Paint shall be a highly reflective, high-hide, 100% acrylic marking paint intended and suited for use over any bituminous concrete surface or acrylic color-coating system in recreational or light traffic areas, "Hi-Hide Line Paint" by DecoTurf or Approved Equal.

B. Paint shall not cause cracking, crazing, peeling, or deterioration to asphalt as is common with solvent-style traffic paints.

C. Paint colors shall be selected from one manufacturer's standard list of colors as approved by the Landscape Architect.

D. The supplied paint shall not require mixing of separate components.

2.06 ADHESIVE PAVEMENT MARKING TAPE

A. Adhesive Pavement Marking Tape shall be as specified in Section 323000 – Site Improvements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The installer shall examine previous work, related work, and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, subgrades, previous work, and conditions.

3.02 CONSTRUCTION OF GRAVEL BASE COURSE UNDER ALL PAVED AREAS

A. Gravel shall be spread in layers from self-spreading vehicles or with power graders of approved types, or by hand methods. Gravel shall be spread to obtain the required compacted measure. The gravel shall be compacted to not less than 95% of the maximum dry density of the material as determined by the standard AASHTO Test Designation T99 Compaction Test Method C, at optimum moisture content. Compaction shall continue until the surface is even and true to the proposed lines and grades with a tolerance of 3/8” above or below the required cross-sectional elevations and to a maximum irregularity not exceeding 3/8” under a 10 foot line longitudinally. Any specific area which after being rolled does not form a satisfactory, solid stable foundation, shall be removed, replaced and recompacted.

3.03 BITUMINOUS CONCRETE PAVING

A. Surface Preparation:

1. Remove loose material from compacted subbase surface immediately before applying prime coat.

2. Proof roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

3. Notify Contractor of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

4. Prime Coat: Apply at rate of 0.20 to 0.50 gallons per square yard, over compacted subbase. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile.

5. Tack Coat: Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gallons per square yard of surface. Allow to dry until at proper condition to receive paving.

6. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Clean damaged surfaces.

B. Placing Mix:

1. General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225°F (107°C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

    a. Place binder course in 2" compacted thickness.

    b. Place top course in 1-1/2" compacted thickness.

2. Pavement Placing: Place in strips not less than 10' wide, unless otherwise acceptable to Owner’s Representative. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

3. Cutting Existing Paving: Where a definite line of separation between new and existing bituminous paving occurs, cut existing paving with a machine which permits cutting without damaging paving to remain in place, and that will provide clean, sharp joints. Seal cut edges of paving with cut back asphalt and protect until new paving is placed. Cut back any existing paving which becomes damaged, disturbed or settles, due to construction operations, by same method specified above and replace with new bituminous paving, as directed by the Owner’s Representative, without additional cost to the Owner.

4. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

5. Setting Frames and Grates: Do not set frames and grates in paved areas to final grades until placement and compaction of the binder course is completed. Set frames in full mortar beds to grades of proposed surrounding surfaces. Place high early strength cement concrete collars around castings to the grades of the binder course.

C. Rolling:

1. General: Begin rolling when mixture will bear roller weight without excessive displacement.

    a. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

2. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

3. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

4. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

5. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

6. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

    a. Erect barricades to protect paving from traffic until mixture has cooled enough not to become damaged.

D. Field Quality Control:

1. General: Test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Owner's Representative.

2. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

    a. Base course: ±1/2".

    b. Surface course: ±1/4".

3. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10' straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness:

    a. Base course surface: 1/4".

    b. Wearing course surface: 3/16".

    c. Crowned surfaces: test with crowned template centered and at right angle to crown. Maximum allowable variance from template 1/4".

4. Check surface at intervals as required or directed by Owner's Representative

3.04 SURFACE PREPARATION FOR COLOR COATING AND STRIPING

A. Allow new bituminous concrete paving to cure a minimum of 14 days. Do not allow the use of curing agents.

B. Clean the entire surface. Power blowers should be used to remove dust and debris. Pressure washing may be needed to remove stains. Pressure should be less than 2,500 lbs/in^2.

C. Cracks shall be filled prior to surface preparation

3.05 CONDITIONS DURING INSTALLATION OF ACRYLIC RESURFACER, COLOR COATING AND LINE PAINT

A. No portions of the installation process shall be conducted during rainfall, or when rainfall is imminent. The air temperature must be at least 50^{o}F and rising. Do not apply when surface temperature is above 140^{o}F

3.06 APPLICATION OF ACRYLIC RESURFACER

A. Apply one (1) coat of acrylic resurfacer under play graphics only as shown on the Drawings. Dilution with water and sand (or Portland cement, depending on manufacturer) is required. Follow manufacturer's recommendations.

B. Completely follow printed manufacturer's instructions for, but not limited to, dilution ratio of water to sand or Portland cement, gradation of sand, surface preparation and installation of acrylic resurfacer.

3.08 APPLICATION OF PLAYGROUND PAVING GRAPHICS AND LINE WORK PAINT

A. Apply paint for paving graphics in colors as noted on the Drawings. Graphics and colors shall be laid out in the field for approval by the Landscape Architect prior to actual painting.

B. Edges of painted areas shall be smooth, regular, and accurately laid out..

C. All acrylic paint shall be applied as per manufacturer's recommendations. Apply a minimum of (2) coats of all final paint colors, including line work, and all graphics shown on the Drawings. Final paint color shall be solid color fully saturated without holidays, voids, or areas of acrylic resurfacer showing through.

D. Contractor must adequately protect newly painted and resurfaced areas to deter vandalism of the painted surfaces until paint has completely dried and cured. Any and all defacement, vandalism, or damage to the painted surface during the drying or curing period shall be completely repaired by the Contractor without additional cost to the Owner.

3.09 GRADES AND ELEVATIONS

A. The Drawings indicate, in general, the alignment and finish grade elevations. The Owner's Representative, however, may make such adjustments in grades and alignment as are found necessary.

3.10 PROTECTION

A. All rules and regulations governing respective utilities shall be observed in executing all work under this Section. All work shall be executed in such a manner as to prevent any damage to existing trees, curbs, paving, walls, rails, utility lines, structures, and adjoining property.

3.11 FINAL CORRECTIONS

A. The Owner's Representative reserves the right to inspect the work to determine if adjustments are necessary in grade, alignment or layout. The Contractor shall make such adjusts without further compensation.

3.12 CLEAN -UP

A. The Contractor shall remove all debris, construction equipment and scrap material from all areas within the limit of work prior to the final inspection and acceptance.

END OF SECTION 321216

SECTION 32 12 43
FLEXIBLE POROUS PAVING

PART 1 - GENERAL

1.01 CONTRACT REFERENCES

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of the CONTRACT AND GENERAL CONDITIONS.

1.02 SUMMARY

A. This Section specifies requirements for flexible porous paving on the Contract Drawings and as listed below.

B. Related Work: The following Sections contain work related to this Section:

1. Section 310000 Earthwork

1.03 REFERENCES

A. ASTM Standards:

1. 1. ASTM C 666/C 666M-03, "Standard Test Method for Resistance of Concrete to Freezing and Thawing, Procedure A - freezing and Thawing in Water." Samples shall indicate only minimal mass change results after 300 nominal freeze-thaw cycles, and visual examination of the test specimens shall indicate no cracks or breaks.
    a. a. D 3385-03 Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer.
    b. D 3665-06 Standard Practice for Random Sampling of Construction Materials E 329-06a Specification for Agencies Engaged in Construction Inspection and/or Testing.

1.04 SUBMITTALS

A. Qualification Data for Flexible Porous Paving Installer

1. Provide job references from a minimum of three successfully installed Flexible Porous Paving projects, as required herein, including the address, owner/client/general contractor contact info, square footage, and photographs for each project.

2. Manufacturer's Certifications.

B. Manufacturer’s catalog product data, installation instructions, and proposed mix design.

C. Samples for Verification: Provide one 6” diameter sample, full thickness.

1.05 QUALITY ASSURANCE

A. Utilize an Installer certified by the Manufacturer and who has successfully installed flexible porous paving on projects of similar nature or project size.

1.06 PROJECT/SITE CONDITIONS

A. Schedule placements to minimize exposure to wind and heat before curing materials are applied.

B. Avoid placing porous paving if rain, snow, or frost is forecast within 24 hours unless measures are taken as described later. Always protect fresh paving from moisture and freezing.

PART 2 - PRODUCTS

2.01 SUBBASE

A. Coarse aggregates shall meet the durability requirements of ASTM C 33. Subbase shall be as specified in the Drawings and Section 310000 – Earthwork.

2.02 FLEXIBLE POROUS PAVING

A. Flexible Porous Paving shall be Flexipave by KBI Industries or Approved Equal.

B. Bonding: Have the capacity to bind with: wood; steel; concrete; aluminum; compacted aggregate; enamel tile, or; fiberglass

C. Resistance to degradation: Resistant to: chlorine; ozone; bromine; muriatic acid; salt water; oil; transmission oil, and; hydraulic oil.

D. Aggregate:

1. Stone: Triple-washed coarse aggregate, No. 8 coarse aggregate (3/8 to ½ inch) per ASTM C 33. Bagged and labeled as tested and certified by Flexible Porous Paving Manufacturer.

a. Nominal maximum aggregate size shall not exceed ⅓ of the specified paving thickness.

2. Rubber: Recycled passenger tires ground to ⅜” nominal with the wire remnants removed.

E. Binding agent: urethane liquid prepolymer based upon Diphenylmethane-Diisocyanate.

F. Air Entraining Agents: Prohibited.

G. Mix Design: Using materials acceptable to the Manufacturer design a tentative mix and test for the consistency intended for use on the work and specified.

1. The volume by weight of aggregate per cu. yd. shall be 50% of the total dry mix.
2. The volume by weight of the rubber product per cu. yd. shall be 50% of the total dry mix.

3. Permeability: Pervious infiltration rate of 2,000 gallons/square foot/hour.

2.03 FORMS

A. Make forms with steel, wood, or other material that is sufficiently rigid to maintain specified tolerances, and capable of supporting concrete and mechanical concrete placing equipment.

B. Forms shall be clean and free of debris of any kind, rust, and hardened concrete.

C. Form release: Diesel, Bio-diesel or vegetable oil coating.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION

A. Prepare subgrade as specified in the contract documents.

B. Construct subgrade to ensure that the required paving thickness is obtained in all locations.

C. Keep all traffic off of the subgrade during construction to the maximum extent practical. Regrade subgrade disturbed by delivery vehicles or other construction traffic, as needed.

D. Compact the material added to obtain final subgrade elevation.

E. Determine subgrade permeability in accordance with ASTM D3385 before porous paving placement. Confirm that subgrade permeability meets requirements of Contract Documents.

3.02 SUBBASE

A. Prepare subbase in accordance with contract documents.

3.03 SETTING FORMWORK

A. Set, align, and brace forms so that the hardened paving meets the tolerances specified herein.

B. Apply form release agent to the form face which will be in contact with porous paving, immediately before placing paving.

C. The vertical face of previously placed concrete may be used as a form.

1. Protect previously placed paving from damage.
2. Do not apply form release agent to previously placed concrete.
3. Apply liquid urethane bonding agent to face of surfaces when adhesion is desired

D. Placement width shall be as specified in Contract Documents.

3.04 BATCHING, MIXING, AND DELIVERY

A. Batch and mix on site in compliance with Manufacturer's written specifications, except that discharge shall be completed within 5 minutes of the introduction of urethane to the dry products .

3.05 PLACING AND FINISHING PAVING

A. Do not place porous paving on frozen or wet subgrade or subbase.

B. Deposit porous paving either directly onto the subgrade or subbase by wheelbarrow or by material handler onto the subgrade or subbase, unless otherwise specified.

C. Deposit porous paving between the forms to an approximately uniform height.

D. Spread the porous paving using a come-along, short-handle, square-ended shovel or rake.

E. Use steel trowels to finish to the elevations and thickness specified in Contract Documents.

3.06 FINAL SURFACE TEXTURE

A. Final surface of porous paving shall be smoothed with bull float and magnesium trowels.

3.07 EDGING

A. When forms are not used, bevel the edge of the top surface to a 45° slope.

3.08 CURING

A. Begin curing within 20 minutes of paving discharge, unless longer working time is accepted by the Manufacturer.

B. Completely cover the paving surface with a minimum 4 mil thick polyethylene sheet only if raiN or sprinklers are imminent within 20 minutes. Cut sheeting to a minimum of a full placement width.

1. Cover all exposed edges of paving with polyethylene sheet.
2. Secure curing cover material without using dirt.

C. Cure paving for a minimum of 24 uninterrupted hours, unless otherwise specified.

3.09 HOT- AND COLD-WEATHER CONSTRUCTON

A. When hot weather is anticipated up to 95 degrees Fahrenheit, no special procedures are necessary.

B. In cold weather when temperatures may fall below freezing just after an installation, utilize a fan to maintain airflow over porous paving during the curing process.

3.10 OPENING TO TRAFFIC

A. Do not open the paving to traffic until the porous paving has cured for at least 24 hours during warm weather, and 48 hours during very cold temperatures at or near freezing and not until the porous paving is accepted by the Owner for opening to traffic. Paving should be checked and verified to be sufficiently hardened.

END OF SECTION 321243

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SECTION 321313
CONCRETE PAVING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Concrete Pavement-Broom Finish

2. ADA Tile for Accessible Curb Ramps

3. Concrete Accessible Curb Ramps

1.02 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings

B. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement

C. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement

D. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

E. ASTM A 615 - Deformed and Plain Billet-Steel for Concrete Reinforcement

F. ASTM C33 - Concrete Aggregates

G. ASTM C94 - Ready Mixed Concrete

H. ASTM C150 - Portland Cement

I. ASTM C260 - Air-Entraining Admixtures for Concrete

J. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete

K. ASTM C494 - Chemical Admixtures for Concrete

L. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces

1.03 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain materials from same source throughout.

C. Sample and test concrete during placement of concrete as follows:

1. Sampling Fresh Concrete: ASTM C172; except modified for slump to comply with ASTM C94.
2. Slump: ASTM C143; one test for each concrete load at point of discharge and one for each set of compressive strength test specimens.

3. Air Content: ASTM C231; pressure method; one for each set of compressive strength specimens.
4. Compressive Strength Tests: ASTM C39; one (1) set for each 150 cubic yards (115 cubic meters) or fractions thereof, of each concrete class placed in any one day or for each 5000 sq. ft. (465 square meters) of surface area placed; two (2) specimens tested seven (7) days, three (3) specimens tested 28 days and one (1) specimen retained in reserve for later testing if required.

1.04 REGULATORY REQUIREMENTS.

A. Conform to applicable code for paving work on public property.

B. Submit proposed mix design to Landscape Architect for review prior to commencement of work.

C. Tests of cement and aggregates will be performed to ensure conformance with requirements stated herein.

D. Three concrete test cylinders will be taken for every 75 or less cubic yards (57 or less cubic m) of concrete placed each day.

E. One additional test cylinder will be taken during cold weather and be cured on site under same conditions as concrete it represents.

F. One slump test will be taken for each set of test cylinders taken.

1.05 SUBMITTALS

A. Submit product data under provisions of the General Conditions.

B. Submit manufacturer's instructions under provisions of the General Conditions

C. Product Data: Submit product data for the following materials and items.

1. Concrete Design Mix
2. Joint Filler
3. Primer and Sealant for Expansion Joints
4. Forming Accessories
5. Admixtures
6. Patching Compounds
7. Sealants
8. Laboratory Test Reports: Submit concrete materials test reports and mix design reports certifying that each material or item complies with or exceeds the specified requirements.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150 Normal-Type I Portland type, gray color.

B. Fine and coarse Aggregates: ASTM C33

C. Concrete shall contain 1 pound of 100% polypropylene microfiber per cubic yard.

Fiber shall be added during batching at the plant to insure uniform distribution. The micro-fiber shall be W.R. Grace micro-fiber or equal and shall be used in accordance with the supplier's specifications

D. Water: Clean and not detrimental to concrete

2.02 FORM MATERIALS

A. Unless otherwise indicated, construct formwork with plywood, metal, metal framed plywood faced or other acceptable panel type materials to provide continuous, straight, smooth, exposed surfaces.

1. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
2. Provide forms that comply with US Product Standard PS 1 and the following:

a. B-B High Density Overlaid Concrete Form, Class I.
b. B-B (Concrete Form) Plywood, Class I, exterior grade or better, mill oiled and edge sealed, with each piece bearing legible inspection trademark.

B. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

C. Form Ties: Provide factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least l/2 inch (12.7 mm) inside concrete for steel ties and l/4 inch (6.35 mm) for wire ties.
2. Unless otherwise indicated, provide form ties which will not leave holes larger than 1 inch (25 mm) diameter in concrete surface.

2.03 ACCESSORIES

A. Curing Compound: SF TT-C-800, Type 1, 30 percent solids.

B. Preformed Joint Filler and Backer Rod: Expanded polyethylene joint filler and backer rod, as manufactured by A. H. Harris and Sons, Medfield, Mass. or approved equal.

C. Sealant shall be "Sikaflex-1A" as manufactured by Sika Corporation, Lyndhurst, New Jersey or approved equal. Sealant shall be in accordance with Federal Specification TT-S-00230C, Type II, Class A and ASTM C-920, Type S, Grade NS, Class 25.

2.04 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Use accelerating admixture in cold weather only when approved by Landscape Architect. Use of admixture will not relax cold weather placement requirements.

C. Use set-retarding admixtures during hot weather only when approved by Landscape Architect.

D. Use water-reducing admixture in all concrete.

E. Use air-entraining admixture in exterior exposed concrete.

2.05 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Provide concrete of the following characteristics:

1. Compressive Strength of 28 days: 4000 psi (276 mPa).
2. Slump: of 3 inches
3. Air Content: Between 5% and 7%

2.06 ADA TILE – for accessible curb ramps

A. Tile shall be manufactured of cast-in-place, homogeneous glass and carbon reinforced composite that is integrally colored to be colorfast and UV stable. Tile shall have an Inline Dome pattern or truncated domes with a diameter of nominal 0.9", a height of nominal 0.2" and a center-to-center spacing of 1.6" minimum and 2.4" maximum. Tiles shall be in accordance with ADA Regulation for Detectable Warning on Curb Ramps. Tiles shall meet the following physical characteristics:

Compressive Strength 695	23,800 psi	ASTM D 695
Water Absorption	0.13% @ 2 weeks	ASTM D 570
Accelerated Weathering 26	No charge (3,000 hours)	ASTM G 26
Freeze/Thaw/Heat	No disintegration	ASTM C 1026

B. Color shall be brick red, Federal Color #20109.

C. Tile shall be as manufactured by ADA Solutions, Inc. of North Billerica, Massachusetts (800-372-0519) or MassDOT approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify compacted subgrade and base is ready to support paving and imposed loads.

B. Verify gradients and elevations of base are as shown on the drawings.

C. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Remove water from excavations. Before placement of concrete, remove wood chips, shavings, and hardened concrete from forms.

1. Clean all equipment.
2. Wet forms, except in freezing weather, or oil forms.

A. Earth shall be uniformly moist when concrete is placed. Sprinkling method shall not be such as to form mud or pools of water. Watering subgrade immediately prior to placing concrete is not sufficient to make the soil uniformly moist.

C. Notify other crafts to permit installation of their work. Coordinate installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

D. Notify Landscape Architect a minimum of 24 hours prior to commencement of concreting operations.

3.03 FORMING

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure.

B. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

C. Design and fabricate formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

B. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades.

C. Tolerances: Set forms with the upper edge true to line and grade with an allowable tolerance of 1/8 inch (3 mm) in any 10 foot (3 m) long section

D. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 JOINTS

A. Place expansion joints at 25 foot maximum intervals or as shown on plan to correct elevation and profile. Align sidewalk joints.

B. Place joint filler and sealant where pavement meets curbing or structures including building, light bases, hydrants, and at other conditions as shown on drawings.

C. Install galvanized steel dowels on 18” centers where expansion joints are located.

D. Provide saw-cut control joints at 5 foot intervals maximum of sidewalk, or as shown on plan.

E. Apply joint sealer where indicated on drawings. Apply in accordance with manufacturer's instructions.

3.05 PLACING CONCRETE

A. Field Inspection: Do not place concrete until forms have been inspected and approved.

1. Place Ready-Mix concrete within specified time after batching.

Below 40 degrees F (4 degrees C)	See Cold Weather Placing
40 - 85 degrees F (4 - 29 degrees C)	90 minutes
86 - 90 degrees F (30 - 32 degrees C)	75 minutes
Above 90 degrees F (32 degrees C)	60 minutes

2. Adding Water: Do not add water after initial introduction of mixing water for batch except when slump of concrete is less than that specified upon arrival at job site, and maximum water/cement ratio for mix has not been exceeded

a. Add water to bring slump within specified limits. Turn drum at least 30 additional revolutions at mixing speed. Do not add water to batch at any later time.
b. Insure that concrete strength meets specified requirements, and water does not exceed maximum amount specified in CONCRETE MIX DESIGN.

B. General: Comply with ACI 304, and as specified herein.

1. Deposit concrete continuously or in layers of such thickness that concrete will not be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness.
2. If section cannot be placed continuously, provide construction joints. Deposit concrete as nearly as practicable to its final location to avoid segregation.

C. Placing Concrete in Forms:

1. Consolidate placed concrete by high frequency mechanical vibrating equipment, supplemented as necessary by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

a. Do not use vibrators to transport concrete inside forms.
b. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine.
c. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing segregation of mix.

D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in continuous operation, within limits of construction joints, until placement of panel or section is completed. Maintain reinforcing in proper position during concrete placement operations.

E. Placing Concrete Sidewalks & Pads: Place concrete in forms in one (1) layer of such thickness that when consolidated and finished, sidewalks will be of thickness indicated in drawings.

F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures; comply with ACI 306.

G. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

H. Ensure inserts, embedded parts and formed joints are not disturbed during concrete placement.

I. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

J. Place concrete to pattern indicated.

3.06 BROOM FINISHING

A. Concrete shall have a Medium Broom, non-slip finish, saw-cut joints, tooled edge, and scored, as indicated on drawings.

B Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

C Liquid Chemical Hardener Finish: Apply chemical hardener finish after complete curing and drying of the concrete surface.

1. Dilute liquid hardener with water, and apply in three (3) coats; first coat, 1/3 strength; second coat, 1/2 strength; third coat, 2/3 strength. Evenly apply each coat, and allow 24 hours for drying between coats.
2. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instructions.
3. After final coat of chemical hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

3.07 CONCRETE PAVEMENT CURING AND PROTECTION

A. Curing of the finished concrete surface shall be started as soon as it is possible to do so without damaging the surface. The surface shall be wetted or otherwise kept moist throughout a minimum six (6) day curing period through the use of polyethylene film, wetted burlap, or by a spray applied curing compound. The concrete surface shall be protected from all traffic or other disturbance during the curing period.

B. The Contractor shall provide adequate surveillance for all poured-in-place concrete pavements until concrete has set firmly, to prevent unwarranted markings of the concrete surface. Any unauthorized marking or graffiti in the finished surfaces shall be a cause for rejection by the Landscape Architect and replacement by the Contractor.

C. Adequate protection shall be provided where temperatures of forty degrees (40 degrees F.) or lower occur during placing of concrete, and during the early curing period. The minimum temperature of fresh concrete after placing, and for the first three (3) days shall be maintained above fifty-five degrees (55 degrees F). In addition to the above requirements, an additional three (3) days of protection from freezing shall be maintained.

3.08 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 014500.

B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

C. Patching Defective Areas: Immediately cut out honeycomb, rock pockets, voids over 1/8 inch (6.35 mm) in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than one (1) inch (25 mm).

1. Cut edges perpendicular to concrete surface.
2. Thoroughly clean, dampen with water, and brush coat area to be patched with neat cement grout or proprietary bonding agent before placing cement mortar or proprietary patching compound.

D. Remove and replace concrete with defective surfaces if defects cannot be repaired

to satisfaction of Landscape Architect.

1. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning.

    a. Dampen concrete surfaces in contact with patching concrete and brush with neat cement grout, or apply concrete bonding agent.
    b. Mix patching concrete of same materials to provide concrete of same type of class as original concrete.
    c. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

END OF SECTION

SECTION 32 14 13
PERMEABLE PRECAST UNIT PAVING

PART 1 - GENERAL

1.01 CONTRACT REFERENCES

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of the CONTRACT AND GENERAL CONDITIONS.

1.02 SUMMARY

A. This Section specifies requirements for permeable pavers and related items as shown on the Contract Drawings and as listed below.

B. Related Work: The following Sections contain work related to this Section:

1. Section 033053 Cast-In-Place Concrete

2. Section 310000 Earthwork

1.03 REFERENCES

A. All work and materials shall conform to the requirements of the Massachusetts Department of Transportation, Highway Division Standard Specifications for Highways and Bridges (MDOTSSHB), latest edition.

B. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

American Society for Testing and Materials (ASTM):
C29 Bulk Density and Voids in Aggregate
C33 Concrete Aggregates
C136 Sieve Analysis of Fine and Coarse Aggregates
C936 Solid Concrete Interlocking Paving Units
D448 Sizes of Aggregate for Road and Bridge Construction

1.04 SUBMITTALS

A. Permeable Pavers:

1. Submit samples for verifications: Three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.

2. Accepted samples become the standard of acceptance for the product produced.

3. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.

4. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.

B. Joint Opening and Bedding Course Aggregate:

1. Test results from an independent testing laboratory for compliance with ASTM #9.

2. Test results from an independent testing laboratory for sieve analysis, including washed gradations per ASTM C 136.

3. Test results for void space percentage per ASTM C 29

C. Base Aggregate:

1. Test results from an independent testing laboratory for compliance with ASTM #57.
2. Test results from an independent testing laboratory for sieve analysis, including washed gradations per ASTM C 136.
3. Test results for void space percentage per ASTM C 29

D. Paving Installation Contractor:

1. Submit job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.

1.05 QUALITY ASSURANCE

A. Utilize a Manufacturer having at least ten years of experience manufacturing interlocking concrete pavers on projects of similar nature or project size.

B. Source Limitations:

1. Obtain Permeable Pavers from one source location with the resources to provide products of consistent quality in appearance and physical properties.
2. Obtain Permeable Joint Opening Aggregate from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.

C. Paving Contractor Qualifications:

1. Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project.
2. Utilize a Contractor conforming to all local, state/provincial licensing and bonding requirements.

D. Mockups:

1. Install a 10 x 10 ft paver area.

2. Use this area to determine surcharge of the bedding aggregate layer, joint sizes, lines, laying pattern(s), color selection, and levelness.

3. This area will be used as the standard by which the work will be judged.

4. Subject to acceptance by owner, mock-up may be retained as part of finished work.

5. If mock-up is not retained, remove and properly dispose.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. In accordance with Conditions of the Contract and Division 1 Product Requirement Section.

B. Manufacturer required to complete production of materials within 30 days after order has been placed to avoid construction delays.

C. Deliver Permeable Pavers in manufacturer's original, unopened and undamaged container packaging with identification labels intact.

1. Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
2. Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
3. Unload pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.

D. Store and protect materials such that they are kept free from mud, dirt and other foreign materials.

1.07 PROJECT/SITE CONDITIONS

A. Environmental Requirements:

1. Do not install permeable pavers on bedding sand.

2. Do not install pavers on frozen permeable setting bed aggregate materials.

3. Do not install pavers over frozen permeable base or subbase aggregates.

4. Do not install permeable base or subbase aggregates over frozen subgrade.

1.08 MAINTENANCE

A. Provide a minimum of 5% additional material for overage to be used during construction.

B. Contractor to provide 100 square feet of each product and size used to owner for maintenance and repair. Furnish Pavers from the same production run as installed materials.

C. Manufacturer to supply maintenance manuals for Permeable Pavers.

PART 2 - PRODUCTS

2.01 PERMEABLE PAVERS

A. Permeable Pavers shall be Eco-Priora Pavers as manufactured by Unilock New York, New England Division, 35 Commerce Drive, Uxbridge, MA 01569 (508) 278-6700 or Approved Equal

B. Size: Manufacture the size indicated with a maximum tolerance of plus or minus 1/16 in all directions.

1. 9.4 in (24.0 cm) x 4.7 in (12.0 cm) x 3.1 in (8.0 cm) thick. Note: Imperial dimensions are nominal equivalents to the metric dimensions.

C. Color: Granite Blend. Finish: Standard

D. Pavers must meet the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence shall not be a cause for rejection.

1. Average compressive strength 8000 psi (55MPa) with no individual unit under 7,200 psi (50 MPa).
2. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
3. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C1645-06, with no breakage greater than 1.0% loss in dry weight of any individual unit. Conduct this test method not more than 12 months prior to delivery of units.

E. Maximum allowable breakage of product is 5%.

2.02 JOINT OPENING AND BEDDING COURSE AGGREAGATE

A. Provide permeable Joint Opening and Bedding Course Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No. 8 as presented in Table 1.

TABLE 1
JOINT OPENING AND BEDDING COURSE AGGREGATE
GRADATION REQUIREMENTS

ASTM No. 8	
Sieve Size	**Percent Passing**
3/8 in	85 to 100
No. 4	10 to 30
No. 8	0 to 10
No. 16	0 to 5

2.03 BASE AGGREGATE

A. Provide permeable Base Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No. 57 as presented in Table 2.

TABLE 2
BASE AGGREGATE
GRADATION REQUIREMENTS

ASTM No. 57	
Sieve Size	**Percent Passing**
1 1/2 in	100

1 in	95 to 100
1/2 in	25 to 60
No. 4	0 to 10
No. 8	0 to 5

2.04 SUBBASE AGGREGATE

A. Provide permeable Base Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No. 2 as presented in Table 3.

TABLE 3
SUBBASE AGGREGATE
GRADATION REQUIREMENTS

ASTM No. 57	
Sieve Size	**Percent Passing**
3 in	100
2.5 in	90 to 100
2 in	35 to 70
1.5 in	0 to 15
3/4 in	0 to 5

2.05 EDGE RESTRAINT

A. Per manufacturer's recommendation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance before placing the Permeable Concrete Pavers.

1. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.

2. Verify that Geotextiles have been placed according to drawings and specifications.

3. Verify that Permeable Base and Subbase Aggregate materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.

4. Provide written density test results for soil subgrade and Permeable Base and Subbase Aggregate materials to the Owner, General Contractor and paver installation subcontractor.

5. Verify location, type, and elevations of edge restraints, concrete collars around utility structures, and drainage inlets.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Verify that the soil subgrade is free from standing water.

B. Stockpile Permeable Setting Bed, Joint, and Base, and Subbase Aggregate materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.

C. Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the Permeable Subbase and Base Aggregate materials.

D. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all Permeable Joint, Setting Bed, and Base, and Subbase Aggregate materials contaminated with sediment with clean materials.

E. Complete all subdrainage of underground services within the pavement area in conjunction with subgrade preparation and before the commencement of Permeable Base Aggregate construction.

F. Do not damage underdrain pipes, overflow pipes, observation wells, or inlets and other drainage appurtenances during installation. Report all damage immediately.

G. Compact soil subgrade uniformly to at least 90 percent of Standard Proctor Density per ASTM D 698 for pedestrian areas. Compact soil subgrade uniformly to at least 95 percent Modified Proctor per ASTM D 1557 for vehicular areas.

H. Proof-roll prepared subgrade according to requirements in Division 31 Section "Earth Moving" to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting and replace with compacted backfill or fill as directed.

Note: Compaction of the soil subgrade shall be based on the recommendations of the Designing Engineer. The Architect/Engineer shall inspect subgrade preparations, elevations and conduct density tests for conformance to specifications.

Note: Mechanical tampers (jumping jacks) are recommended for compaction of soil subgrade and aggregate base around lamp standards, utility structures, building edges, curbs, tree wells and other protrusions. Areas not accessible to roller compaction equipment shall be compacted to the specified density with mechanical tampers. CAUTION - Care shall be taken around the perimeters of excavations, buildings, curbs, etc. These areas are especially prone to consolidation and settlement. Wedges of backfill shall not be placed in these areas. If possible, backfilling and compacting in these areas particularly shall proceed in shallow lifts, parallel to the finished surface.

3.03 INSTALLATION

A. Edge Restraints

1. Provide edge restraints where perimeter of permeable paving does not abut concrete curb or wall.

B. Permeable Base and Subbase Aggregate

1. Provide the Permeable Base and Subbase Aggregate in uniform lifts not exceeding 6 in., (150 mm) loose thickness and compact to at least 95 percent as per ASTM D 4254 to depths as indicated.

2. Compact the Permeable Base and Subbase Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the roller.

3. Tolerance: Do not exceed the specified surface grade of the compacted Permeable Subbase Aggregate material more than ±3/4 in. (20 mm) over a 10 ft. (3 m) long straightedge laid in any direction.

4. Grade and compact the upper surface of the Permeable Base and Subbase Aggregate material sufficiently to prevent infiltration of the Permeable Setting Bed Aggregate material both during construction and throughout its service life.

Note: In-place density of the Permeable Base and Subbase Aggregate materials may be checked per ASTM D 4254. Compacted density shall be 95% of the laboratory index density established for the subbase and base stone.

C. Permeable Setting Bed Aggregate

1. Provide and spread Permeable Setting Bed aggregate evenly over the base course and screed to a nominal thickness of 2 in.

    a. Do not disturb screeded Permeable Setting Bed Aggregate.

    b. Do not substantially exceed screed area which cannot be covered by pavers in one day.

    c. Do not use Permeable Setting Bed Aggregate material to fill depressions in the base surface.

2. Keep moisture content constant and density loose and constant until pavers are set and compacted.

3. Inspect the Permeable Setting Bed Aggregate course prior to commencing the placement of the permeable concrete pavers.

D. Permeable Pavers

1. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.

2. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

3. Exercise care in handling face mix pavers to prevent surfaces from contacting backs or edges of other units.

4. Provide Permeable Pavers using joint pattern as indicated. Adjust joint pattern at pavement edges such that cutting of edge pavers is minimized. Cut all pavers exposed to vehicular tires no smaller than one-third of a whole paver.

5. Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight.

    a. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

6. Provide space between paver units of 1/32 in. (1 mm) wide to achieve straight bond lines.

7. Do not exceed joint (bond) lines more than ±1/2 in. (±15 mm) over 50 ft. (15 m) from string lines.

8. Fill gaps between units or at edges of the paved area that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.

9. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

10. Do not allow traffic on installed pavers until Permeable Joint Aggregate has been vibrated into joints. Keep skid steer and forklift equipment off newly laid pavers that have not received initial compaction and Permeable Joint Aggregate material.

11. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a to 5000-lbf (22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:

    a. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.

    b. Compact installed concrete pavers to within 6 feet (1,800 mm) of the laying face before ending each day's work. Cover pavers that have not been compacted and leveling course on which pavers have not been placed, with nonstaining plastic sheets to prevent Permeable Setting Bed Aggregate from becoming disturbed.

12. Remove any cracked or damaged pavers and replace with new units prior to installing Permeable Joint Opening Aggregate material.

13. Provide, spread and sweep Permeable Joint Opening Aggregate into joints immediately after vibrating pavers into Permeable Setting Bed course until full. Vibrate pavers and add Permeable Joint Aggregate material until joints are completely filled, then remove excess material. This will require at least 4 passes with a plate compactor.

14. Tolerances: Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage). Do not exceed 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.

15. Remove excess Permeable Joint Aggregate broom clean from surface when installation is complete.

3.04 FIELD QUALITY CONTROL

A. Verify final elevations for conformance to the drawings after sweeping the surface clean.

1. Do not deviate final surface tolerance from grade elevations more than ±3/8 in. (±10 mm) under a 10 ft (3 m) straightedge or indicated slope, for finished surface of paving.

B. Set surface elevation of pavers 1/8 in. (3 mm) above adjacent drainage inlets, concrete collars or channels.

C. Lippage: No greater than 1/8 in. (3 mm) difference in height between Permeable Interlocking Concrete Pavers and adjacent paved surfaces.

3.05 REPARING, CLEANING AND SEALING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean. Clean Permeable Pavers in accordance with the manufacturer's written recommendations.

C. Seal as indicated. Apply Sealer for Permeable Pavers in accordance with the manufacturer's written recommendations.

3.06 PROTECTION

A. Protect completed work from damage due to subsequent construction activity on the site.

3.07 PERMEABLE JOINT AGGREGATE MATERIAL REFILLING

A. Provide additional Permeable Joint Aggregate material after 120 days and before 150 days after date of Substantial Completion/Provisional Acceptance.

1. Fill Permeable Joint Aggregate material full to the lip of the paver.

END OF SECTION 321413

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SECTION 321613
GRANITE CURB

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section specifies requirements for furnishing and installing granite street curb.

B. The work includes:

1. Furnishing and installing granite street curb at DPW Access Ramp and as shown on the Drawings

2. Removing and resetting existing granite curb as needed

3. All associated items and operations required to complete the installations, including surface preparation, concrete support, jointing, and finishing.

1.02 REFERENCE STANDARDS

A. References herein are made in accordance with the following abbreviations and, all work under this Section shall conform to the latest editions as applicable.

B. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.

C. ANSI/ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

D. ANSI/ASTM D1752 – Standard Specification for Preformed Sponge Rubber, Cork, and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

E. ASTM C33 – Standard Specification for Concrete Aggregates.

F. ASTM C94 – Specification for Ready-Mixed Concrete.

G. ASTM C150 – Standard Specification for Portland Cement.

H. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

I. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

J. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.

1.03 SUBMITTALS

A. Submit shop drawings and manufacturer's literature for granite curb, edging, corners and inlets indicating size, shape and dimensions, finish, and setting method for Engineer's approval.

1.04 DELIVERY, STORAGE AND HANDLING

A. Granite and units shall be adequately protected from damage during transit to the site.

B. Curbing shall be protected against staining, chipping, and other damage. Cracked, badly chipped, or stained units will be rejected and shall not be employed in the work.

1.05 SAMPLES

A. The Contractor shall supply to the site samples of all curb types for approval prior to ordering materials. Approved sample material may be used in the work upon approval by the Engineer.

PART 2 – PRODUCTS

2.01 GRANITE CURB

A. Granite curb shall be light gray in color, free from seams and other structural imperfections or flaws which would impair its structural integrity, and of a smooth splitting character. Natural color variation characteristic of the deposit from which the curb is obtained will be permitted.

B. Whenever curbing is sawed, all surfaces that are to be exposed shall be thoroughly cleaned and any iron rust or iron particles removed by sandblasting or other methods approved by the Engineer and any saw mark in excess of 1/8 inch shall be removed.

C. Dimensions

1. The stones for the granite curb shall be cut to the dimensions and curvature hereinafter needed:

Type	Minimum Length	Width at Top	Depth	Minimum Width at Bottom
Street	6 feet (except as required for transition sections)	6 inches	17 to 19 inches	4 inches (for 2/3 length)

2. Stones to be set on a radius of 100 feet or less shall be cut to the required curvature, unless otherwise approved and, except for making closures, shall be of the following minimum lengths:

Radius	Minimum Length
50 feet to 100 feet	6 feet
25 feet to less than 50 feet	4 feet-6 inches

10 feet to less than 25 feet	3 feet

D. Finish

1. Granite Street Curb shall have a smooth split face and a sawn top.

2. Cut ends that are exposed at a corner shall be finished to match the face finish.

3. All granite curb shall have a top surface free from wind, and shall be peen hammered or sawed to an approximately true plane, and shall have no projections or depressions greater than 1/8 inch. The front and back arris lines shall be pitched straight and true and there shall be no projection on the back surface for 3 inches down from the top which would exceed a batter of 4 inches to 1 foot.

   a. The front face shall be at right angles to the planes of the top and ends of the curb unit and shall be smooth quarry split, free from drill holes and with no projection of more than 1 inch and no depression of more than 1/2 inch measured from the vertical plane of the face through the arris or pitch line for a distance down from the top of 8 inches. For the remaining distance, there shall be no projection or depression greater than 1 inch measured in the same manner.

   b. The ends of all stones shall be square with the planes of the top and face of the curb so that when the stones are placed end to end as closely as possible, no space shall show in the joint at the top and face of more than 1/2 inch for the full width of the top and for 8 inches down on the face; after which the end may break back not over 8 inches from the plane of the joint. The arris formed by the intersection of the plane of the joint with the planes of the top and exposed faces shall have no variation from the plane of the top and exposed faces greater than 1/8 inch.

2.02 CEMENT MORTAR

A. Cement mortar shall be composed of one part Portland cement and two parts of sand by volume with sufficient water to form a workable mix. Cement shall be Portland cement ASTM C150, Type II.

2.03 TRANSITION SECTIONS

A. Horizontal transition sections shall be provided at all locations where curb sections change (i.e., vertical to sloped). Vertical transition sections shall also be provided for curb sections at ramps. Vertical transition sections for granite curb shall be made as shown on the Drawings.

PART 3 - EXECUTION

3.01 GENERAL

A. Trenching, excavation, backfilling, and compaction shall be completed in

accordance with the MDOT Standard Specificcations, except as modified within this Section.

B. Cement mortar bedding, if required, shall be placed as shown on the Drawings.

3.02 GRANITE CURB INSTALLATION

A. Furnish and install new curbing in the locations and in accordance with the details shown on the Drawings.

B. Cut special curb sections as required, keeping curb profile at full depth, and with parallel sides. Excavate to the lines and grades required to establish the subgrade limits required for curbing construction.

C. Curb, curb corners or edging shall be fitted together as closely as possible

D. Radial curb shall be finished on the exposed face

E. Where curb sections intersect at right angles, the curb parallel to the primary pathway shall overlap the end of the intersecting curb as shown on the plans. The exposed end face of the overlapping section shall be finished to match other exposed face surfaces.

F. Provide grade stakes to check alignment for curb setting. Install granite curb true to lines and grade. Install vertical, flush or transition curbing in locations and in accordance with the details shown on the Drawings.

G. Transitions from normal curb settings to ramps shall be accomplished with transition curb as shown on the drawings. Transitions shall be of the same type curb and similar to that abutting the transition piece and, if on a curve, of the same radius.

H. Set granite curb on concrete cradle as follows:

1. All spaces under the curb shall be filled with dry placed, zero slump concrete so that the curb will be completely supported throughout its length.

2. After proper alignment of curbing and concrete base has been established, place additional concrete, of slightly wetter consistency, to extend up each face of curbing as detailed on the Drawings.

3. Joints between curb stones shall be filled full depth with cement mortar and neatly pointed on the top and exposed faces. After pointing, clean of all excess mortar and tool joints slightly below adjacent stone surfaces as approved by the Landscape Architect/Engineer.

I. Procedures for removal and resetting of existing granite curb, and new granite curb, in existing pavements shall include the following:

1. Prior to excavation for existing granite curb removal, the pavement surface shall be saw cut a minimum of one foot from the face of curb.

2. Existing curb shall be carefully excavated, and removed in a manner that protects the

curb and existing pavement to remain from damage.

3. Existing granite curb shall be cleaned by sandblasting as required to remove bituminous material, paint and concrete from exposed surfaces prior to resetting in the proposed work.

4. New granite curb shall be set to match the top of existing granite curb remaining in place at abutting sections and, if required, transitioned to the typical section shown on Drawings within the first section of curb. Cement concrete shall be placed along the front face of the curb as shown on the Drawings.

END OF SECTION

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SECTION 321816
POURED-IN-PLACE RUBBER SURFACING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Provide all labor, equipment, implements and materials required to furnish, install, construct and perform all paving operations complete as shown on drawings and specified herein.

B. Work includes, but is not limited to the following:

1. Poured in Place Rubber Resilient Surfacing
2. Preparation of subbase for Surfacing

1.02 DEFINITIONS

A. The following related items are included herein and shall mean:

1. S.S.H.B. - Standard Specifications for Highways and Bridges, the Commonwealth of Massachusetts, Department of Public Works, latest edition.
2. A.S.T.M. - American Society for Testing and Materials.
3. A.A.S.H.T.O. - American Association of State Highway and Transportation Officials.

1.03 JOB CONDITIONS

A. Start of work under this Section shall constitute acceptance of the foundation conditions to which this work is to be applied. Any defects in work resulting from such conditions shall be corrected under this Section, at no extra cost to the Owner.

B. Maintain sub-base in satisfactory condition and properly drained until surface improvement is placed.

1.04 SUBMITTALS AND SAMPLES

A. Submit up to four 6” by 6” Poured in Place rubber samples bound with the specified binder for confirmation of standard color blend including 33% black

PART 2 - PRODUCTS

2.01 POURED IN PLACE RUBBER RESILIENT SURFACING

A. Material shall have a wearing course composed of MDI-based polyurethane and EPDM rubber granules (a man-made rubber containing minimum of 30% EPDM) and a base course composed of recycled poured-in-place SBR rubber fibers. It shall not contain hazardous substances, such as toluene, lead, or mercury compounds or cadmium coloring pigments. Surface shall have sub-base of bituminous concrete or crushed aggregate as indicated in the drawings and which provides proper drainage.

B. For areas with a slope greater than 3:1 and not within a fall zone use a 50-50 blend of SBR to give the top surface more support.

C. Play Surface shall meet or exceed current Consumer Product Safety Commission (CPSC) guidelines issued in 'A Handbook for Public Playground Safety (latest edition)' for a minimum fall height of 7 feet, current Americans with Disabilities Act Guidelines (ADAG), and current American Society for Testing and Materials (ASTM) F-1292-91 requirements.

D. Binders shall be aromatic type. Utilizing latex or emulsion type binder will not be accepted. Pre-fabricated shock pads will also not be considered equal.

E. Color shall be mix of three colors including 33% black, selected from the standard array of colors by the Landscape Architect; sample to be approved by Landscape Architect.

F. The finished surface shall be slip-resistant; supply ASTM-E-303 slip characteristic test results.

G. Material shall be ignition-resistant; supply passing ASTM-D 2859 test results.

H. Material shall be water-permeable, and wear and weather-resistant. Sealants shall be low odor and non-yellowing.

2.02 CRUSHED STONE BASE

A. Crushed stone base shall conform to all the requirements for Dense Graded Crushed Stone in Mass. Highway Standard Specifications except that the mix shall be of the following sizes:

U.S. Sieve Size and No.	Percent Passing by Weight
1 inch	90 -100
5/8 inches	50-80
1/4 inches	30-50
No. 4	15-35
No. 8	10-30
No. 30	3-5
No. 200	0-3

2.03 BITUMINOUS CONCRETE BASE COURSE

A. The bituminous concrete base course shall be as specified in Section 321216 – Bituminous Concrete Pavement & Pavement Markings.

PART 3 – EXECUTION

3.01 GRADE STAKES

A. Install and maintain grade stakes, as directed. All subgrades must be approved before base course construction.

3.02 FINISH GRADES

A. The words "finish grades" as used herein mean the required final grade elevations.

3.03 INSTALLATION OF SUB-BASE FOR POURED IN PLACE RUBBER SURFACING

A. Install with slopes ranging from 2% to 30% as shown on grading plan.

B. Install stone base with density of 95% compaction.

3.04 POURED-IN-PLACE RUBBER SAFETY SURFACE

A. Contractor shall provide copies of testing procedures and results, performed by an independent testing source, which demonstrate compliance with the CPSC and ASTM guidelines. Per CPSC and ASTM F-1292 Critical Height testing procedures at 30, 72, and 120 degrees F, the installed surface shall pass the 200 G-max and 1000 HIC test for a height at least equal to the highest fall height of equipment as installed within its zone.

B. When installed, the system shall be handicapped-accessible and comply with the Civil Rights Restoration Act of 1987 and the Americans with Disabilities Act of 1990 (ADA).

C. Contractor shall provide a written five (5) year performance guarantee from date of installation. The manufacturer shall provide a written guarantee for three (3) years from date of installation against decay and biochemical degradation calling for replacement of defective materials during the guarantee period. Contractor shall install system so as to comply with manufacturers' warranty requirements.

D. Installers of the rubber safety surface system shall have five years of experience, minimum, and shall provide three (3) local references where installation can be inspected.

E. Install sub base as shown in the drawings and to provide proper drainage of ¼" per foot toward low point.

F. Install material per manufacturer's specifications.

END OF SECTION

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SECTION 321817
ENGINEERED WOOD FIBER SURFACING

PART 1 – GENERAL

1.01 WORK INCLUDED

A. The work of this section consists of all labor, material, equipment, appliances, and services necessary to provide the following work within the Contract Limit Line as required by the drawings and as specified herein.

B. The following list of items is to be used as a guide and shall not be considered as limiting the scope of the work.

1. Engineered Wood Fiber Surfacing
2. Resilient Rubber Mats

1.02 SUBMITTALS

A. Engineered Wood Fiber Surfacing

1. Submit manufacturer's product data for approval.

B. Rubber Mat

1. Submit manufacturer's product data for approval.

1.03 QUALITY CONTROL AND TESTING

A. ASTM F1292

1. Standard Specification for Impact Attenuation of Surfacing Materials within the Use Zone of Playground Equipment.
2. Test results must be for Engineered Wood Fiber and Mats.
   - Test performed on new material.
   - Test performed on 12-year-old Engineered Wood Fiber.
3. Test results for Engineered Wood Fiber must show G-max values of less than 155G for an 8" thick system or 120G for a 12" system with a 12' drop height, and HIC values less than 1,000 for both new and 12-year-old materials.
4. Test results for Engineered Wood Fiber must show G-max values of less than 200G for a 12" system with a 14' drop height, and HIC values less than 1,000 for both new and 12-year-old materials.
5. Test results for mats must show G-max values of less than 200G and HIC values of less than 1,000 for a 3' drop height.

B. ASTM F1951

1. Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.
2. Must meet the intent of the Americans with Disabilities Act (ADA).

C. ASTM F2075

1. Standard Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Playground Equipment.

2. Material must pass sieve analyses as well as other tests for tramp metal particles and hazardous metals as described in Section 9.0. Metal particles in the Engineered Wood Fiber may cause injury if a child fall on them. Unsafe levels of hazardous metals such as lead, arsenic, or cadmium can be harmful to children.
3. Standard wood chips, bark mulch or materials from recycled pallets will not be acceptable.

PART 2 – PRODUCTS

2.01 ENGINEERED WOOD FIBER SURFACING

A. Material used will consist only of recently harvested North American hardwoods including Oak, Maple, Ash, Poplar, Hickory, Beech, Birch and Locust. All woods shall have been debarked and shall be free of soil, leaves, twig material and other contaminates which hasten decomposition. The moisture content shall be between 25% and 55% by weight. No chemical treatment or additives are allowed. Positively no recycled wood from pallets or waste wood is permitted due to the possibility of contamination and the risk of poor surface stability.

B. The density of the material shall be from 18 lbs. per cubic foot to 23 lbs. per cubic foot. Wood fiber surfacing shall be randomly sized, approximately ten times longer than wide. The material shall meet the gradation requirements of ASTM C136.

C. Hardwood fiber must meet or exceed C.P.S.C., A.D.A., C.S.A., ASTM F-1292-99, and ASTM F-1951 guidelines.

D. Wood fiber must be wheelchair accessible as required by the Americans with Disabilities Act and have been tested to the guidelines of ASTM PS-83 or ASTM F-1951 for accessibility.

2.02 WOOD FIBER DRAIN

A. Drain strip that channels water away from playground.

B. Minimum flow rate of 10 gpm/ft.

C. Needle-punched 100% non-woven geotextile sleeve encasing a monofilament nylon mesh.

D. Laid out on 6’ centers in the direction of the grade.

E. Prevents deterioration of Engineered Wood Fiber.

2.03 GEOTEXTILE FABRIC/FELT

A. Needle-punched 100% non-woven geotextile fabric that separates the Engineered Wood Fiber from soil below.

B. Material allows water to flow through, and prevents rock and soil contamination of the Engineered Wood Fiber.

C. Designed to cover the sub-grade and drain strip to ensure proper drainage.

D. Seams should be overlapped 3”.

2.04 RESILIENT RUBBER MATS

A. Size varies-see layout plan. All mats are 1.5” thick.

B. Mats have beveled edges (ADA compliant)

C. Placed under each swing seat and slide exit

PART 3 – EXECUTION

3.01 ENGINEERED WOOD FIBER SURFACING AND RUBBER MATS

A. Install Wood Fiber as indicated on the drawings and as recommended by the Manufacturer.

B. Rubber Mats to be installed at surface of wood fiber as indicated on the drawings and as recommended by the Manufacturer.

PART 4 – WARRANTY

4.01 WARRANTY

A. Wood Fiber Surfacing must have a 15-year limited warranty.

END OF SECTION

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SECTION 32 30 00
SITE IMPROVEMENTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Coordinate the work of this section with Bidding and Contract Requirements; Conditions of the Contract; Division 1 – General Requirements, Technical Specifications, Division 2 and the Contract Drawings.

B. Examine all other Sections of the Specifications for requirements that affect work under this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 SUMMARY OF WORK

A. Provide all labor, equipment, and materials required to furnish and install miscellaneous site improvements as shown on the Drawings and specified herein. The work includes but is not limited to:

1. Bike Racks
2. Round Tables with Seating
3. Single Benches with Backrest
4. Double Bench with Backrest
5. Double Bench with Two Backrests
6. Picnic Table Set with Bench Top on Concrete Wall
7. Seating Cube
8. Square Tables and Seating Cubes with Backrest (ADD ALT. #4)
9. Trash and Recycling Compactor Unit (protection and installation only, owner provided)
10. Trash and Recycling Receptacles
11. Drinking Fountain
12. Community Bulletin board
13. Tree stump seats (vertical placement) & log benches (horizontal placement)
14. Sitting boulders
15. Stepping stones
16. Basketball kit
17. Playground sand
18. Climbing Holds
19. Painted Graphics on Existing Picket Fence to Remain (ADD ALT. #5)
20. Water Play Feature
21. Custom Precast Concrete Water Play Feature (ADD ALT. #6)
22. Adhesive Pavement Marking Tape
23. Precast Concrete Curb
24. Plant Protection Fence

B. See Drawings for locations and details.

1.03 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the following standards:

1. ASTM: American Society for Testing and Materials
2. ANSI: American National Standards Institute
3. FS: Federal Specifications
4. BIFMA: Business and Institutional Furniture Manufacturer's Association
5. PCI: Precast Concrete Institute
6. PCA: Portland Cement Association
7. Standard Specifications: Comply with the Commonwealth of Massachusetts, Massachusetts Highway Department, Standard Specifications for Highways and Bridges, 1995 Edition.

B. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

C. Layout and Grading: After staking out the work, and before beginning final construction, obtain the Landscape Architect's approval for layout and grades. Contractor shall make adjustments as determined by the Landscape Architect. Landscape Architect may make adjustments to grades and layout as is required to meet existing and proposed conditions without additional cost to the contract price.

1.04 RELATED WORK UNDER OTHER SECTIONS

A. Section 033053 Cast in Place Concrete

B. Section 310000 Earthwork

C. Section 321816 Poured-in-Place Rubber Surfacing

D. Section 321817 Engineered Wood Fiber Surfacing

1.05 SUBMITTALS

A. Provide complete Shop Drawings and/or samples and catalog cuts for all items called for on the Drawings and as specified herein in accordance with applicable requirements under Division 1.

1. Shop Drawings shall show all details including sizes, materials, quantities and manner of assembling the various members, properly coordinated with the related work. Shop Drawings shall show true profiles, methods of anchoring hardware, if any, and all other necessary information.

2. Do not order materials until Landscape Architect's approval has been obtained. Delivered materials shall closely match any approved samples.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original unopened and undamaged packages with labels legible and intact.

B. Store materials in unopened packages in a manner to prevent damage from the environment and construction operations.

C. Handle in accordance with manufacturer's instructions.

D. The Contractor shall be solely responsible for all materials stored on the site once delivered. Any materials left unsecured at the job site shall be solely at the contractor's own risk.

1.07 MAINTENANCE KIT

A. At the completion of construction, the Contractor shall provide to the City Department of Public Works, Parks Maintenance Division, a Maintenance Kit containing all touchup paint, maintenance instructions, spare parts, and other maintenance materials provided by the manufacturers of all improvements.

B. The Maintenance Kit shall be delivered in a single container clearly labeled with the Park Name, and each item shall be identified as to the source.

PART 2 - PRODUCTS

2.01 BIKE RACKS

A. Bicycle Racks shall be a "vintage style" with a Somerville custom "Powderhouse" rack plate as shown on the Drawings, manufactured by Custom Fabrications of Harpursville, NY, Cycle Safe Inc. of Grand Rapids, MI or Approved Equal.

B. The rack shall be composed of Schedule 40 Steel Pipe and ¼" Steel plate. All surfaces shall be smoothed and free from burrs, barbs, splinters, and sharpness, and all edges and ends rolled, rounded, or capped.

C. The entire rack shall be coated with an e-coat primer and then finished with a polyester powder coat. Color: Black.

2.02 ROUND TABLES WITH SEATING

A. Tables with Seating shall be Model CFPT-012-Custom as shown on the Drawings, and manufactured by Custom Fabrications of Harpursville, NY, Cycle Safe Inc. of Grand Rapids, MI or Approved Equal.

1. Standard round tables shall be 36" in diameter.
2. A single wheelchair accessible round table shall be 42" in diameter.
3. Seating shall be approximately 26" square, with backrest, and shall be mounted with a pivot that allows seat to rotate 45° in each direction.

B. Tables tops and seats shall be composed of ¼" x 1-1/2" steel slats. All surfaces shall be smoothed and free from burrs, barbs, splinters, and sharpness, and all edges and ends rolled, rounded, or capped.

C. Tables and chairs shall be designed for embedded mounting in concrete foundations per manufacturer's instructions.

D. All steel pieces shall be phosphate washed, primed with zinc rich primer and coated with an exterior grade polyester powder coat. Color: Black.

E. All accessory hardware shall be stainless steel.

2.03 SINGLE BENCHES WITH BACKREST

A. Benches shall be R&R-CW-200-AB Crosswise Bench with R&R-C-HBR-154-AB Double Beam Backrest as shown on the Drawings, and as manufactured by Streetlife Studio America (contact: Thomas Lub, tlub@streetlifeamerica.com) or Approved Equal.

B. Benches shall be 79” long and backrests shall be 61” long.

C. Bench slats and backrests shall be composed of recycled synthetic UV-stabilized composite of polyethylene and polypropylene. Color: Black.

D. Bench supports shall be hot dip galvanized steel. All surfaces shall be smoothed and free from burrs, barbs, splinters, and sharpness, and all edges and ends rolled, rounded, or capped.

2.04 DOUBLE BENCH WITH BACKREST

A. The Double Bench with Backrest shall consist of R&R-CW-200-AB Crosswise Bench with R&R-CW-200-AB-Ext Extension for Crosswise Bench and R&R-C-HBR-154-AB Double Beam Backrest as shown on the Drawings, and as manufactured by Streetlife Studio America (contact: Thomas Lub, tlub@streetlifeamerica.com) or Approved Equal.

B. Double bench shall be a total of 158” long and shall have a 61” long backrest, justified to the right side of the bench as shown in the drawings.

C. Bench slats and backrests shall be composed of recycled synthetic UV-stabilized composite of polyethylene and polypropylene. Color: Black.

D. Bench supports shall be hot dip galvanized steel. All surfaces shall be smoothed and free from burrs, barbs, splinters, and sharpness, and all edges and ends rolled, rounded, or capped.

2.05 DOUBLE BENCH WITH TWO BACKRESTS

A. The Double Bench with Two Backrests shall consist of R&R-CW-200-AB Crosswise Bench with R&R-CW-200-AB-Ext Extension for Crosswise Bench and two R&R-C-HBR-120-AB Double Beam Backrests as shown on the Drawings, and as manufactured by Streetlife Studio America (contact: Thomas Lub, tlub@streetlifeamerica.com) or Approved Equal.

B. Double bench shall be a total of 158” long and shall have two 47” long backrests, justified to either end of the bench and facing opposite to each other, as shown in the drawings.

C. Bench slats and backrests shall be composed of recycled synthetic UV-stabilized composite of polyethylene and polypropylene. Color: Black.

D. Bench supports shall be hot dip galvanized steel. All surfaces shall be smoothed and free from burrs, barbs, splinters, and sharpness, and all edges and ends rolled, rounded, or capped.

2.06 PICNIC TABLE SET WITH BENCH TOP ON CONCRETE WALL

A. Picnic tables shall consist of the R&R-PS-TH-AB-ALL Picnic Table, with spacing of supports customized to allow for wheelchair access at end of table, as manufactured by Streetlife Studio America (contact: Thomas Lub, tlub@streetlifeamerica.com) or Approved Equal. Picnic table benches shall be one R&R-CW-200-AB Crosswise Bench and one R&R-CW-TOP-200-60-AB Crosswise Seat top as shown on the Drawings, and as manufactured by Streetlife Studio America. Concrete bench beneath bench top shall be as specified in Section 03 30 53 Cast-in-Place Concrete.

B. At one picnic table, the picnic table bench shall be replaced by two seating cubes, as specified below, to provide adequate space for wheelchair access at the middle of the table.

C. Picnic tables, benches, and bench tops shall each be 79” long.

D. Bench slats and table top slats shall be composed of recycled synthetic UV-stabilized composite of polyethylene and polypropylene. Color: Black.

E. Bench and table supports shall be hot dip galvanized steel. All surfaces shall be smoothed and free from burrs, barbs, splinters, and sharpness, and all edges and ends rolled, rounded, or capped.

2.07 SEATING CUBES

A. Seating Cubes shall be R&R-L6-CUB-AB Cube with Six Beams as shown on the Drawings, and as manufactured by Streetlife Studio America (contact: Thomas Lub, tlub@streetlifeamerica.com) or Approved Equal.

B. Seating Cubes tops shall be 24” squares.

C. Seating Cube slats shall be composed of recycled synthetic UV-stabilized composite of polyethylene and polypropylene. Color: Black.

D. Seating Cube supports shall be hot dip galvanized steel. All surfaces shall be smoothed and free from burrs, barbs, splinters, and sharpness, and all edges and ends rolled, rounded, or capped.

2.08 SQUARE TABLES AND SEATING CUBES WITH BACKREST (ADD ALT. #4)

A. Square Tables shall be M&W-TS-84-AB Custom Size Freestanding square table as shown on the Drawings, and as manufactured by Streetlife Studio America (contact: Thomas Lub, tlub@streetlifeamerica.com) or Approved Equal.

1. Square table tops shall be 33” square.
2. A single wheelchair accessible square table shall be roughly 48” square.

B. Seating Cubes with Backrests shall be R&R-L6-CUB-AB Cube with Six Beams with R&R-C-LBR-60-AB Single Beam Backrest as shown on the Drawings, and as manufactured by Streetlife Studio America (contact: Thomas Lub, tlub@streetlifeamerica.com) or Approved Equal.

C. Seating Cubes tops shall be 24” squares and backrests shall be 24” long.

D. Seating Cube, Backrests, and Table Top slats shall be composed of recycled synthetic UV-stabilized composite of polyethylene and polypropylene. Color: Black.

E. Table and Seating Cube supports shall be hot dip galvanized steel. All surfaces shall be smoothed and free from burrs, barbs, splinters, and sharpness, and all edges and ends rolled, rounded, or capped.

2.09 TRASH AND RECYCLING COMPACTOR UNIT (PROTECT AND INSTALL ONLY, OWNER PROVIDED)

A. The contractor shall be responsible for stockpiling and protecting from damage the existing trash and recycling compactor unit.

B. The contractor shall reinstall the trash and recycling compactor unit according to the manufacturer's instructions.

C. In the event that the trash and recycling compactor unit is damaged during construction, the contractor shall provide an equivalent BigBelly with Single Stream Recycling Unit at no additional cost to the Owner.

2.10 TRASH AND RECYCLING RECEPTACLES

A. Trash receptacle shall be model CFTR-003 Black Trash Receptacle with Hinged Lockable Side Door, welded down Bonnet Style lid, and 32-gallon Rubbermaid Liner, as shown on the Drawings, and manufactured by Custom Fabrications of Harpursville, NY, Cycle Safe Inc. of Grand Rapids, MI or Approved Equal.

B. Recycling receptacle shall be CFTR-003-02 Recycle Blue Recycling Receptacle with Hinged Lockable Side Door, welded down Recycle lid, and 32-gallon Rubbermaid Liner, as shown on the Drawings, and manufactured by Custom Fabrications of Harpursville, NY, Cycle Safe Inc. of Grand Rapids, MI or Approved Equal.

C. Receptacle heights shall be 36" and overall width shall be 23 ¼".

D. Finish shall be exterior grade polyester powder coat, minimum of 4 mils thick on all surfaces.

E. Contractor shall provide heavy duty stainless steel anchor bolts for anchoring in concrete. For anchoring in asphalt, contractor shall provide anchor bolts by Asphalt Anchor Corp. or Approved Equal. Install with anchor grout per manufacturer's instructions.

2.11 DRINKING FOUNTAIN

A. Drinking fountain shall be M-43A Bowl on Arm Architectural Style Drinking Fountain as shown on the Drawings, manufactured by Murdock Manufacturing of City of Industry, CA or Approved Equal.

B. Pedestal and arm shall be heavy duty iron castings and base of pedestal shall have four mounting holes. Pedestal and arm shall be furnished with a heavy grade of oil based enamel.

C. Access cover shall be secured with vandal-resistant stainless steel screws.

D. Bowls shall be octagonal, powder coated, solid brass casting.

E. Valves shall be self-closing, pushbutton operated, incorporating a replaceable cartridge and requiring less than 5 pounds of force to operate. Valves shall include an adjustable stream regulator controlling the water.

F. Bubblers shall be stainless steel and operate on a water pressure range of 30 - 105 psig.

G. All solid brass castings shall conform to ASTM standards B61 and B62. Unit shall conform to ANSI A117.1, 2010 ADA Standards for Accessible Design, ANSI/NSF 61-9, and Public Law 111-380.

H. Pedestal Color shall be Black.

2.12 COMMUNITY BULLETIN BOARD

A. Community Bulletin Board shall be Model# LSIDMC-VA-2436, 24x36 Outdoor Message Center with Cork Board, by OutdoorDisplayCases.com, a division of Access Display Group, Inc. of Freeport, NY or Approved Equal, constructed of recycled plastic lumber with swinging polycarbonate doors, roof overhang, interior cork board surface.

B. Posts shall be 4”x4” recycled lumber mounting posts from the same manufacturer. Color shall be selected by Landscape Architect from manufacturer’s standard range.

C. Final mounting height of bulletin board shall be determined and approved in the field by the Landscape Architect and the Owner’s Representative.

2.13 TREE STUMP SEATS (VERTICAL PLACEMENT) AND LOG BENCHES (HORIZONTAL PLACEMENT)

A. Tree stump seats and log benches shall be constructed of Black Locust (*Robinia pseudoacacia*) salvaged and protected during tree removal operations on site.

B. Black locust logs and stumps shall be cut to required dimensions as shown on the drawings. Contractor shall sand all rough edges to be smooth to the touch.

2.14 SITTING BOULDERS

A. Boulders shall be weather worn and smoothed with no rough and sharp edges.

B. Boulders shall be a maximum of 28” above grade as shown in the Drawings once installed and a minimum of 24” long, following the approximate dimensions as shown in the drawings.

C. Landscape Architect will review and tag representative stones. Representative photos may be substituted for tagging in the field at the discretion of the Landscape Architect.

D. Boulders shall be set on level fill, with a flat side down to prevent overturning once in place. The boulders should then be buried a minimum of 3” on all sides and be placed with flattest side up.

2.15 STEPPING STONES

A. Stepping stones shall be real flag stone (not manufactured stone) at dimensions of approximately 18”-30” long by 12”-30” wide and have a minimum thickness of 3”. Contractor is responsible for providing stepping stones to cover area as shown in the Drawings.

B. Each stone should be relatively flat on one broad side.

C. Colors should range in grays, blues and browns, typical for native flag stone pavers.

2.16 BASKETBALL KIT

A. Basketball kit shall provide a standard height goal and a lowered goal on a single post, embedded mount.

B. Basketball kit shall consist of the components listed below, as provided by Jaypro Sports of Waterford, CT or Approved Equal. All components must be provided by a single manufacturer.

1. Standard pole, backboard, and goal shall be model SPA4-FABT-UG.

a. Pole shall be 4-1/2” diameter straight post with 4’ offset.
b. Backboard shall be fan aluminum.
c. Goal shall be playground goal.
d. Standard goal shall be set at 10’ ht. above finished grade.

2. Additional hoop brace kit shall be model SP-4BK.

3. Outrigger shall be model SP-4R.

4. Additional backboard shall be fan aluminum, model ALB-24BT.

5. Additional goal shall be playground goal, model UBG-500.

a. Additional goal shall be set at 7.5’ ht. above finished grade.

2.17 PLAYGROUND SAND

A. Sand shall be washed sandbox sand that meets all of the standards set by the US Consumer Product Safety Commission and the National Association for Education of Young Children. Playground sand shall be free of irritants, toxins and additives.

2.18 CLIMBING HOLDS

A. Climbing holds shall be cast urethane holds designed for outdoor playground use.

B. Climbing holds shall be 2-Bolt Playground Climbing Holds by Atomik Climbing Holds of Provo, UT or Approved Equal.

C. Holds shall be set using stainless steel drop-in anchors, attached with epoxy adhesive, per manufacturer’s instructions.

2.19 PAINTED GRAPHICS ON EXISTING PICKET FENCE (ADD ALT. #5)

A. The existing metal picket fence shall be prepared and cleaned with a steel wire brush.

B. Graphic pattern, as shown on the drawings, shall be masked out.

C. Graphics shall be painted using enamel paint designed for consistent corrosion-resistant color in an outdoor environment. Enamel paint shall be Rustoleum High Performance Protective Enamel Spray or Approved Equal.

1. Contractor shall apply a single coat of flat gray primer by same manufacturer as enamel paint, Professional Primer Spray by Rustoleum, or Approved Equal.

2. When primer has dried sufficiently, Contractor shall apply 2 coats of enamel paint. A single color shall be selected by Landscape Architect from manufacturer's standard range.

2.20 WATER PLAY FEATURE

A. Water Play Feature shall be New Orleans Water Play System consisting of Water Trough, Mixing Table, and Farm Pump as supplied by Goric Playgrounds of Belmont, MA, or Approved Equal.

B. The water trough shall be of welded stainless steel construction, sheet thickness: 2.5 mm, tube Ø 38 mm. Water trough shall have two stands with infinitely variable inclination for installation for the required slope for the inflow and outflow of the water. Water trough shall include water flap to adjust flow.

C. The mixing table shall be a welded structure made of stainless steel, with 1 water discharge pipe with conical stopper made of rubber and fixing device for total removal of water, and 5 movable mixing plates. Thickness of steel sheet shall be 2.5 mm, pipe Ø 38 mm.

D. Farm pump shall be SD75 hand pump for public water play with a valve controlled by an air pressure shock absorber that shuts off the water flow when the handle is not moving. The valve shall open only when the handle is being pushed downwards, simulating the pump action of a traditional well pump.

1. Water connection to farm pump shall be as shown in the Drawings.

E. All components shall be surfaced mounted to cast-in-place concrete foundations per manufacturer's instructions. Foundation dimensions shall be as shown in the Drawings.

2.21 CUSTOM PRECAST CONCRETE WATER PLAY FEATURE (ADD ALT. #6)

A. Custom Precast Concrete Water Play Feature shall include the following components:

1. Farm Pump, as specified above, by Goric Playgrounds
2. Precast Concrete Upper Basin with Undulating Surface
3. Precast Concrete Lower Basin
4. 2" Diameter Drain
5. Pipe Connection to Lower Basin
6. Water Gate cast into Precast Lower Basin
    a. Water gate shall be Draw Gate by Goric Playgrounds
7. Cast-in-place Concrete Foundations

B. Precast water basins shall be as shown in the Drawings. Fabricator shall be Northern Design Precast of Loudon, NH (603-783-8989) or Approved Equal. Precast manufacturer qualifications: Minimum 10 years experience and 3 similar projects.

C. Shop Drawings

1. Submit shop drawings of precast water basin including:
   a. Profiles, sizes, dimensions, locations, and layout.
   b. Details of joints, reinforcement, anchors, connections, inserts, finishes and materials.
   c. Location and details of items attached to structure.
   d. Other items cast into units.
   e. Handling procedures and sequence of erection for special conditions.
   f. Relationship to adjacent materials

2. Landscape Architect will provide 3d model of design to fabricator.

D. Samples: Provide 12” x 12” material samples of precast shall be submitted to indicate color and texture.

E. Concrete Materials:

1. Portland cement:
   a. ASTM C150, Type as applicable.
   b. Colors:
      1) Facing mix: Gray color. Use same brand and source of supply throughout.
      2) Backing mix: Gray color.
2. Aggregates: ASTM C33, clean and free of staining and deleterious material.
   a. Fine: Uncoated, natural sand free from silt, loam, and clay.
   b. Coarse: Uncoated, crushed stone, maximum size No. 467, Table No. 2.
   c. Facing mix aggregate:
      1) Type: Granite.
      2) Color: White.
      3) Size: 1/8” maximum.
3. Admixtures:
   a. Water reducing or water reducing/set retarding: ASTM C494.
   b. Air entraining: ASTM C260.
   c. Coloring: ASTM C979, pure mineral oxide, alkali resistant, colorfast, water insoluble, chemically inert, and weather resistant, color to match approved sample panel.
4. Fly ash: ASTM C618, maximum 2 percent loss on ignition.

5. Reinforcing:
   a. Reinforcing bars: ASTM A615/A615M, deformed billet steel, Grade 40.

b. Accessories: Provide supports, spacers, ties, and other devices required for placement of reinforcing.

F. Finish on exposed surfaces: Acid etch surfaces after curing to medium exposure of aggregate. Provide uniform finish to match approved sample panels.

2.22 ADHESIVE PAVEMENT MARKING TAPE

A. Adhesive pavement marking tape shall be skid resistant, reinforced polyurethane traffic tape, suitable at a temperature range of -40° - 200° F, Stamark 380IES by 3M or Approved Equal.

B. Adhesive pavement marking tape shall be 4” wide for application on concrete curb and 6” wide for application on top of acrylic color coating.

2.23 PRE-CAST CONCRETE CURB

A. The concrete shall have a minimum compressive strength of 5,000 psi at 28 days, and shall contain 5 to 7 percent entrained air.

B. Precast concrete curb units shall be rub finished:
1. After the concrete has properly hardened, the exposed surfaces shall be rubbed with a #16 carborundum stone or an approved abrasive to fully remove laitence and sand grain finish. No cement shall be used in the rubbing process.
2. The finish of the units shall be uniform and shall conform to those of adjacent work in their final position.

C. Precast concrete curb sections shall be furnished with sockets in each end to receive dowels to maintain the horizontal and vertical alignment of the curb. The dowel socket shall be 11/16 inch by 2-1/2 inches. 5/8 inch by 4 inch dowels shall be provided.

2.24 PLANT PROTECTION FENCING (ADD ALT. #3)

A. Plant Protection Fence shall be constructed of 4” diameter white cedar fence posts drilled to accept galvanized steel cable. Cable ends shall be secured with galvanized steel turnbuckle hardware. Contractor shall swage cable to avoid any protruding sharp edges.

2.25 STEEL EDGING

A. Steel Edging shall be as specified in Section 329300 – Planting.

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

A. Work notification: Notify Landscape Architect at least 24 hours prior to initiating work.

B. Establish and maintain required lines and grade elevations.

C. Protect adjacent work.

D. Provide temporary barricades and warning lights as required for protection of project work and public safety.

3.02 PREPARATION

A. Compaction of Subbase and Base will be as specified in Section 310000, Earthwork.

B. The installer shall examine previous work, related work, and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, subgrades, previous work, and conditions. Do not start work until unsatisfactory conditions have been fixed.

C. All site furnishings shall be assembled in accordance with the manufacturer's instructions. Components that are chipped, dented, scratched or otherwise damaged shall not be accepted and must be repaired or replaced in a manner acceptable to the Owner's Representative.

3.03 INSTALLATION

A. Review layout of site improvements with Landscape Architect prior to installation.

B. Install site improvements true and plumb to the lines and dimensions shown on the Drawings.

C. Install site furniture according to contract drawings and per specifications.

3.04 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from concrete operations. Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

C. Sweep sidewalks and pavement, wash free of stains, discoloration, dirt, and other foreign material immediately prior to final acceptance.

END OF SECTION

SECTION 323113
CHAIN LINK FENCES AND GATES

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. Provide labor, materials and equipment necessary to complete the work of this Section in place, including but not limited to the following:

1. 4 Foot PVC Coated with Custom Color Steel Chain Link Fence and Gates
2. 6 Foot Galvanized Steel Chain Link Fence

1.2 STANDARDS

A. ASTM B 6 Slab Zinc

B. ASTM F567 Installation of Chain Link Fence

C. ASTM F668 Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric, Class 2a

D. Federal Specification RR-F-191K/ID Fencing,Wire and Post Metal (Chain-Link Fence Fabric), Type IV

E. AASHTO – 181 Chain Link Fence, Type IV, Class A

F. Chain Link Fence Manufacturer's Institute

1.3 SUBMITTALS

A. Shop drawings - The Contractor shall submit shop drawings or catalog cuts including details illustrating fence height, fence post spacing, and sizes of posts, rails, braces, footings, gates and all accessories for approval by the Landscape Architect.

B. Samples - The Contractor shall submit three (3) samples of fence fabric 3" long or 6" square of fabric ties, post cap, latch, hinges and all connectors for approval by the Landscape Architect.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver material in manufacturer's original packaging with all tags and labels intact and legible. Handle and store material in such a manner as to avoid damage.

1.5 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 – PRODUCTS

2.1 GENERAL

A. Extruded Polyvinyl Chloride (PVC) fusion bonded Coated Steel Chain Link Fence Fabric shall be in accordance with US Government Spec. RR-F-191/1A, Type V with Galvanized core. The fence shall bear an imprint-branded at each link with the manufacturer's trade name, country of origin (USA), gauge size and tensile strength. The manufacturer, at the request of the project engineer, prior to installment, shall supply certification that all materials used fully comply with the specifications.

2.2 6' CHAIN LINK FENCE

A. Chain Link Fabric

1. Fabric shall be #6 (six) gauge galvanized wire with a two (2) inch mesh.

   The base metal shall be commercial quality medium-carbon, hot-dipped galvanized steel wire. The finished core wire shall have a minimum breaking strength of 650 lbs, per ASTM F668. The mesh size shall be measured by the distance between the wire forming parallel sides of the mesh, with permissible variation of plus or minus .250 inches.

2. The fabric shall be knuckle selvaged top and bottom, and shall have a permissible variation of plus or minus one inch.

B. Posts, Rails and Braces

1. Posts, rails gate frame and braces shall conform to Federal Specifications RR-F-191/3C and be fabricated of Class I (round steel sections), Grade A (hot-dipped galvanized), seamless steel pipe, in accordance with ASTM A120 (Schedule 40), and be of the following sizes:

End or Corner Posts:	3" / 2.875" O.D. schedule 40
Line Posts:	2 1/2" / 2.375" O.D. schedule 40
Rails and Braces:	1 5/8" / 1.66" O.D. schedule 40

2. Rails shall be joined at posts with boulevard clamps.

D. Fittings

1. Fittings and other appurtenances, including nuts and bolts, shall be galvanized pressed steel, malleable or cast steel.

2. Fence fabric shall be attached to framework with stainless self locking metal bands, Band-it tie or equal. Bands shall be folded back against rails such that no sharp edges or corners protrude.

2.3 4' CHAIN LINK FENCE AND GATES

A. Chain Link Fabric

1. Chain link fabric shall have a fusion bonded polyvinyl coating. Vinyl color for fabric shall be custom RAL color.

Fabric shall be #6 (six) gauge galvanized wire core with a two (2) inch mesh.

The base metal shall be commercial quality medium-carbon, hot-dipped galvanized steel wire. The finished core wire shall have a minimum breaking strength of 650 lbs, per ASTM F668. The vinyl coating shall be continuously bonded (not sprayed or dipped) over the galvanized steel wire by the Extrusion Bonding process under pressure of 5,000 psi to insure a dense and impervious covering free of voids, having a smooth and lustrous surface appearance. An additional adherent shall be applied to bind the vinyl coating to the steel wire. The coating thickness over the galvanized steel mesh shall be 6 mils minimum. The wire shall be vinyl-coated before weaving and shall be free and flexible at all joints. The mesh size shall be measured by the distance between the wire forming parallel sides of the mesh, with permissible variation of plus or minus .250 inches.

2. The fabric shall be knuckle selvaged top and bottom, and shall have a permissible variation of plus or minus one inch.

B. Wire Coating

1. Plasticized Polyvinyl Chloride (PVC) with low temperature (-20 degrees C) plasticizer, no filter, extenders or extraneous matter, other than the necessary stabilizers and pigments shall be used. Colors will be stabilized and have a light fastness that shall withstand a minimum WEATHER-O-METER exposure of 1,5000 hours without any deterioration (Test Equipment Operating Light and Water Exposure Apparatus Carbon - Arc Type ASTM D1499.E42 Type E). The vinyl coating shall, in addition, resist attack from prolonged exposure to dilute solutions of most common mineral acids, seawater and dilute solutions of most salts and alkali.

C. Posts, Gate Frames, Rails and Braces

1. Posts, rails gate frame and braces shall conform to Federal Specifications RR-F-191/3C and be fabricated of Class I (round steel sections), Grade A (hot-dipped galvanized), seamless steel pipe, in accordance with ASTM A120 (Schedule 40), shall not be PVC coated, and be of the following sizes:

End or Corner Posts:	2 1/2” / 2.375” O.D. schedule 40
Line Posts:	2” / 1.9” O.D. schedule 40
Rails and Braces:	1 5/8” / 1.66” O.D. schedule 40
Gate Posts:	2 1/2” / 2.375” O.D. schedule 40 for gate leafs less than 6’ in width. For gates with leafs wider than 6’, posts shall be 4” O.D. pipe, or 9.11 lbs per foot.
Gate Frame:	1 5/8” / 1.66” O.D schedule 40

2. Rails shall be joined at posts with boulevard clamps.

3. Gate posts shall be of sufficient length to allow for an installation depth of approximately three feet six inches below grade level.
4. Gate frame shall have welded joints protected by applying zinc-rich paint in accordance with ASTM Practice A780.

D. Fittings

1. Fittings and other appurtenances, including nuts and bolts, shall be aluminum alloy, galvanized pressed steel, malleable or cast steel.

2. Fence fabric shall be attached to framework with stainless self-locking metal bands, Band-it tie or equal. Bands shall be folded back against rails such that no sharp edges or corners protrude.

3. Heavy duty drop fork positive lockable gate latch shall be a Fulcrum type latch fabricated with galvanized finish.

4. Cane Bolt/Drop Rod latch shall be provided at each gate and shall be lockable. Drop Rod shall be 1 3/8" tubing with a 1 3/8" post cap. Cane Bolt/Drop Latch guide shall be 1 5/8" and be bolted to gate frame. Drop Rod shall have a stop welded to the bottom of the rod for theft prevention. Drop Rod latch shall be lockable with a padlock

5. Gate Hinges at primary park entrance with one 4' gate panel and one 7'6" gate panel shall be heavy duty pressed steel and shall allow for a 90-180 degree outward swing. Hinges shall be as shown on the drawings and shall be finished to match gate frame. The 4" gate shall have a self-closing spring hinges with heavy duty die cast aluminum housing. Hinge pin and spring shall be stainless steel. Gate hinge tension shall be adjustable with a flat-head screwdriver.

6. Gate Hinges at secondary entrance with two (2) 3'-6" equal gate panels shall be heavy duty pressed steel and shall allow for a 90 degree inward swing. Hinges shall be self-closing spring hinges with heavy duty die cast aluminum housing. Hinge pin and spring shall be stainless steel. Gate hinge tension shall be adjustable with a flat-head screwdriver.

PART 3 – EXECUTION

3.1 INSTALLING NEW FENCE

A. Post spacing shall be uniform with maximum spacing of 10 feet in fences erected along straight lines. All posts shall be placed plumb and centered in concrete foundations.

B. If solid ledge is encountered without over-burden of soil, posts shall be set into the rock a minimum depth of 12 inches for line posts and 18 inches for terminal posts. Post holes shall be at least 1 inch greater in diameter than the post and the grout shall be thoroughly worked into the hole so as not to leave voids, and shall be crowned at the top to shed water. Where solid rock is covered by an overburden, the total setting depth shall not exceed the depths required for setting into earth, and the posts shall be grouted into the rock as described.

C. A change in direction of the fence line of 30 degrees or more shall be considered corners. Pull (corner) posts shall be used at any abrupt change in grade.

D. Maximum area of un-braced fence shall not exceed 1,500 square feet.

E. Terminal posts shall be braced to adjacent posts with horizontal brace rails and diagonal truss rods brought to proper tension so that posts are plumb.

F. There shall be no loose connections or sloppy fits in the fence framework. The fence framework shall withstand all wind and other forces due to the weather.

G. Fabric shall be stretched taut and tied to posts and rails. The fabric shall be installed on the security side of the fence and shall be anchored to the framework so that the fabric remains in tension after pulling force is released. The fabric shall be attached to line posts with steel self-locking fabric bands, spaced to line posts at not more than 15 inch intervals and to rails and braces at not more than 24 inch intervals. Fabric bands shall be fusion black to match fabric color in accordance with ASTM F668 class 2b. The fabric shall be securely fastened to all terminal and gate posts with 1/4 in. x 3/4 in. stretcher bars with heavy No. 11 gauge pressed steel tension bands spaced approximately 12 in. apart. All bands, wires and tension bars shall conform to Federal Specification RR-F-191/4C.

H. The Contractor shall promptly remove from the site all excess excavated materials and other debris resulting from the fence construction, and dispose of such materials at the direction of the Owner.

3.2 INSTALLING NEW GATES

A. Gate posts shall be placed plumb and centered in the concrete foundations.

B. Contractor shall take careful measurements of finish grade in area of proposed gate swing and shall account for finish grade elevation on shop drawings.

END OF SECTION

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SECTION 328400

IRRIGATION

PART 1 - GENERAL

1.01 SUMMARY

A. Provide all materials, labor, installation equipment, and technical service to complete construction of automatic irrigation system, as well as the testing and warranty of the system as defined in this Specification and Construction Drawings. Items of work specifically included are:

1. Procurement of all applicable licenses, permits, and fees.
2. Coordination of all utilities.
3. Verification of site conditions.
4. Maintenance during guarantee period.
5. Connection of electrical power supply to the irrigation control system.

1.02 QUALIFICATIONS

A. Qualified irrigation system installers must have a minimum experience of four (4) years with work and products specified herein, including:

1. Weather-Based and Smart Controllers
2. Commercial/Municipal Irrigation Systems
3. Outdoor Plumbing and Cross-Connection Installation

1.03 UTILITIES

A. Water Service Point of Connection

1. Existing 2-Inch Water Service to be reused for Irrigation, Drinking Fountain, and Water Feature. Approximate point of connection location is noted on Drawings.

a. Equipment requirements:
1) Irrigation Backflow Preventer
a) Size: 1¼-Inch
b) Construction: Bronze with Quarter Turn Ball Valve, Bronze Strainer,
c) Ratings: 175 psi Maximum
d) Manufacturer/Model: Watts Model 002M2-QT-S (to fit within Backflow Preventer)
2) Water Meter (per City of Somerville)
a) Size: ¾-Inch
b) Construction: Bronze
c) Features: Magnetic Drive with Automatic Meter Register (ARM), Threaded Input and Output for Nipples and Unions
d) Manufacturer/Model: Neptune Model T-10; or Approved Equal
3) Domestic Water Connection
a) Size: 2-Inch Existing from Central Street

b. Flow and pressure requirements at outdoor point of connection:
1) Flow: Maximum 20 gallons per minute

2) Pressure: 100 pounds per square inch static pressure in street, use pressure regulation at all sprinklers, drip, and quick coupling valves

B. Electrical Power Source

1. New electrical circuits to be provided by Electrical Contractor (Refer to Division 26 Electrical).

a. Power Requirements for Irrigation Controller
b. 120-Volt, 1-Phase, 60-Hz, 20-Amp
c. Conduits to exterior point of connection

C. Communications to Controller (Optional)

1. Cellular Network Card Compatible with Irrigation Controller.

D. Pipe Sleeves

1. Pipe sleeves to be provided by Earthwork Contractor beneath all hardscape, as indicated on Construction Drawings.

a. Pipe sleeve requirements
1) Two (2) parallel 4-inch SDR 26 Class 160 PVC
2) Extend 18 inches beyond edge of hardscape
3) Minimum cover: 24 inches

1.04 RELATED REQUIREMENTS

A. Coordinate with other project trades and refer to overall project Construction Document Specifications and Drawings, including, but not limited to:

1. Division 01 – GENERAL REQUIREMENTS
2. Division 02 – EXISTING CONDITIONS
3. Division 03 – CONCRETE
4. Division 22 – PLUMBING
5. Division 26 – ELECTRICAL
6. Division 31 – EARTHWORK
7. Division 32 – EXTERIOR IMPROVEMENTS
8. Division 33 – UTILITIES
9. Construction Drawings:

a. IR1.0 – Irrigation & Water Layout Plan
b. IR2.0 – Irrigation Details
c. IR2.2 – Outdoor Cross Connection Details
d. Review all other Project Construction Documents for coordination

1.05 APPLICABLE STANDARDS AND CODES

A. At a minimum, comply with the following standards and codes:

1. American Society for Testing and Materials (ASTM)
2. National Standard Plumbing Code (NSPC)
3. National Electric Code (NEC)
4. National Sanitary Foundation (NSF)
5. Underwriters Laboratories, Inc. (UL)
6. Occupational Safety and Health Administration (OSHA)

B. Comply with applicable laws, standards, and regulations of the local governing authority. All local laws more stringent than those referenced above shall take precedent.

1.06 SUBMITTALS

A. Submit the following under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:

1. Literature: Manufacturer's product data sheets, specifications and installation instructions for materials listed in this Specification (Part 2 – Products).

    a. Product submittals shall be concise (no extraneous pages or sections) and clearly marked to show submitted product model, type, size, etc.
    b. Substitute Product Submittal:
        1) Provide specified product submittals for “an approved equal” to Owner’s Representative for approval.
        2) Alternate products are acceptable when products of equal or better quality and performance are submitted and approved by the Owner’s Representative.
        3) Substitute Product Submittals constitute representation that:
            a) Substitute products have been thoroughly investigated and have been determined to be equal or superior in all respects to that specified.
            b) Substitute products shall provide the same warranties as specified products.
            c) Substitute products are compatible with interfacing items.
            d) Assume responsibility of and guarantee system performance as a result of product substitution, including making all subsequent changes to meet design specifications.
    c. Work shall not commence until all products specified are submitted and approved in a written notification by Owner’s Representative.
    d. All product installed shall be new, without defects, and of quality and performance as specified.

2. Schedule: Submit Schedule of all products to be furnished hereunder, indicating manufacturer, size, and model.

    a. Ensure that all of the types/styles of products and installation equipment specified herein can be furnished by the manufacturer submitted.
    b. Provide all spare irrigation parts as noted (see Spare Irrigation Parts)
    c. Prior to submitting schedule, confirm current site conditions are as provided in the Construction Drawings.

3. Qualifications: Submit qualification package as requested by Owner’s Representative. Qualifications package must include:

    a. Two (2) references for similar work performed in last five (5) calendar years.
        1) Contact name
        2) Company Name
        3) Contact Phone Number
        4) Project Name and Location
        5) Brief Project Description

1.07 DELIVERY, STORAGE AND HANDLING

A. Do not deliver materials to the site, until all specified submittals have been submitted to, and approved by, the Owner's Representative.

B. Coordinate with Owner's Representative for temporary storage and staging areas.

C. Protect materials from damage from construction traffic, weather, corrosion, and other causes while stored on-site. Minimize on-site storage as possible.

D. Store and handle all products and materials in compliance with manufacturer instructions and recommendations.

1.08 GUARANTEE AND REPLACEMENT

A. Guarantee entire irrigation system, parts and labor, for one (1) year from official written date of acceptance by Owner's Representative. Provide written warranty showing date of completion and period of warranty prior to request for final payment.

B. System malfunctions occurring during the guarantee period due to defective materials, poor workmanship, or improper adjustment shall be corrected to satisfaction of Owner's Representative at no additional cost to the Owner.

1. Repair all defects within 10 days of notification from Owner or Owner's Representative.
2. Repair defects with approved products.

C. First-year spring system start-up and winterization shall be included in system guarantee.

D. Manufacturer warranties shall be provided for all products and materials where such warranties are offered in published product data. Copies of manufacturer warranties are to be included in the Operations & Maintenance Manual (See Operation and Maintenance)

PART 2 - PRODUCTS

2.01 AUTOMATIC IRRIGATION CONTROLLER

A. Controller

1. Size: 16-Station Minimum
2. Construction: Electronic with 120-Volt Input and 24-28 Volt Output, Stainless Steel Pedestal Enclosure
3. Standards: UL-Listed
4. Features: Manual and Automatic Control, Water Budgeting, Cycle-Soak, Sensor Input Terminals, Internal Transformer, Flow Monitoring Capability, Lightning Protection, Remote Control, Conventional Wire, Web-Based Capabilities
5. Manufacturer/Model: Rain Bird ESP-LXME with IQ; or Approved Equal

B. External Devices (Match Manufacturer of Controller)

1. Rain Sensor (Mounted to Pedestal Enclosure)

    a. Manufacturer/Model: Rain Bird Rain-Check; or Approved Equal

2. Flow Sensor (OPTIONAL)

a. Manufacturer/Model: Rain Bird FS; or Approved Equal

3. Web-Based Control (OPTIONAL)

a. Manufacturer/Model: Rain Bird IQ, with Cellular Service; or Approved Equal

C. Outdoor Grounding

1. Size

a. Wire: 6AWG Bare
b. Rod: 5/8-Inch Diameter x 12-Foot Long
c. Plate: 4-Inch x 96-Inch x 1/16-Inch Thick

2. Construction

a. Wire: Copper
b. Rod: Copper
c. Plate: Copper with Loresco PowerSet Ground Enhancement Material Above and Below

3. Ratings: UL-Listed

4. Features: Cadweld Connectors from Wire to Rod, Plate Manufacturer provided Plate Connections, PVC or ADS Drain Pipe and Grate Cover over Rod Plate with Metal Detection

2.02 IRRIGATION CONTROLLER ENCLOSURE

A. Size: 38 inches tall, 16 inches wide, 16 inches deep

B. Construction: 304 Stainless Steel

C. Ratings: UL-Listed, NEMA 3R

D. Features: Louvered main door, hollow center thermoplastic door seal, filter screens covering louvers, top entry lid with two gas springs, continuous stainless steel piano hinge, locking mechanism and padlock hook, removable stainless steel trays, enclosure made specific for Rain-Bird ESP-LXME

E. Manufacturer/Model: VIT Strong Box, SB-16SS (Specific for Rain-Bird ESP-LXME); or Approved Equal.

2.03 WIRE

A. Valve Control Wire

1. Size: 14AWG Minimum
2. Construction: Single Strand Solid Copper Conductor with PVC Insulation
3. Ratings: UL-Listed, NEC (Class II Circuit), Direct Burial UF/TWU, up to 600-Volt Potential
4. Standards: ASTM B-3, ASTM B-8
5. Markings: Manufacturer, Rating, Size, and Type
6. Manufacturer/Model: Paige Electric Model P7001D; Service Wire Company UF14, UF12; Regency Wire & Cable 14AWG, 12AWG; or Approved Equal.

B. Wire Splices

1. Type: Direct Burial Wire Splice Kit (All Components Intact)
2. Construction: Lockable Plastic Tube, Pre-Filled with Insulation Gel
3. Ratings: UL-Listed, NEC, Direct Burial and Submersion, up to 600-Volt Potential
4. Manufacturer/Model: 3M DBY-6; Rain Bird DB Series; or Approved Equal.

C. Wire Conduit

1. Size: 1-Inch Minimum
2. Construction: Polyvinyl Chloride (PVC) Solvent Weld Below Grade, Galvanized Above Grade
3. Ratings: Schedule 40
4. Fittings: Long Sweep Elbows
5. Manufacturer: Cresline; Certainteed, JM Eagle; or Approved Equal.

2.04 PIPE AND FITTINGS

A. Irrigation Mainline

1. Size: 1½-Inch Maximum
2. Construction: Polyvinyl Chloride (PVC), Solvent Weld
3. Ratings: Class 200, Type 1120, SDR 21
4. Standards: ASTM D-2241
5. Markings: Manufacturer, Nominal Size, Class or Schedule, Pressure, Extrusion Date, Pipe Insertion Mark.
6. Manufacturer: Cresline; Certainteed; JM Eagle; or Approved Equal.

B. Fittings

1. Size:

    a. For Valves Toe Nipples: Schedule 80 PVC
    b. Other Fittings: Schedule 40 PVC

2. Markings: NSF Designation, Size, Class or Schedule
3. Manufacturer: Lasco; Spears; Dura; or Approved Equal

C. Solvent

1. Type: NSF Type I or Type II PVC
2. Standards: ASTM D-2564
3. Manufacturer: IPS Weld-On 711; Oatey HD Cement; Rectorseal Gold; or Approved Equal

D. Primer

1. Type: NSF for PVC
2. Standards: ASTM F-656
3. Manufacturer: IPS Weld-On P-68; Oatey Clear Primer; Rectorseal Jim PR-2; or Approved Equal

E. Irrigation Laterals

1. Size: 1¼-inch Maximum
2. Construction: Polyethylene (PE) 3408

3. Ratings: Class 100, Type III, SDR 15, Class C
4. Standards: ASTM D-2239
5. Colors: Black
6. Fittings: PVC Insert (per ASTM D-2609) with Stainless Steel Clamps on Each Side
7. Markings: Manufacturer, Nominal Size, Class or Schedule, Pressure, Extrusion Date, Pipe Insertion Mark
8. Manufacturers: Oil Creek; Certainteed; JM Eagle; or Approved Equal. Insert Fittings: Lasco, Dura, or Approved Equal. Clamps: Oetiker, or Approved Equal

2.05 ELECTRIC ZONE VALVES

A. Drip Zone Valve (Kit)

1. Size: 1-Inch
2. Construction: Plastic Diaphragm with Reinforced Nylon or Fiberglass Body
3. Ratings: 200 psi with Minimum Flow of 0.2 gpm
4. Features: Manual Bleed Screw, Flow Control, 30 psi Pressure Regulation, and Stainless Steel Screen Filtration to 100 micron (150 mesh)
5. Manufacturer/Model: Hunter PCZ; Rain Bird XCZ; or Approved Equal

B. Sprinkler Zone Valve

1. Size: 1-Inch (20 gpm maximum)
2. Construction: Plastic Globe Valve with Reinforced Nylon or Fiberglass Body
3. Ratings: 200 psi
4. Features: Manual Bleed Screw, Flow Control, Pressure Regulation, and Filter/Scrubber
5. Manufacturer/Model: Hunter ICV-FS; Rain Bird PESB; or Approved Equal

C. Master Valve (OPTIONAL)

1. Size: 1-Inch (maximum 20 gpm)
2. Construction: Brass Globe Valve
3. Ratings: 220 psi
4. Features: Manual Bleed Screw, Flow Control, Pressure Regulation, and Filter
5. Manufacturer/Model: Hunter IBV-FS; Rain Bird EFB-CP; or Approved Equal

2.06 ISOLATION VALVES

A. Small Mainline Isolation Valve

1. Size: 1½-Inch and Smaller
2. Construction: Bronze, Gate Valve
3. Ratings: 200 psi
4. Features: Steel Cross Handle, Non-Rising Stem
5. Manufacturer/Model: Nibco T-113K; Apollo 102T-K; or Approved Equal

2.07 QUICK COUPLING VALVES

A. Small Mainline Quick Coupling Valve

1. Size: 1-Inch, Normally Closed
2. Construction: Brass, Spring-Loaded Valve Seat, Key Engaged
3. Ratings: 125 psi
4. Pressure Regulator: Add 40 psi Pressure Regulator per details

5. Features: 1-Inch NPT Inlet, ACME Key, Locking Vinyl Cover, Anti-Rotation Stabilization Wings

    a. Swing Joint Assembly
        1) Size: 1-Inch
        2) Construction: PVC, with O-Ring Seals and Brass Threaded Outlet
        3) Manufacturer: Hunter HSJ-1 with SnapLok; or Approved Equal

6. Manufacturer/Model: Hunter HQ-44RC-AW; or Approved Equal.

2.08 VALVE BOXES

A. General

1. Size:

    a. 12-Inch Standard Valve Box
        1) Double 1-Inch or 1½-Inch Electric Zone Valves
        2) Single or Double 1-Inch Drip Kits
    b. 6-Inch Round
        1) Wire Splice
    c. 10-Inch Round
        1) Single 1-Inch or 1½-Inch Electric Zone Valve
        2) Isolation Valve
        3) Quick Coupling Valve

2. Construction: Resin
3. Ratings: Tensile Strength 3,000-5,000 psi
4. Color: Green or Black (per Owner's Representative)
5. Features: Lockable, Bolt-Down Covers, Brick Supported
6. Manufacturer/Model: Carson, Model Specification Grade NDS Pro; Rain Bird VB; or Approved Equal

2.09 DRIP IRRIGATION (TREES)

A. Integral Emitter Drip Tubing

1. Type

    a. Tree Drip Rings
        1) Tubing: 17 mm
        2) Emitters:
            a) Rate: 0.9 gph
            b) Spacing: 2- and 3-Foot Diameter Rings
    b. Blank Tubing
        1) Tubing: 17mm
        2) Emitters: none

2. Construction: Polyethylene (PE) with Embedded Pressure Compensating Emitters
3. Ratings: Minimum Bending Radius = 7-inches
4. Fittings: 17mm PVC Barbed Fittings with Stainless Steel Clamps, Corrosion Tubing Stakes to Secure Drip Tubing to Ground
5. Manufacturer/Model: Netafim TLDL9-12 and TLDL0; or Approved Equal

B. Automatic Flushing Valve

1. Size: 1-Gallon Flush
2. Construction: Plastic
3. Fittings: 17mm PVC Barbed Fittings
4. Manufacturer/Model: Netafim TLFV-1; or Approved Equal

2.10 SPRAY SPRINKLERS (SHRUBS)

A. Body

1. Size: 12-inch Pop-Up (Shrubs, Perennials, Groundcovers)
2. Construction: Plastic, Ratcheting Riser, Removable Nozzle, Internal Check Valve
3. Ratings: Pressure Regulated to 30 psi
4. Manufacturer/Model: Hunter PROS-XX-PRS30-CV; Rain Bird 18XX-SAM-PRS, or Approved Equal

B. Nozzles

1. Size: 5’ – 15’ Radius (see Drawings)
2. Features: Full and Part-Circle Fixed-Arc and Strip Patterns
3. Manufacturer/Model: Hunter Pro Spray; Rain Bird MPR; Toro Precision; or Approved Equal

C. Swing Pipe (Polyethylene Laterals)

1. Size: ½-inch inside diameter
2. Features: Flexible pipe for connection to barbed fitting, kink-resistant, maximum operating pressure of 80 psi.
3. Manufacturer/Model: Rain Bird SPX-FLEX; Hunter Pro-Flex

2.11 EARTH MATERIALS

A. Stone (in Valve Boxes)

1. Type: ¾-Inch (minimum) Crushed Stone

B. Clean Sand

1. Gradation: (passing by weight)

a. No. 4 Sieve= 80% Minimum
b. No. 200 Sieve = 5% Maximum

C. Concrete (Irrigation and Backflow Enclosure Bases)

1. Ratings: 3,000 psi 28-day Compressive Strength
2. Standards: ASTM C-33, ASTM C-94, ASTM-C150

2.12 SPARE IRRIGATION PARTS

A. Wrenches, Keys, and Tools for Servicing and Adjusting Sprinkler Heads (2)

B. Quick Coupler Valve Keys (1)

C. Gate Valve (1)

D. Electric Zone Valve (1)

E. Sprinkler Heads and Nozzles (3 or Each)

F. Assorted Isolation Valves, PVC and PE Fittings

G. Integral Emitter Drip Tubing (100' Roll)

H. Assorted Drip Valves and Fittings

2.13 OUTDOOR PLUMBING AND ENCLOSURE (BACKFLOW PREVENTER AND METER)

A. Water Meter (to be purchased by Contractor from City)

1. Size: 3/4-Inch
2. Construction: Brass with Threaded Inlet and Outlet
3. Manufacturer/Model: Neptune T-10 or Approved Equal by City of Somerville

B. Irrigation Backflow Preventer

1. Size: 1¼-Inch
2. Construction: Brass and Bronze
3. Ratings: Lead-Free, 200 psi, Reduced Pressure Zone
4. Features: Quarter-Turn, Strainer
5. Manufacturer/Model: Watts 1¼-Inch 002M2 QTS

C. Drinking Fountain and Water Feature Backflow Preventer

1. Quantity: 2
2. Size: 1-Inch
3. Construction: Brass and Bronze
4. Ratings: Lead-Free, 200 psi, Reduced Pressure Zone
5. Features: Quarter-Turn, Strainer
6. Manufacturer/Model: Watts 1-Inch 002M2 QTS

D. Backflow and Meter Enclosure

1. Size: 60" Long x 38" Wide x 39" Tall
2. Construction: Marine-Grade Aluminum Alloy 5052-H32, 1/8-inch thick; Stainless Steel Mounting Base
3. Ratings: Vandal and Weatherproof
4. Features: Center Split Design Opening, Stainless Steel Cross Bar Locking Mechanism for Padlock, Louvers for Ventilation
5. Manufacturer/Model: VIT Strongbox, Model PE-60AL, or Approved Equal
6. Note: Alternatives and Approved Equals for Backflow and Meter Enclosure shall also submit shop drawings to demonstrate adequate space for 3 backflow preventers and city meter.

PART 3 - EXECUTION

3.01 GENERAL

A. Competent superintendents and assistants shall be on-site at all times during product delivery, installation, testing, and system adjustments.

1. Field communication by Owner or Owner's Representative to superintendent shall be binding.

B. System features shall be laid out as indicated on Drawings, making minor adjustments for variations in planting arrangements or field conditions. Major changes shall be reviewed with Owner's Representative before acceptance.

1. Irrigation lines shown on Construction Drawings are diagrammatic only.
2. Location of irrigation equipment is contingent upon and subject to integration with all other underground utilities, tree roots, and hardscape design elements.

3.02 EXAMINATION

A. Review and verify project conditions are as indicated on Construction Drawings prior to starting work, including but not limited to:

1. Utilities provided by Others
2. Site grades and dimensions
3. Landscaping and features
4. Structures
5. Pipe sleeves

B. Report any irregularities of site conditions to the Owner's Representative prior to beginning work.

C. Beginning of installation constitutes acceptance of existing project conditions.

3.03 PROJECT COORDINATION

A. Coordinate with Owner's Representative to expeditiously install system.

B. Provide written notifications (electronic is acceptable) to Owner's Representative prior to work commencement, weekly for progress report, for any proposed changes to system design, and upon installation completion.

C. All questions of design intent, proposed design changes, field notifications, and product substitution after installation commences shall be in writing to Owner's Representative as a Request for Information (RFI).

D. Utility Coordination:

1. Maintain 6-inch minimum clearance between irrigation lines and any utility line. Do not install sprinkler lines directly above another utility of any kind.
2. Exercise care when excavating, trenching and working near existing utilities.

3.04 SITE PROTECTION

A. Protect landscaping, paving, structures, walls, footings, etc. from damage caused during work. Damage to work of another trade shall be reported at once.

B. Replace or repair any damage with same product or material, to the satisfaction of Owner's Representative at no additional cost to the Owner per Guarantee.

C. Route pipe as necessary to prevent damage to tree roots. Where trenching must occur near trees, provide proper root pruning and sealing methods to all roots 1-inch and larger.

3.05 EXCAVATION, TRENCHING, AND BACKFILLING

A. Notify and request approval from Owner's Representative if pipe pulling is the intended installation method. Pipe pulling is an accepted installation practice only under the following conditions:

1. Maximum pipe size 2 inches, and
2. Suitable soils (i.e. naturally rounded loamy soils without sharp rocks), and
3. Specified pipe burial depth can be maintained.

B. Pipe Trench:

1. Excavate trenches straight and true, minimizing site disturbance as possible.
2. Final trench bottom shall be undisturbed soil and shall be free of rocks and debris larger than 1 inch or with sharp edges. If trench base is unsuitable for laying pipe, over excavate 2 inches below pipe invert, and place Clean Sand or Stone.

C. Clean Backfill:

1. Material: Clean Sand (See Earth Materials)

    a. Clean backfill must be free of foreign material, debris, frozen material and rocks larger than 1-inch.

2. Carefully place clean backfill a minimum depth of 10-inches over pipe and wire, tamp in place.
3. Carefully place material around pipe and wire, tamp in place.

D. Trench Backfill:

1. Material: Re-use excavated material

    a. Clean backfill must be free of foreign material, debris, frozen material, and rocks larger than 1-inch.

2. Place and compact in maximum 6-inch lifts to dry density equal to undisturbed soil. Compaction by truck or equipment tires is prohibited.
3. Avoid backfilling in hot weather.
4. Match adjacent subsurface grades without hills or depressions. Repair settling (as required by Guarantee).
5. If final planting soils, mulch, or sod were removed or disturbed during trenching, replace to match Project Specifications and regrade as necessary.

    a. Use sod cutter where applicable, or reseed disturbed areas to acceptance of Owner.

3.06 PIPE INSTALLATION

A. PVC Pipe Installation:

1. Cut plastic pipe with handsaw or pipe cutter, removing all burrs at cut ends. All pipe cuts shall be square and true. Bevel cut end as required to conform to manufacturer instructions.
2. Make all solvent-weld joints as per manufacturer's instructions and avoid applying excess primer or solvent. Do not wipe off excess solvent from each connection.

a. Allow welded joints minimum 5 minutes set-up/curing time before moving or handling.
   1) Above 80ºF: Allow connections to set 24 hours.
   2) Below 80ºF: Follow manufacturer instructions.
   3) Below 40ºF: Prohibited.

3. Maximum deflection per joint shall not exceed manufacturer limits.
4. Maintain 1-inch minimum between lines which cross at angels of 45 to 90 degrees

B. Pipe and wire shall run in same trench as mainline, at the elevation of the pipe invert (See Wire Installation).

C. Pipe Cover (unpaved surfaces):

1. PVC Mainline = 22 inches
2. PVC Lateral = 16 inches

D. Pipe Protection:

1. Prevent foreign material from entering pipe during installation.
2. Open ends of pipe shall be closed by watertight plug or seal when not in use.
3. Securely store pipe when not scheduled for installation.
4. Pipe shall not be installed when water is in trench, during rainstorms, or when temperature is below 40 ºF.
5. No additional pipe may be installed or backfilled if water enters trench during pipe installation. Remove all water from trench before resuming installation.
6. Pipe installed at temperatures below 40 ºF shall be removed and replaced at no cost to owner.
7. Trenched PVC pipe shall be snaked to accommodate for expansion and contraction due to changes in temperature.

3.07 PIPE SLEEVE INSTALLATION

A. Coordinate with Owner's Representative for provided pipe sleeves and locations installed by Earthwork Contractor.

B. New Pipe Sleeves:

1. Pipe Sleeve Cover: Minimum 24 inches
2. Install pipe sleeves where irrigation pipe runs under hardscape (see Construction Drawings).
3. Extend pipe sleeves minimum 18 inches beyond edges of hardscapes.
4. Prior to installation of pipe, pipe sleeve ends shall be field marked with vertical wood stakes extending above grade to allow field location during irrigation system installation.

C. Cutting through or jacking under new pavement shall be strictly prohibited. Failure to provide sleeves shall require notification to Owner's Representative for resolution.

3.08 ELECTRICAL CONDUIT INSTALLATION

A. Electrical conduit shall be installed:

1. Under and through all hardscape areas,
2. Above ground wiring

B. Electrical conduit shall extend 18-inches beyond edges of hardscape.

3.09 ELECTRIC ZONE VALVE INSTALLATION

A. Install electric zone valves on level crushed stone base generally where shown on Construction Drawings. Do not pour stone around valves that are already installed.

B. Install all Schedule 80 PVC threaded nipples with Teflon tape, isolation valves, and/or union couplings in and out of electric zone valves as shown on details on Construction Drawings.

C. Set valves plumb with adjusting handle and all bolts, screws, and wiring accessible through valve box opening.

D. Install at sufficient depth to provide between 4-6 inches of cover from top of valve to finish grade.

E. Install specified valve box over all electric zone valves. Ensure lid is flush with final proposed grade (coordinate with Site Contractor).

F. Adjust zone valve operation after installation using flow control device on valve.

G. Install 30-psi Pressure Regulator and Filter for Drip Irrigation where Drip Zone Kits are not ordered.

3.10 ISOLATION VALVE INSTALLATION

A. Install isolation valves per detail where indicated on Construction Drawings.

B. Install all isolation valves on level crushed stone base for operation ease with appropriate valve wrench. Do not pour stone around valves that are already installed.

C. Install specified valve box over all isolation valves. Ensure lid is flush with final proposed grade (coordinate with Site Contractor).

D. Check and tighten valve bonnet packing before valve box and backfill installation.

3.11 QUICK COUPLING VALVE INSTALLATION

A. Install quick coupling valves where indicated on Construction Drawings; generally, at ends of mainline branches and immediately downstream of well.

B. Mount mainline quick coupling valves on 1-inch diameter, 12-inch long brass swing joint assemblies and stabilizers.

C. Install pressure regulating valves to 40 psi off quick coupling valve service tee.

3.12 WIRE INSTALLATION

A. Install wiring per local codes for less than 30-Volt service.

B. Install valve wire in trench alongside mainline at invert elevation with multiple wire bundles cinched together at every 12-feet maximum using plastic cable cinches.

C. Backfill carefully to avoid any damage to wire insulation on conductors.

1. In areas of unsuitable material, use clean sand in bottom of trench before placing wire (see Excavation, Trenching, and Backfilling)

2. Minimum cover: 12-inches

D. Maintain sufficient slack for expansion, contraction and servicing. Do not install wiring tightly.

1. Provide and install additional 8 to 12 inches slack for conventional wire for each change of direction.
2. Provide sufficient length of wire in valve boxes to allow valve solenoid, splice, and all connections to be brought above grade for servicing.
3. Coil slack for neatness in valve box.

E. Provide waterproof splices at all in-ground wire connections using approved splice kits. All splices shall be made in valve boxes and recorded on Record Drawings.

F. Provide complete wiring diagram showing wire routing for connections between controller and valves as specified in Record Documents.

3.13 GROUND INSTALLATION

A. Controller Grounding

1. Wire bare copper 8AWG wire to irrigation controller ground lug. Run ground wire to designated area for grounding rod and plate. Cadweld ground wire to additional bare copper 8AWG wire for grounding plate.
2. Grounding Rod

a. Prepare stone base for 4-inch round PVC or ADS drain pipe, 18 inches deep with open drain grate. Ensure no other wire or electrical services are located within 12-foot radius for sphere of influence.
b. Drive 12-foot grounding rod into earth through center of stone base with minimum 6 inches below grate cover.
c. Drill hole through PVC or ADS drain pipe wall 12 inches below grade.
d. Place PVC or ADS drain pipe centered over stone and grounding rod.
e. Feed bare copper grounding wire through drilled hole in drain pipe wall.
f. Make Cadweld connection between bare copper wire and grounding rod.
g. Place open grate on PVC or ADS drain pipe. Regrade and reseed around grate to make flush with existing grade (do not create high or low points at grate). Bolt or screw down grate to drain pipe wall.

3. Grounding Plate

a. Ensure no other wire or electrical services are located within 12 inches from each long side and 8 feet off each end of grounding plate for sphere of influence.
b. Install grounding plate 36 inches below grade. Set grounding plate within 50 pounds of ground enhancement material spread evenly above and below plate.
c. Place 4-inch diameter, 36-inch deep PVC or ADS drain over center of grounding plate. Place open grate on PVC or ADS drain pipe. Regrade and reseed around grate to make flush with existing grade (do not create high or low points at grate). Bolt or screw down grate to drain pipe wall.

3.14 SPRINKLER INSTALLATION

A. Sprinklers shall not exceed maximum spacing as indicated on Construction Drawings (maximum head-to-head spacing).

B. Install sprinklers flush with grade on PVC swing joints as specified.

C. Flush system before installing internals, flush caps, and nozzles (see Testing and Adjustments)

D. Adjust all sprinklers after installation using flow control device on valve.

3.15 DRIP IRRIGATION INSTALLATION

A. Tree Drip Ring

1. Install two (2) drip rings using tree drip ring emitter tubing. Center rings on tree trunk and rest on root ball.
2. Connect between tree rings using blank tubing
3. Connect all individual trees in series using drip ring lateral pipe and PVC barbed fittings.

3.16 AUTOMATIC IRRIGATION CONTROLLER INSTALLATION

A. Controller

1. Install controller at location shown on Construction Drawings.
2. Wire valves and external sensors into controller through conduits and set proper programming.

    a. Program “Cycle-Soak” feature for all zones with sloped or poorly draining soils.
    b. Install and calibrate soil moisture sensors as per manufacturer instructions.
    c. Soil moisture sensors are not required for each irrigation zone. Assign representative soil moisture sensors for similar zones, such as:
        1) Sun vs. Shade
        2) Lawn vs. Plantings
        3) Heavy vs. Light Soils
        4) Use Irrigation Plans provided for Recommended Quantity and Assignment

3. Using licensed electrical, wire controller to 120-Volt, 20-Amp electrical supply provided by Electrical Contractor.
4. Provide keys to Owner after final walkthrough.

B. Rain and Weather Sensors

1. Install sensors within Sensor Guard welded to irrigation controller enclosure. Wire sensor through Sensor Guard, through enclosure, and into Controller.
2. Exposed sensor wire shall be installed within ½-inch galvanized conduit, where applicable.
3. Rain Sensor shall have direct overhead exposure to atmospheric conditions and not in contact with overhead irrigation.

C. Flow Sensor (OPTIONAL)

1. Install Flow Sensor where shown on Construction Drawings.
2. Provide straight pipe for Flow Sensor to reduce turbulence:

    a. Upstream: 20 inches (10 times pipe diameter)
    b. Downstream: 10 inches (5 times pipe diameter)

3. Wire Flow Sensor to Automatic Irrigation Controller as specified with waterproof connectors. Do not use splices between Controller and Flow Sensor.

3.17 VALVE BOX INSTALLATION

A. Furnish and install valve boxes as per valve schedule above for each valve, splice, or sensor.

B. Install valve boxes on minimum 4-inches crushed stone base. Pouring stone into valve box after installation is not acceptable.

C. Finish elevation of all boxes shall be at grade, unless otherwise noted in Drawings.

D. Provide level brick supports beneath valve boxes.

1. For square/rectangular boxes, provide four (4) supports - one at each corner.
2. For round boxes, provide three (3) supports equally spaced.

3.18 PEDESTAL ENCLOSURE FOR CONTROLLER INSTALLATION

A. Install enclosure on concrete pads as indicated on Drawings. Final location of enclosures shall be coordinated with the Owner's Representative as to best screen the enclosure and deter vandalism. Final location shall also be coordinated with utility department to ensure proper placement of water supply line.

B. Concrete pad for controller enclosure shall be 24 inches long by 24 inches wide by 6 inches deep.

C. Install one (1) 1-inch sweep elbow (power), one (1) 1-1/2-inch sweep elbow (ground), and one (1) 3-inch sweep elbow (field wiring) through concrete pad into controller enclosure as per detail.

3.19 BACKFLOW AND METER ENCLOSURE INSTALLATION

A. Install enclosure on concrete pad as indicated on the detail, generally where indicated on the drawings. Final location of enclosures shall be coordinated with the Owner's Representative as to best screen the enclosure and deter vandalism. Final location shall also be coordinated with utility department to ensure proper placement of water supply line.

B. Concrete pad for backflow enclosure shall be 72 inches long by 50 inches wide by 6 inches deep (6 inch offset from enclosure dimensions).

C. Plumb all backflow preventers, city water meter, and winterization port generally as shown on Drawings. Leave minimum clearance of 2 inches from inside of enclosure for all equipment.

D. Mark-out and set pipe sleeves through pad prior to pouring.

3.20 TESTING AND ADJUSTMENTS

A. Include all testing and adjustments in submitted bid price.

B. System Flushing:

1. Open electric zone valves and flush out irrigation system under full head of water before installing sprinkler internals, flush caps, and nozzles.

2. Flush entire irrigation system after complete installation.
3. Clogged nozzles shall be remedied after completion of irrigation system.

C. Testing:

1. Test all pipe and valves for leaks at operating pressure. Repair all leaks and retest until leaks are remedied.
2. Perform coverage test with Owner's Representative present. Operate electric zone valves for five (5) minutes minimum during coverage test. Readjust sprinkler nozzles and head locations (as necessary) to attain proper coverage. Replace any equipment that does not meet specified standards.
3. After testing, clean all equipment of debris during installation.

D. Adjust sprinkler heads and valve boxes as necessary for mowing and landscaping.

E. Throughout guarantee period, adjust sprinklers and ensure coverage due to settlement and landscaping operations.

3.21 RECORD DOCUMENTS

A. Record (As-Built) Drawings

1. Maintain and update Record Drawings with red-line markings as project progresses, including locations of:

    a. Sprinklers and descriptions (nozzle, pop-up height, and type)
    b. Valve Boxes and descriptions (valve type, zone numbers, splice, etc.)
    c. All equipment installed with distinct symbols.
    d. Pipe routing and tees.
    e. Wire routing and splices.

2. Locations of installed equipment (valve, controller, sensors) shall be referenced by two permanent locations (swing ties) or GPS.
3. Make all notes legible as work progresses, any new equipment added shall use distinct symbols denoting location.
4. Document any changes from original Construction Drawings.
5. Prints of original Construction Drawings may be obtained from the Owner's Representative at cost (0% markup).
6. Record Drawings shall be used as basis of payment for work completed. Provide copies of red-lined set to Owner's Representative along with payment request.

B. Record Documents

1. Record Documents shall be on-site at all times. Maintain record of the following as the project progresses:

    a. Plumbing and Electrical permits (state whether or not required)
    b. Materials Approved and approval date
    c. Pressure Test results, testing personnel and testing date.
    d. Materials delivered, Accepted, and Installed by whom and date.
    e. Field Communications and Requests for Information (RFI)

C. Prior to final punchlist, provide complete electronic and hard copy files of Record Drawings and Documents to Owner's Representative as part of project completion. All information must be complete and shall be added to submitted documents prior to acceptance.

3.22 OPERATION AND MAINTENANCE

A. General

1. Bid price shall include up to four (4) hours of irrigation system overview and instruction with Owner and/or Owner's Representative.

B. Operation and Maintenance Manual

1. Provide three (3) hard cover binders titled "Operation and Maintenance for Hoyt-Sullivan Park Field Irrigation System" prior to application for acceptance and final payment.
2. Operation and Maintenance Manual shall include, but not be limited to:

    a. Title Page and Table of Contents
    b. One-Paragraph Written Description of Irrigation System
    c. Manufacturers' Data and Cut Sheets of Equipment, including:
        1) Copies of all approved submittals
        2) Wire resistance readings to each electric valve at completion (for future troubleshooting)
        3) Recommended operating settings
        4) Recommended maintenance schedule
        5) Name, address, and telephone number of installer (for repairs, spring startup, and winterization during 1-year guarantee period)
        6) Irrigation program for periods without rain and recommended settings including, zone run time, days per week, cycle-soak, and rain sensor suspension.
    d. Winterization and Spring Startup Instructions (after 1-year guarantee period)
    e. Guarantee Data
    f. Pockets with Folded Plans of:
        1) Original Design Drawing
        2) Final Record Drawing
        3) Controller Valve and Wiring System Diagram Drawing

3.23 SITE CLEANUP

A. Remove all unused materials and equipment from project site safely and efficiently. Dispose of all unused materials legally - including construction debris and trash.

B. Adjust ground, compact, and re-plant around irrigation sprinkler heads and trenches as necessary for proper angle and elevation.

C. Fill all depressions, erosion rills, tire tracks, etc. with proper planting soil mix to ensure site drainage.

3.24 FINAL OWNER ACCEPTANCE

A. Final Owner Acceptance of Irrigation System is predicated on:

1. Complete system installation, adjustment, testing, and instructional overview.
2. Submission of Operation and Maintenance Manuals to Owner's Representative.
3. Proper Programming of Automatic Irrigation Controller.
4. Completed and approved all punchlist items.

B. Owner and/or Owner's Representative shall provide written notice (hard copy and/or electronic) for Final Acceptance. Date of Final Acceptance notice shall serve as start of 1-year Guarantee period as described above.

END OF SECTION

SECTION 329300

PLANTING

1.1 DESCRIPTION OF WORK

A. Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Plant Material furnished and placed
2. Staking and guying trees
3. Pruning New Plants as directed by Landscape Architect
4. Plant Material Guarantee and Acceptance
5. Planting Soil furnished and placed
6. Soil Additives provided as needed
7. Steel Landscape Edging
8. No Mow Seed Mix
9. Maintenance
10. Clean-up

1.2 REFERENCES

A. "AMERICAN STANDARD FOR NURSERY STOCK," latest edition, American Association of Nurserymen (ANSI Z60.1)

B. ANSI 133.1 Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees

C. National Arborist Association - PRUNING STANDARDS FOR SHADE TREES, latest edition

D. "STANDARDIZED PLANT NAMES," 1942 Edition, American Joint Committee on Horticultural Nomenclature

1.3 DEFINITIONS

A. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.

B. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.

C. Bare-Root Stock: Exterior plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for kind and size of exterior plant required.

D. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for

kind, type, and size of exterior plant required.

E. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.

F. Finish Grade: Elevation of finished surface.

G. Planting Soil Mix: Native or imported loam, manufactured loam, or surface soil modified to become Loam; mixed with soil amendments

1.4 QUALITY ASSURANCE

A. Qualification of personnel.

1. Qualification of Landscape Contractor: The work of this Section shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years experience. Submit proof that the landscape contracting firm meets this requirement.
2. Qualification of Foreman or Crew Leader: All work of unloading, stockpiling, storing, transporting on-site, planting, staking and guying, fertilizing, and maintenance of trees, shrubs, vines, groundcover, and perennials shall be supervised by a foreman or crew leader who is a Certified Landscape Professional or a Certified Horticulturist. Submit proof of certification. Foreman and Crew Leader shall remain on the project on a consistant basis from the beginning of planting through provisional acceptance.

B. Material Sampling and Testing shall be specified, performed and paid for under the work of Section 320513 PLANTING SOILS

C. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

D. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position.

E. Locating Plant Material

1. Schedule and Season: Location of plant material shall be scheduled to provide optimal conditions for acquiring the healthiest specified plants possible from approved nursery sources. Contractor shall identify proposed planting dates on the Construction Schedule submitted within 10 days of the Owner-Contractor Agreement (as specified in Section, SUBMITTAL REQUIREMENTS) and shall be prepared to discuss the planting schedule with the Owner and the Architect.
2. Notify Landscape Architect of sources of planting materials within twenty-one (21) days after Notice to Proceed is given. Any request for substitutions in plant species, variety or size shall be made within this 21 day period.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 SAMPLES & SUBMITTALS

A. Bark Mulch: Submit supplier’s product literature and 1 cubic foot sample

B. Tree Staking and Guying Materials: Submit product literature

C. Soil Additives

1. Submit manufacturer's product data for all soil additives needed to amend specified soil.

D. Topsoil

1. The Contractor shall provide a one (1) cubic foot representative sample from each proposed source for testing and approval as directed by the Landscape Architect. The Conractor shall deliver samples to testing laboratory prior to any loaming and shall have the testing report sent directly to the Landscape Architect, and pay all coasts.

2. Mechanical and chemical (PH soluble salts) analysis shall be by public extension service agency or a certified private testing laboratory in accordance with the current standards of the Association of Official Agricultural Chemists and approved by Landscape Architect.

3. Report shall be submitted at least one (1) month before any loaming is to be done. Soil tests shall be for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Soluble Salts and Lead, and show acidity and USDA classification of the soil.

4. Report shall include recommendations based on the analysis and the proposed planting plan.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver exterior plants freshly dug.

B. Do not prune trees and shrubs before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

C. Handle planting stock by root ball.

D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, mulch, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.7 COORDINATION

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of

Substantial Completion.

Spring:	Deciduous materials	March 21 through June 1
	Evergreen materials	April 15 through June 1
	No Mow Seed Mix	March 15 through May 15 if Fall seeding is not possible
Fall:	Deciduous materials	September 1 through December 15
	Evergreen materials	August 15 though November 1
	No Mow Seed Mix	August 20 through October 20

If the construction completion date prohibits in-season planting, the Contractor shall receive approval from the Landscape Architect either to complete work after the project completion date or to prepare for out-of-season planting, including wilt-proofing and extra watering measures. The plant guarantee period shall remain as stated below. No frozen ground planting will be permitted. Only heeled in plants will be permitted during summer planting.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

PART TWO - PRODUCTS

2.1 PLANTING SOIL (LOAM BORROW)

A. Loam shall be a "fine sandy loam" or a "sandy loam" determined by mechanical analysis and based on the USDA classification system. It shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than one inch, lumps, plants and their roots, debris and other extraneous matter over one inch in diameter or excess of smaller pieces of the same materials as determined by the Landscape Architect. It shall not contain toxic substances harmful to plant growth. It shall be obtained from naturally well drained areas which have never been stripped before and have a history of satisfactory vegetative growth. Loam shall contain not less than 4% nor more than 10% organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 F, plus or minus 9.

B. Loam shall provide a rich, organic layer of planting soil that is also well-drained. Loam shall be a mixture of topsoil, compost and sand.

C. Loam shall have an acidity range of pH 5.6 to pH 6.5.
   1. The amount of either sulfur or limestone required to adjust the planting loam to the proper pH range (above) shall be determined by the Landscape Architect on the basis of soil tests as specified herein.

2.2 SOIL ADDITIVES

A. Commercial fertilizer, peat, humus or other additives shall be used to counteract soil deficiencies as recommended by the soil analysis and as directed by the Landscape Architect.
   1. Commercial fertilizer shall be a product complying with the State and United

States Fertilizer Laws. Deliver to the site in the original unopened containers which shall bear the manufacturer's Certificate of Compliance covering analysis which shall be furnished to the Landscape Architect. At least 50% by weight of the Nitrogen content shall be derived from organic materials. Fertilizer shall contain the percentages of weight of ingredients as follows, or as recommended by the soil analysis when that is significantly different:

	Nitrogen	Phosphorus	Potash
For all plants	10%	10%	10%

B. Ground dolomite limestone shall be an approved agricultural limestone containing not less than 85% of total calcium or magnesium carbonates. Limestone shall be ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve.

C. Humus shall be natural humus, reed peat or sedge peat. It shall be free from excessive amounts of zinc, low in wood content, free from hard lumps and in a shredded or granular form. According to the methods of testing of A.O.A.C., latest edition, the acidity range shall be approximately 5.5 pH to 7.6 pH and the organic matter shall be not less than 85% as determined by loss on ignition. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis.

D. Peat moss shall be composed of the partly decomposed stems and leaves of any or several species of sphagnum moss. It shall be free from wood, decomposed colloidal residue and other foreign matter. It shall have an acidity range of 3.5 pH to 5.5 pH as determined in accordance with the methods of testing of A.O.A.C., latest edition. Its water absorbing ability shall be a minimum of 1,100% by weight on an oven-dry basis.

E. Superphosphate: Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 18% available phosphoric acid.

2.3 PLANT MATERIALS

A. Selection of the Nursery Stock

1. At least forty-five (45) days prior to the expected planting date (for spring or fall planting) or at least sixty (60) days prior to the expected planting date (for summer planting), the Contractor shall request, in writing, that the Landscape Architect provide a representative to select and tag stock to be planted under this Section. This request shall be made at least fifteen (15) days prior to the date on which stock selections are to be made. The Letter of Request shall also have attached a Letter of Certification from the supplier attesting to the fact that the stock to be selected from is, in fact, the patented tree or plant required under this Section or a substitution approved by the Landscape Architect.
2. The Landscape Architect shall supply the necessary tags or seals which shall be durable and capable of accepting weather-resistant ink or an embossed process. The tags or seals shall be attached directly and securely to each selected plant.
3. The Contractor shall arrange for and bear the cost of transportation (fuel, car rental, etc.), meals in transit, and overnight accommodations (if necessary) to select and tag the required number of specified stock.

B. The Contractor shall furnish and plant all plants shown on the drawings, as specified, and in quantities as listed on the PLANT LIST except where noted. All plants shall be nursery grown.

C. Plants shall be in accordance with the USA Standard for Nursery Stock of the American Association of Nurserymen.

D. All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. Trees shall have straight trunks and all abrasions and cuts shall be completely callused over.

E. All plants shall be sound, healthy, and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs or larvae.

F. All groundcover shall be container grown. Stock shall have been grown in a container long enough for the root system to have developed sufficiently to hold its soil together, firm and whole. No plants shall be loose in the container. Groundcover plants must be in a moist, vigorous condition. Thin plants will not be accepted.

G. The root system for all plants shall have an extensive, symmetrically balanced fibrous root system. In addition all plants shall meet the following:

1. All trees must be moved with the root systems as solid units with balls of earth firmly wrapped with burlap. The diameter and depth of the balls of earth must be sufficient to encompass the fibrous root feeding system necessary for the healthy development of the plant. No tree shall be accepted when the ball of earth surrounding its roots has been badly cracked or broken preparatory to or during the process of planting or after the burlap, staves, ropes or platform required in connection with its transplanting have been removed. The trees and balls shall remain intact during all operations.
2. All parts of the fibrous root system of all plants shall be moist and fresh with white color when washed of soil. When the plant is removed from the container, the visible root mass shall be healthy with white root tips. The root system of all plants shall be free of disease, insect pests, eggs, or larvae.
3. Any root ball which shows signs of asymmetry, injury, or damage to the root system shall be rejected.
4. Curling or spiraling of the roots along the walls of rigid containers will not be accepted.
5. All trees shall be healthy and vigorous, as noted by healthy white roots, firm root ball, disease free trunk and leaves. All trees that are not planted once shall be protected from desiccation with mulch completing covering the root ball and watered in well. Contractor shall be responsible for tree and shrubs lost due to improper care and preparation.
6. The diameter and depth of the balls of earth must encompass the fibrous and root feeding system necessary for the healthy recovery of the plant. Minimum root ball diameters and depths shall be in accordance with ASNS standards.
7. No plants shall be loose in their containers.
8. Container grown plants which have roots growing out of the container shall be rejected.

H. The height of the trees (measure from the crown of the roots to the tip of the top branch) shall be not less than the minimum size designated. The caliper measurement shall be taken six (6) inches above ground level up to and including four (4) inch caliper size and twelve (12) inches above ground level for larger sizes. The branching height for shade trees next to walks shall be seven (7) feet. This may be obtained with permission of Architect by pruning after delivery if this does not ruin the shape or form of the trees or cause unsightly scars. The trunk of each tree shall be (unless otherwise indicated on the drawings) a single trunk growing from a single un-mutilated crown of roots. No part of

the trunk shall be conspicuously crooked as compared with normal trees of the same variety. The trunk shall be free from sun scale, frost cracks, or wounds resulting from abrasions, fire or other causes. No pruning wounds having a diameter exceeding two inches shall be present and such wounds must show vigorous bark on all edges. No trees which have had their leaders cut will be accepted.

I. The Contractor shall take note that only tree and shrub stock grown specifically for hardiness in the same Hardiness Zones as the project site will be accepted. The Contractor's suppliers must certify in writing that the stock has actually been grown under the same zone or a hardier zone or that the stock was asexually propagated from and grafted onto stock from a strain proven hardy to the project site zone conditions. Trees and plants not so certified will not be accepted.

2.5 MULCH

A. Bark Mulch: Mulch shall be high quality, double-ground, premium bark mulch of 70 percent hemlock bark with the balance spruce and pine bark. Mulch shall have been aged for a minimum of 6 months and not longer than two years. Bark mulch shall be shredded to a uniform size; free of dirt, debris and foreign matter; with pieces no thicker than one-quarter inch. Mulch must be free of stringy material or chunks over 3 inches in size and shall not contain, in the judgment of the Architect, an excess of fine particles. Submit sample for the Architect's approval.

2.6 WATER

A. The Contractor shall be responsible for furnish his/her own supply of water to the site at no extra cost. All plant materials or beds injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor’s responsibility to correct. Water shall be potable.

B. Conractor shall not assume that any existing irrigation system on site will be available or in working order.

C. Contractor shall obtain any necessary permits and written approvals from the client to use a municipal water source to water the plant material.

D. Provide water schedule upon completion of planing. Notify the Landscape Architect 24 hors before watering plant material if there is any deviation from watering schedule.

2.7 ECO-JUTE FOR SOIL STABILIZATION

A. Soil stabilization Eco-Jute shall be from Belton Industries made of 100% biodegradable woven jute blanket. For use on slopes greater than 2.5:1

2.8 STAKING AND GUYING MATERIALS

A. Staking Material: Stakes for trees shall be 2” x 2” solid pine stakes with pointed ends length as necessary to support each tree to approximately 1/3 of its height. Stakes shall extend a minimum of 24” into the ground.

B. Guys: Provide “Arbortie” nylon tree webbing. Trees shall be guyed as detailed.

2.9 STEEL LANDSCAPE EDGING

A. Steel Landscape Edging shall be 3/16” thickness as provided by Sure-loc Corporation of

Holland, MI, or approved equal. Edging to be in 16' sections.

B. Edging to be manufactured from steel with interlocking system and stake punch outs in each strip

C. Sections to lock together without offset or double thickness at the joints and secured with two 12" stakes at every joint.

D. Steel edging to be powder coated, baked on enamel supllied in black.

E. Stakes are to be a minimum of 15" long and manufactured of steel.

2.10 NO MOW SEED MIX

A. Seed Species: Contractor shall submit weight by seed count.

1. No Mow Lawn Seed Mix Application Rate: 5.0 lbs per 1,000 SF.

Seed mixture shall be composed of the following:

No Mow	Percent	Origin	Germ
Windward Chewings Fescue - Festuca commutata	24.84%	OR	85%
Sheep Fescue - Festuca ovina	24.27%	CAN	85%
Aurora Hard Fescue – Festuca brevipila (F. longifolia)	12.94	OR	85%
Rhino Hard Fescue – Festuca brevipila (F. longifolia)	11.96%	OR	85%
Seabreeze Slender Creeping Red Fescue - Festuca rubra	12.77	OR	85%
Lustrous Creeping Red Fescue - F. rubra, subsp. rubra	11.85%	OR	85%

1.34% Inert Matter
0.01% Other Crop Seed
0.02% Weed Seed
Noxious Weed Seed: None

No Mow seed shall be as supplied by Prairie Nursery, Inc. of Westfield, WI (**www.prairienursery.com**) or approved equal.

PART THREE – EXECUTION

3.1 FINE GRADING AND LOAMING

A. After existing pavement has been removed, existing vegetation has been either removed and stockpiled for transplant or removed, scarify subgrade, remove compacted areas and then spread loam mix.

B. After the areas to be loamed have been brought to subgrade, and immediately prior to dumping and spreading the loam, the subgrade shall be loosened by disking or rototilling to a depth of at least three inches (3") to permit bonding of the loam to the subsoil. Remove all stones greater than two inches (2") and all debris or rubbish. Such material shall be removed from the site.

C. Loam shall be placed and spread over approved areas to a depth sufficiently greater than six inches (6") so that after natural settlement and light rolling, the completed work will conform to the lines, grading and elevations indicated. Supply additional

loam, after testing and approval, as may be needed to give the specified depths and finished grades under the contract without additional cost to the Owner.

D. No subsoil or loam shall be handled in any way if it is in a wet, dry, or frozen condition.

E. Sufficient grade stakes shall be set for checking the finished grades. Grades shall be established which are accurate to one-tenth (1/10th) of a foot either way. Connect contours and spot elevations with an even slope.

F. After lime, fertilizer, and humus if required have been spread and incorporated into the bed, it shall be carefully prepared by scarifying or harrowing and hand raking. All large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter, and stones over one inch (1") in diameter shall be removed from the loam. Loam shall also be free of smaller stones in excessive quantities as determined by the Landscape Architect. If lawn is to be hydroseeded, lime and fertilizer may be applied with seed.

G. The whole surface shall then be rolled with a hand roller weighing not more than 100 lbs. per foot of width. During the rolling, all depressions caused by settlement or rolling shall be filled with additional loam and the surface shall be regraded and rolled until presenting a smooth and even finish to the required grade.

3.2 SOIL ADDITIVES

A. Follow all recommendations for soil additives as determined by an approved Soil Testing Laboratory, and all manufacturers' instructions pertaining to additives.

3.3 PLANTING LOCATIONS

A. All plant locations shall be staked out on the ground and the locations must be approved by the Landscape Architect before any excavation is started. If it is necessary to adjust any of the locations because of unforeseen problems, the changes shall be under the direction of the Landscape Architect and there shall be no extra charges for these adjustments.

3.4 PLANT ARRIVAL

A. Notify the Architect at least five (5) working days prior to the proposed arrival of plant material on the site. Landscape Architect shall inspect trees in their tree pits prior to loosening of root ball covering and backfilling of pits so that adjustments in orientation and alignment can be made. Contractor shall coordinate with Landscape Architect to arrange a site visit as soon as plants have been placed.

B. All trees, shrubs and groundcover shall be planted within five days of arrival on the site or will be rejected by the Architect. All plants delivered to the site and not planted within 24 hours of delivery shall have their root balls covered with mulch and shall be watered on a daily basis. Container grown shrubs stored on site shall be shaded from direct sunlight at all times and shall not be stored on paved surfaces.

3.5 TREE PIT EXCAVATIONS

A. Width and depth of tree pit shall be as shown in the construction drawings.

3.6 PLANTING TREES

A. The planting excavation shall be filled with enough of the specified planting soil mix as shown in the drawings. Stock shall be placed on compacted planting soil.

B. The tree shall be lifted and set in place, being careful to not disturb the root ball and to keep it intact. Expose flare of root ball. The balled and burlapped stock shall be set plumb and in center of pit or trench with root flare raised above adjacent finish grades as indicated.

C. Contractor shall adjust tree so that trunk is vertical when viewed from all sides.

D. After Landscape Architect has approved tree setting, remove burlap and wire baskets from tops and sides of balls, but do not remove from under balls. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation.

E. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

F. For container-grown stock, set stock plumb and in center of pit or trench on compacted planting soil with top of ball raised above adjacent finish grades as indicated. Carefully remove containers so as not to damage root balls.

G. Mulch with material shown in planting detail.

H. Contractor shall cut off and remove all ribbons and seals from the plant material and dispose of them off site in a legal manner.

3.7 PLANTING SHRUBS

A. Place planting soil mix in bottom of previously excavated planting pit in eight inch layers and tamp firmly.

B. Place shrubs carefully, as shown on the contract drawing details, and position so that the shrub will be at the same soil height as it was previously grown. Remove rope from ball and burlapped shrubs and lay burlap back from ball at least 2/3 down. For container-grown shrubs, cut any circling roots and break up root mass if roots are pot-bound.

C. The planting trench shall be backfilled with planting soil mix. After backfilling is completed, tamp soil firmly and water thoroughly for 15 minutes.

D. Mulch as shown in planting details. Mulch entire length and width of continuous shrub beds.

3.8 PLANTING GROUNDCOVER

A. Groundcover is to be planted in continuous beds. After clearing and grubbing of planting areas, contractor shall excavate plant beds to a depth of 12" below finish grade and grade smooth. Plant beds shall be backfilled with 12" of prepared planting mix prior to installation of groundcover. Place planting soil mix in six inch layers and tamp firmly. Water thoroughly. Do not puddle. Allow water to drain through undisturbed.

B. Place groundcover carefully, as shown on the contract drawing details, and position so

that the plant will be at the same soil height as it was previously grown.

C. Mulch as shown on planting details. Mulch entire length and width of continuous groundcover beds.

3.9 GUYING AND STAKING

A. Contractor shall keep trees plumb and upright at all times.

B. Stake trees as shown in contract drawing details, being careful so that the stakes are clear of the root ball mass.

3.10 MULCH

A. Mulch material shall be placed over entire saucer areas of individual trees and shrubs and over the entire area of planting beds to a depth of 2 inches after settlement, not later than one week after planting. Do not apply mulch prior to the first watering of plant materials. Do not apply mulch prior to placement of surface applied fertilizer and verification of placement by the Landscape Architect.

3.11 STEEL LANDSCAPE EDGING

A. Check to ensure that all underground lines, irrigation hoses, and other cables are installed below the maximum depth of edging to be used.

B. Edge where noted on designer's plan. Define the area to be edged using string, garden hose or paint. Using a spade or mechanical trencher, cut a trench along area to be defined to depth so that top of edging will not exceed ½" above finish grade.

C. Install edging with stake pockets of inside of bed. Top of edging not to exceed ½" above finish grade.

D. Install stakes 24" o.c. with a minimum of 5 stakes per section of edging.

E. Back fill on both sides of edging during installation leaving no more than two sections unsupported at one time. Compact back fill along eding ensuring that top edge is no more than ½" above finish grade.

3.12 PRUNING NEW PLANTS

A. Pruning of new plants shall be as directed by Landscape Architect and as recommended by the Arborist. Contractor shall review proposed pruning with Landscape Architect and Arborist prior to execution of work.

B. Each tree and shrub shall be pruned in accordance with American Nurserymen Association Standards and National Arborist Association to preserve the natural character of the plant. Work shall be performed by a specialist as approved by the Architect/Engineer.

C. All dead wood or suckers and all broken or badly bruised branches shall be removed. In addition, up to one-third of the wood may be removed by thinning out to balance root loss due to transplanting providing the natural character and form of the tree is preserved. Never cut a leader.

D. Pruning shall be done with clean, sharp tools.

3.13 MAINTENANCE OF PLANT MATERIAL

A. Maintenance shall begin immediately after each plant is planted. The official maintenance period will comence upon the completion of all planting and shall continue for ninety (90) days minimum within the growing season (April 1 through December 1). Maintenance period may carry over to the following growing season or be extended into the non-growing season depending on the time of planting and seasonal conditions. Contractor shall submit a maintenance plan to the Architect.

B. Maintenance shall include watering of planted areas, weeding, mulching, removal of dead material, re-setting plants to proper grades in upright position, edging, repairs of washouts and gullies, repairs to protecting fences and all other necessary works of maintenance.

1. All plants during the maintenance period shall be watered at least twice each week or as needed. At each watering the soil around each tree or shrub shall be thoroughly saturated. If sufficient moisture is retained in the soil, as determined by the Landscape Architect or Owner's Representative, the required watering may be reduced. Trees will require a minimum of ten (10) gallons of water each; shrubs a minimum of five (5) gallons each.
2. Planting beds and individual plant pits shall be kept free of weeds. Mulch shall be replaced as required to maintain a three inch (3") layer. Beds and individual pits shall be neat in appearance and maintained to the lines originally laid out.
3. Plants that die during the maintenance period shall be replaced as directed by the Landscape Architect.
4. Spraying for both insect pests and diseases shall be included during the maintenance period as required and as directed by the Landscape Architect.

3.14 PLANT MATERIAL ACCEPTANCE

A. Upon completion of the maintenance period, the Contractor shall request in writing that the Landscape Architect formally inspect the planting work.

B. If plant material and workmanship are acceptable, written notice will be given by the Landscape Architect or Owner's Representative to the Contractor stating that the work has received Provisional Acceptance, and that the guarantee period has commenced from the date of Provisional Acceptance.

C. If a number of plants are sickly or dead at the time of inspection, or if in the Landscape Architect's opinion, workmanship is unacceptable, written notice will be given by the Landscape Architect to the Contractor in a form of a punch list, which itemizes necessary planting replacements and/or other deficiencies to be remedied. All dead and unsatisfactory plants shall be removed promptly from the project. Replacements shall conform in all respects to the Specifications for new plants and shall be planted in the same manner and maintained for ninety (90) days minimum from time of planting as described above.

Should the Owner require that the Landscape Architect tag replacement plant materials, the Contractor shall locate replacement stock and arrange for the Landscape Achitect to select and tag the required replacement stock.

D. Acceptance of the planting work shall be established by the Landscape Architect in writing, following the completion of maintenance work requirements as specified herein and following the correction of all punch list deficiencies by the Contractor.

E. Contractor shall maintain an updated list of all plant materials brought to the site that includes any changes in size, species or variety. A final Plant List shall be submitted to the Landscape Architect in conjunction with Contractor's As-built documents. As-built redlines shall indicate locations of all substitutions on the Planting Plan.

3.15 GUARANTEE

A. Plants shall be guaranteed for a period of one (1) year after written notification of acceptance and shall be alive in satisfactory growth at the end of the Guarantee Period.

B. During the Guarantee Period, the Contractor shall replace, at his/her expense, in accordance with the Contract Plans and Specifications, any plants that are dead, or in the opinion of the Landscape Architect or Owner's Representative, in an unhealthy or unsightly condition and/or have lost their natural shape due to dead branches, excessive pruning, or other cause.

C. At the end of the Guarantee Period, a Final Inspection will be held to determine whether any plant material replacements are required. Each plant shall show at least 75% healthy growth and shall have the natural character of its species as determined by the Landscape Architect. Plants found to be unacceptable shall be removed promptly from the site and replaced during the normal planting season, until the plants live through one year.

D. A Final Inspection for acceptance will be made after the replacement plantings have lived through one (1) year.

E. All replacements shall be plants of the same kind and size specified in the PLANT LIST. Replacement cost shall be borne by the Contractor, except for replacements necessitated by vandalism or neglect on the part of others.

3.16 SEQUENCE FROM PLANT MATERIAL LOCATION THROUGH FINAL ACCEPTANCE

A. Contractor notifies Landscape Architect of sources of planting materials and proposed substitutions within twenty-one (21) days of Notice to Proceed.

B. Contractor requests Landscape Architect to tag located plant materials ahead of specified time for plant installation.

C. Plant material tagged at Nursery by Landscape Architect

D. Plant locations staked and flagged by Contractor and inspected by Landscape Architect prior to plant arrival.

E. Contractor notifies Landscape Architect five (5) days in advance of plant material arrival.

F. Contractor places all stock in plant pits and coordinates with Landscape Architect to inspect plant conditions and locations prior to backfilling.

G. Upon completion of all plant installation, Contractor submits written request for inspection of planting by the Landscape Architect. If planting work is acceptable, Landscape Architect issues a Completion of Planting letter. Date of letter marks the beginning of the official Maintenance Period. Contractor submits Maintenance Plan to Landscape Architect.

H. Upon completion of the Maintenance Period, Contractor submits written request for inspection of planting by Landscape Architect. If planting is acceptable, Landscape Architect issues a Provisional Acceptance letter. Date of letter marks the beginning of the one year Guarantee Period.

H. Following the one year Guarantee Period, Owner's Representative coordinates with Contractor to schedule a Final Inspection.

I. Contractor provides replacement plant materials as necessary until Final Acceptance of all planting by the Owner.

END OF SECTION

SECTION 334600

UNDERDRAIN SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Provide all materials, labor, installation equipment, and technical service to complete construction of site underdrain system, as well as the testing and warranty of the system as defined in this Specification and Construction Drawings. Items of work specifically included are:

1. French drain installation.
2. On-site grading and elevation verification.
3. Excavation for dry wells.
4. Coordination of all utilities.
5. Verification of site conditions.
6. Maintenance during guarantee period.

1.02 QUALIFICATIONS

A. Qualified irrigation system installers must have a minimum experience of four (4) years with work and products specified herein, including:

1. Rainwater, stormwater, and site runoff drainage and conveyance systems.
2. Municipal park projects

1.03 RELATED REQUIREMENTS

A. Coordinate with other project trades and refer to overall project Construction Document Specifications and Drawings, including, but not limited to:

1. Division 01 – GENERAL REQUIREMENTS
2. Division 02 – EXISTING CONDITIONS
3. Division 03 – CONCRETE
4. Division 22 – PLUMBING
5. Division 26 – ELECTRICAL
6. Division 31 – EARTHWORK
7. Division 32 – EXTERIOR IMPROVEMENTS
8. Division 33 – UTILITIES
9. Construction Drawings:
    a. IR1.0 – Irrigation & Water Layout Plan
    b. IR2.1 – Water Play Details
    c. Review all other Project Construction Documents for coordination

1.04 APPLICABLE STANDARDS AND CODES

A. At a minimum, comply with the following standards and codes:

1. Plumbing and Drainage Institute (PDI)
2. National Standard Plumbing Code (NSPC)
3. National Sanitary Foundation (NSF)
4. Underwriters Laboratories, Inc. (UL)
5. Occupational Safety and Health Administration (OSHA)

B. Comply with applicable laws, standards, and regulations of the local governing authority. All local laws more stringent than those referenced above shall take precedent.

1.05 SUBMITTALS

A. Submit the following under provisions SUBMITTAL PROCEDURES:

1. Literature: Manufacturer's product data sheets, specifications and installation instructions for materials listed in this Specification (Part 2 – Products).
    a. Product submittals shall be concise (no extraneous pages or sections) and clearly marked to show submitted product model, type, size, etc.
    b. Substitute Product Submittal:
        1) Provide specified product submittals for “an approved equal” to Owner’s Representative for approval.
        2) Alternate products are acceptable when products of equal or better quality and performance are submitted and approved by the Owner’s Representative.
        3) Substitute Product Submittals constitute representation that:
            a) Substitute products have been thoroughly investigated and have been determined to be equal or superior in all respects to that specified.
            b) Substitute products shall provide the same warranties as specified products.
            c) Substitute products are compatible with interfacing items.
            d) Assume responsibility of and guarantee system performance as a result of product substitution, including making all subsequent changes to meet design specifications.
    c. Work shall not commence until all products specified are submitted and approved in a written notification by Owner’s Representative.
    d. All product installed shall be new, without defects, and of quality and performance as specified.

2. Schedule: Submit Schedule of all products to be furnished hereunder, indicating manufacturer, size, and model.

    a. Ensure that all of the types/styles of products and installation equipment specified herein can be furnished by the manufacturer submitted.
    b. Provide all spare irrigation parts as noted (see Spare Irrigation Parts)
    c. Prior to submitting schedule, confirm current site conditions are as provided in the Construction Drawings.

3. Qualifications: Submit qualification package as requested by Owner’s Representative. Qualifications package must include:

    a. Two (2) references for similar work performed in last five (5) calendar years.
        1) Contact name
        2) Company Name
        3) Contact Phone Number
        4) Project Name and Location
        5) Brief Project Description

1.06 DELIVERY, STORAGE AND HANDLING

A. Do not deliver materials to the site, until all specified submittals have been submitted to, and approved by, the Owner’s Representative.

B. Coordinate with Owner's Representative for temporary storage and staging areas.

C. Protect materials from damage from construction traffic, weather, corrosion, and other causes while stored on-site. Minimize on-site storage as possible.

D. Store and handle all products and materials in compliance with manufacturer instructions and recommendations.

1.07 GUARANTEE AND REPLACEMENT

A. Guarantee entire underdrain system, parts and labor, for one (1) year from official written date of acceptance by Owner's Representative. Provide written warranty showing date of completion and period of warranty prior to request for final payment.

B. System malfunctions occurring during the guarantee period due to defective materials, poor workmanship, or improper adjustment shall be corrected to satisfaction of Owner's Representative at no additional cost to the Owner.

1. Repair all defects within 10 days of notification from Owner or Owner's Representative.
2. Repair defects with approved products.

C. Manufacturer warranties shall be provided for all products and materials where such warranties are offered in published product data. Copies of manufacturer warranties are to be included in the Operations & Maintenance Manual (See Operation and Maintenance)

2.01 UNDERDRAIN SYSTEM

A. Perforated Pipe

1. Pipe
    a. Size: 6-Inch Diameter
    b. Construction: Polyvinyl Chloride (PVC), 2-Hole 120deg Perforated Pipe, Solvent Weld
    c. Ratings: Schedule 40
    d. Standards: ASTM D1785 Drainage Perforated Pipe
    e. Markings: Manufacturer, Nominal Size, Class or Schedule, Pressure, Extrusion Date, Pipe Insertion Mark.
    f. Manufacturer: Cresline; Certainteed; JM Eagle; or Approved Equal.
2. Fittings
    a. Size: Schedule 40 PVC
    b. Markings: NSF Designation, Size, Class or Schedule
    c. Manufacturer: Lasco; Spears; Dura; or Approved Equal
3. Solvent
    a. Type: NSF Type I or Type II PVC
    b. Standards: ASTM D-2564
    c. Manufacturer: IPS Weld-On 711; Oatey HD Cement; Rectorseal Gold; or Approved Equal
4. Primer
    a. Type: NSF for PVC
    b. Standards: ASTM F-656
    c. Manufacturer: IPS Weld-On P-68; Oatey Clear Primer; Rectorseal Jim PR-2; or Approved Equal

B. Drainage Stone

1. Type: 1½" Crushed Stone

C. Filter Fabric

1. Type: Woven Geotextile
2. Construction: UV Stabilized Propylene Filament
3. Strength:
    a. Tensile Strength(lbs): 365MD/200CD
    b. Puncture (lbs): 115MD/75CD
4. Opening Size (AOS): 40 Sieve ASTM
5. Flow Rate: 145g/m/sf
6. Standards: ASTMD4632, ASTM D6241, ASTM4491, DD4751
7. Markings: Manufacturer, Nominal Size, Class or Schedule, Pressure, Extrusion Date, Pipe Insertion Mark.
8. Manufacturer: TenCate Mirafe FW402; or Approved Equal.

2.02 DRY WELL

A. Precast Dry Well

1. Size: 3'-6" Diameter, 6'-5" High (2 Risers)
2. Concrete: 4,000 psi minimum 28-day Strength
3. Manufacturer: Shea Concrete Products Mini-Dry Well 160-Gallons per Riser; or Approved Equal.

2.03 FRENCH DRAIN SYSTEM (ALTERNATE UNDERDRAIN PRODUCT)

B. Prefabricated French Drain

1. Size: 10" x 10' with 4" Slotted Pipe
2. Features: Gravel free French Drain System, consisting of fabric, lightweight gravel substitute, and pipe.
3. Flow Capacity: 130.9 gpm @ 1% Slope
4. Ratings:
    a. Flow Capacity: 130.9 gpm @ 1% Slope
    b. Storage Volume: 21.5 gallons/10ft bundle
5. Standards: ASTM D-3786
6. Manufacturer/Model: NDS EZ-1001F; or Approved Equal.

3.01 GENERAL

A. Competent superintendents and assistants shall be on-site at all times during product delivery, installation, testing, and system adjustments.

1. Field communication by Owner or Owner's Representative to superintendent shall be binding.

B. System features shall be laid out as indicated on Drawings, making minor adjustments for variations in planting arrangements or field conditions. Major changes shall be reviewed with Owner's Representative before acceptance.

1. Location of underdrainage system is contingent upon and subject to integration with all other underground utilities, tree roots, and hardscape design elements. Location shown on Construction Drawings is diagrammatic only.

3.02 EXAMINATION

A. Review and verify project conditions are as indicated on Construction Drawings prior to starting work, including but not limited to:

1. Utilities provided by Others
2. Site grades and dimensions
3. Landscaping and features
4. Structures

B. Report any irregularities of site conditions to the Owner's Representative prior to beginning work.

C. Beginning of installation constitutes acceptance of existing project conditions.

3.03 PROJECT COORDINATION

A. Coordinate with Owner's Representative to expeditiously install system.

B. Provide written notifications (electronic is acceptable) to Owner's Representative prior to work commencement, weekly for progress report, for any proposed changes to system design, and upon installation completion.

C. All questions of design intent, proposed design changes, field notifications, and product substitution after installation commences shall be in writing to Owner's Representative as a Request for Information (RFI).

D. Utility Coordination:

1. Maintain 6-inch minimum clearance between underdrain and any utility line. Do not install drainage directly above another utility of any kind. Report any conflicts of installation to Owner before commencing work.
2. Exercise care when excavating, trenching and working near existing utilities.

3.04 SITE PROTECTION

A. Protect landscaping, paving, structures, walls, footings, etc. from damage caused during work. Damage to work of another trade shall be reported at once.

B. Replace or repair any damage with same product or material, to the satisfaction of Owner's Representative at no additional cost to the Owner per Guarantee.

C. Route system as necessary to prevent damage to tree roots.

3.05 EXCAVATION, TRENCHING, AND BACKFILLING

D. Pipe Trench:

1. Excavate trenches straight and true, minimizing site disturbance as possible.
2. Final trench bottom shall be undisturbed soil and shall be free of rocks and debris larger than 1 inch or with sharp edges. If trench base is unsuitable for laying pipe/underdrain sysetm, over excavate 2 inches below pipe invert, and place clean backfill.

E. Clean Backfill:

1. Material:

a. Clean backfill must be free of foreign material, debris, frozen material and rocks larger than 1-inch.

2. Carefully place clean backfill around any system/equipment, tamp in place.

3.06 PIPE INSTALLATION

A. PVC Pipe Installation:

1. Cut plastic pipe with handsaw or pipe cutter, removing all burrs at cut ends. All pipe cuts shall be square and true. Bevel cut end as required to conform to manufacturer instructions.
2. Make all solvent-weld joints as per manufacturer's instructions and avoid applying excess primer or solvent. Do not wipe off excess solvent from each connection.

a. Allow welded joints minimum 5 minutes set-up/curing time before moving or handling.
1) Above 80ºF: Allow connections to set 24 hours.
2) Below 80ºF: Follow manufacturer instructions.
3) Below 40ºF: Prohibited.

3. Maximum deflection per joint shall not exceed manufacturer limits.
4. Maintain 1-inch minimum between lines which cross at angels of 45 to 90 degrees

B. Underdrain System shall be installed as designed, with pipe inverts and pipe slopes to be verified in field. Report any deviations from design assumptions.
1.

C. Pipe Protection:

1. Prevent foreign material from entering pipe during installation.
2. Open ends of pipe shall be closed by watertight plug or seal when not in use.
3. Securely store pipe when not scheduled for installation.
4. Pipe shall not be installed when water is in trench, during rainstorms, or when temperature is below 40 ºF.
5. No additional pipe may be installed or backfilled if water enters trench during pipe installation. Remove all water from trench before resuming installation.
6. Pipe installed at temperatures below 40 ºF shall be removed and replaced at no cost to owner.
7. Trenched PVC pipe shall be snaked to accommodate for expansion and contraction due to changes in temperature.

3.07 FILTER FABRIC INSTALLATION

A. Follow manufacturer's instructions.

B. Cut fabric as necessary with sharp cutting tool, do not pull fabric to cut to size.

C. Wrap pipe entirely with filter fabric, reducing any unnecessary folds or creases.

D. Seams:

1. Overlap along the length of the pipe to be a minimum of 3-inches, with seam directly below the pipe.
2. Seams along the length of the pipe overlap a minimum of 1-foot.

3.08 DRY WELL INSTALLATION

A. Over excavate for the dry well to provide 1 foot of 1½-inch crushed stone around and below the dry well.

1. Inspect Dry Well natural soil material. Clay, silt, and other fine materials are not suitable for Dry Well infiltration. Coordinate with Owner's Representative for resolution.

B. Install Dry Well on Compacted Drainage sub-base of 1½-inch crushed stone.

C. Install filter fabric around the dry well, with minimum of 1-foot overlap at all seams.

D. Pitch influent pipe minimum of 1% slope into Dry Well. Seal influent pipe with Link-Seal or hydraulic cement, extend pipe minimum of 6-inches into dry well.

E. Install Drainage Stone around entire dry well, minimum of 1-foot beyond.

3.09 RECORD DOCUMENTS

A. Record (As-Built) Drawings

1. Maintain and update Record Drawings with red-line markings as project progresses, including locations of:

    a. Pipe routing: pipe, caps, joints, and tees.
    b. Dry Well Location
    c. Underdrain pipe elevations at every 25' length; dry well rim and invert elevations.

2. Locations of installed equipment pipe joints/tees/dry well shall be referenced by two permanent locations (swing ties) or GPS.
3. Make all notes legible as work progresses, any new equipment added shall use distinct symbols denoting location.
4. Document any changes from original Construction Drawings.
5. Prints of original Construction Drawings may be obtained from the Owner's Representative at cost (0% markup).
6. Record Drawings shall be used as basis of payment for work completed. Provide copies of red-lined set to Owner's Representative along with payment request.

B. Record Documents

1. Record Documents shall be on-site at all times. Maintain record of the following as the project progresses:

    a. Permits (if required)
    b. Materials Approved and approval date
    c. Materials delivered, Accepted, and Installed by whom and date.
    d. Field Communications and Requests for Information (RFI)

C. Prior to final punchlist, provide complete electronic and hard copy files of Record Drawings and Documents to Owner's Representative as part of project completion. All information must be complete and shall be added to submitted documents prior to acceptance.

3.10 SITE CLEANUP

A. Remove all unused materials and equipment from project site safely and efficiently. Dispose of all unused materials legally - including construction debris and trash.

B. Adjust ground, compact, and re-plant around system and trenches as necessary for proper angle and elevation.

C. Fill all depressions, erosion rills, tire tracks, etc. with proper planting soil mix to ensure site drainage.

3.11 FINAL OWNER ACCEPTANCE

A. Final Owner Acceptance of Drainage System is predicated on:

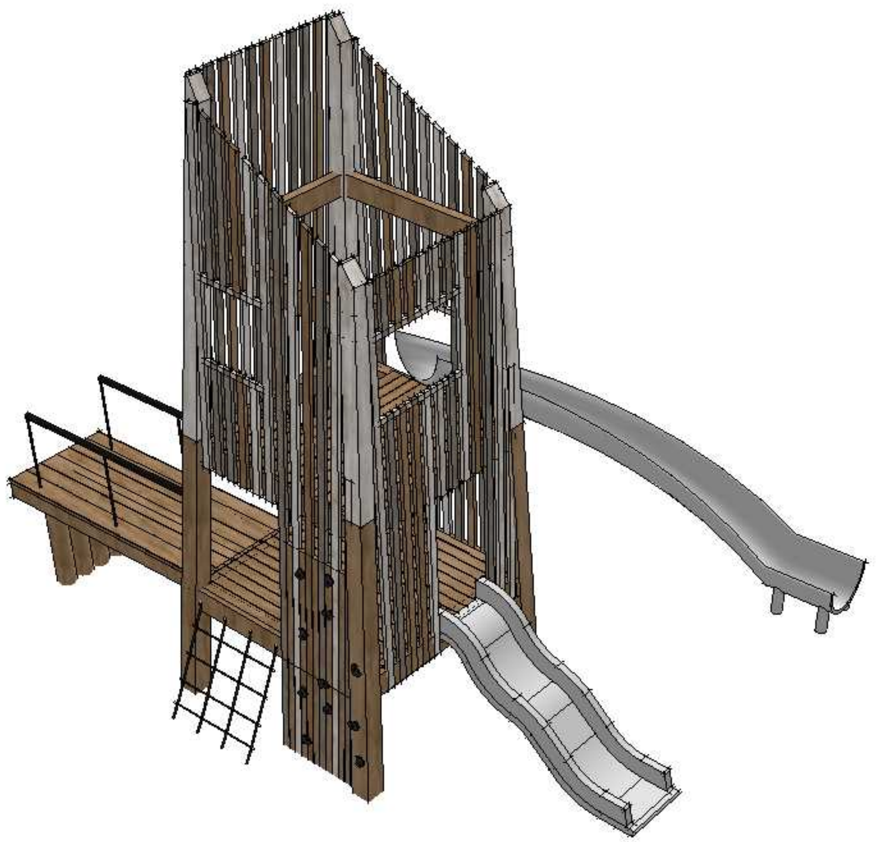
1. Complete system installation, testing, and instructional overview.
2. Completed and approved all punchlist items.

B. Owner and/or Owner's Representative shall provide written notice (hard copy and/or electronic) for Final Acceptance. Date of Final Acceptance notice shall serve as start of 1-year Guarantee period as described above.

END OF SECTION

APPENDIX A:
PLAY EQUIPMENT INSTALLATION

REFERENCE IMAGE



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- SURFACING: WHEN AN IMPACT-ABSORBING SURFACE MATERIAL IS REQUIRED, IT MUST COMPLY WITH ASTM F-1292 (MOST RECENT EDITION) FOR THE DEFINED FALL HEIGHT OF THE EQUIPMENT SPECIFIED IN DRAWINGS BY EARTHSCAPE OR A CONTRACTUALLY OBLIGATED CRITICAL HEIGHT SPECIFIED IN ADVANCE. ENSURE USE ZONES, SAFETY ZONES, AND/OR PROTECTIVE SURFACING ZONES AROUND ALL PLAY EQUIPMENT ARE COMPLIANT WITH ASTM F-1292 (MOST RECENT EDITION) - BY OTHERS.
- SURVEY AND FACILITIES: SURVEY WORK INCLUDING BENCHMARKS, LINES AND LEVELS, PRE-CONSTRUCTION SURVEY, AS-BUILT DRAWINGS BY OTHERS.
- THESE DRAWINGS ARE INTENDED TO BE PRINTED AT 11" X 17" PAGE SIZE. DO NOT SCALE.
- ALL MEASUREMENTS ARE IN MM UNLESS OTHERWISE STATED.
- ALL EXPOSED WOOD EDGES SHALL HAVE A MIN 1/4" (6MM) RADIUS.
- BOLTS ARE 3/4" (19MM) HDG CARRIAGE BOLTS UNLESS OTHERWISE STATED.
- STRUCTURAL SCREWS ARE 3/8" (10MM) GRK RSS SCREWS UNLESS OTHERWISE STATED.
- MULTI-PURPOSE SCREWS ARE #10 R4 SCREWS UNLESS OTHERWISE STATED.
- 28 DAY CONCRETE STRENGTH IS 35 MPA MINIMUM, EXPOSURE CLASS C-1 WITH 5-8% ENTRAINED AIR.
- EQUIPMENT SHALL COMPLY WITH THE REQUIREMENTS OF ASTM F-1487-11.
- THE STRUCTURES FEATURED IN THESE PLANS ARE INTENDED FOR CHILDREN AGED 2-5 YEARS OLD.
- VISUAL DETAILS INCLUDING BUT NOT LIMITED TO: NET SPACING, ROPE APPEARANCE AND COLOURS ARE FOR CONCEPTUAL PURPOSES ONLY.
- ALL 6"X6" (152X152) VERTICAL MEMBERS SHALL COMPLY WITH NON-DPS REQUIREMENTS.
- ALWAYS WEAR PROPER PPE AND FOLLOW SAFE PRACTICES.

REVISION HISTORY

V. NO	MM/DD/YY	COMMENTS
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KEY DATA

MAXIMUM HEIGHT: 19' 11" / 6080mm

FALL HEIGHT: 9' 3" / 2800mm

AREA OF SURFACING: 605 ft² / 55 m²

LEGEND

- EWC: EASTERN WHITE CEDAR
- WRC: WESTERN RED CEDAR
- DPS: DESIGNATED PLAY SURFACE
- GRK RSS: RUGGED STRUCTURAL SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-2442 APPROVED
- GRK R4: MULTI-PURPOSE SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-3201 APPROVED

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web: earthscape**play**.ca
email: play@earthscape.ca

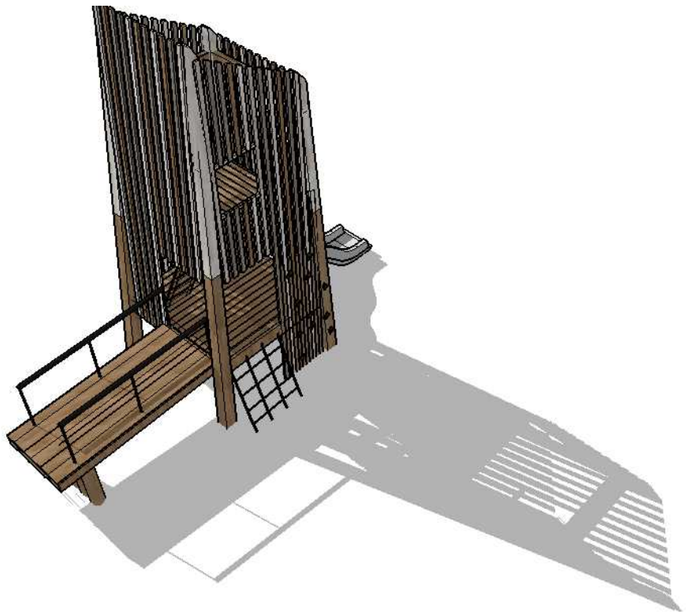
Hoyt Sullivan Park - Somerville, MA

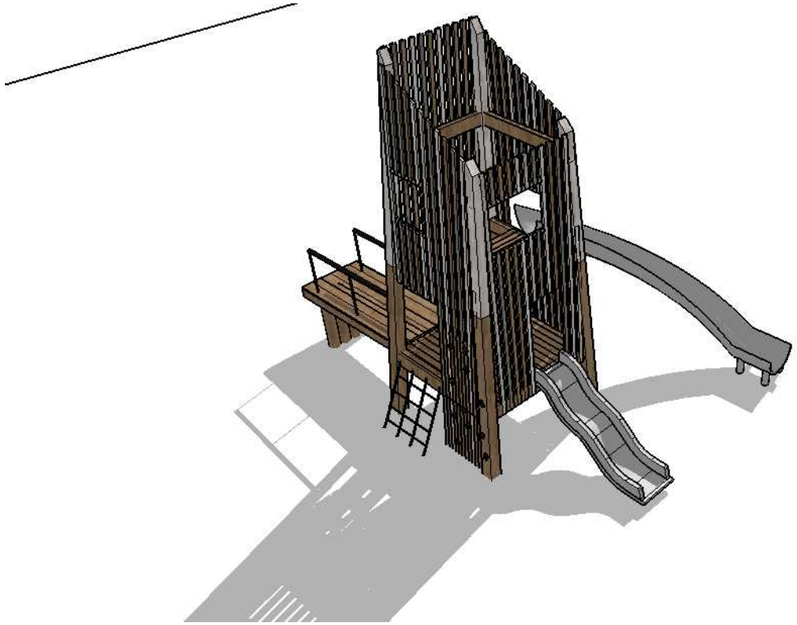
DRAWN BY: MT CHECKED BY:

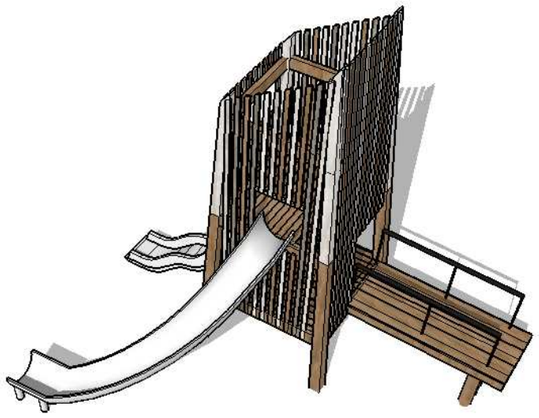
TOWER - GENERAL NOTES, REVISIONS

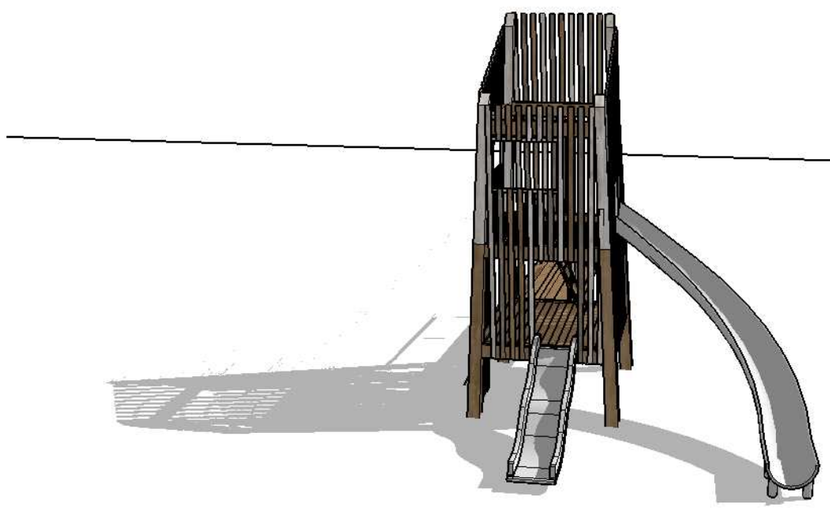
CURRENT VERSION v1.0

P **01**









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Hoyt Sullivan Park - Somerville, MA

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TOWER - PERSPECTIVES

CURRENT VERSION

v1.0

P

02

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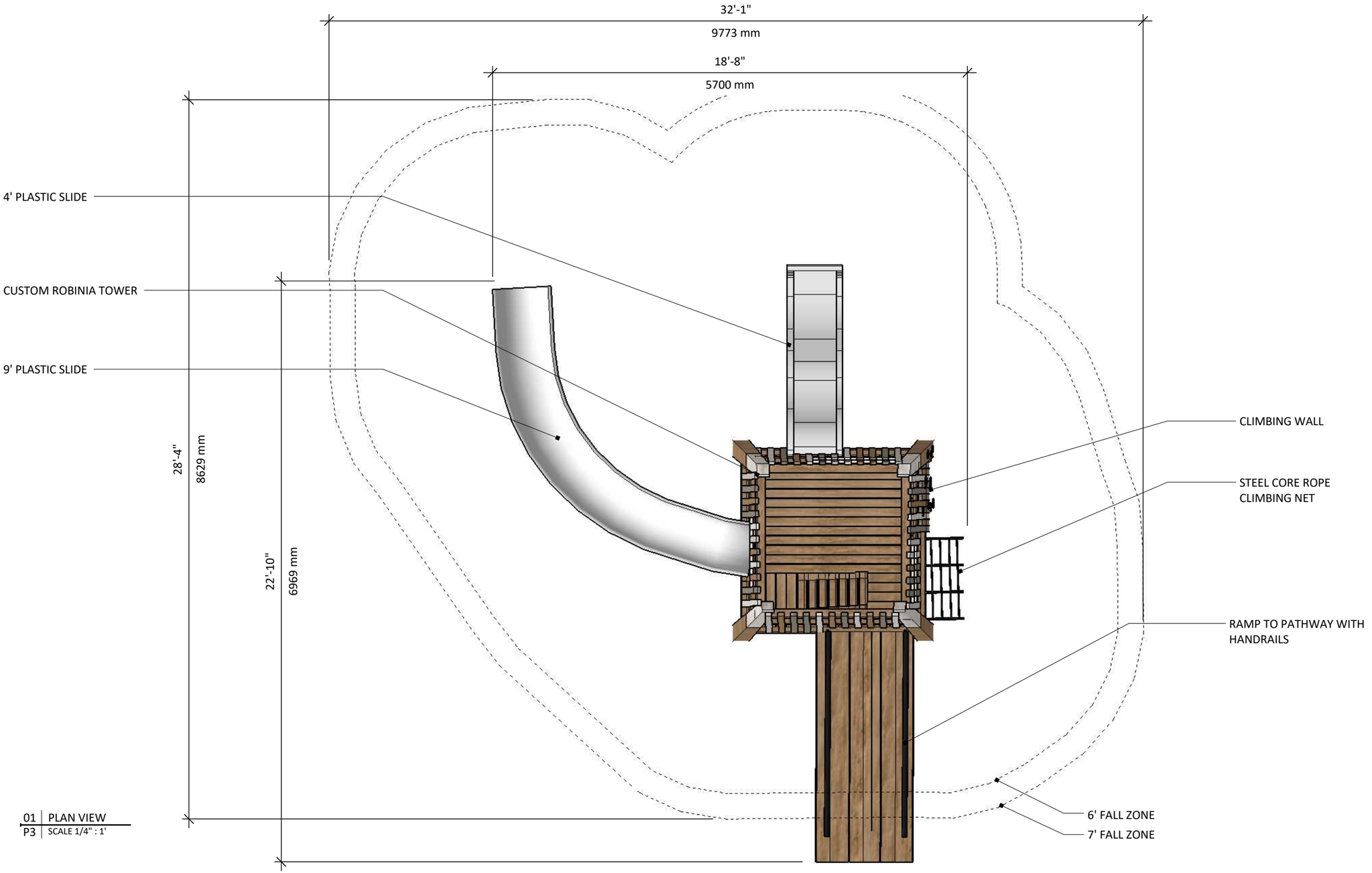

01 | PLAN VIEW
P3 | SCALE 1/4" : 1'

PRELIMINARY - NOT FOR CONSTRUCTION

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Hoyt Sullivan Park - Somerville, MA	TOWER - PLAN	**CURRENT VERSION**	**P**	**03**
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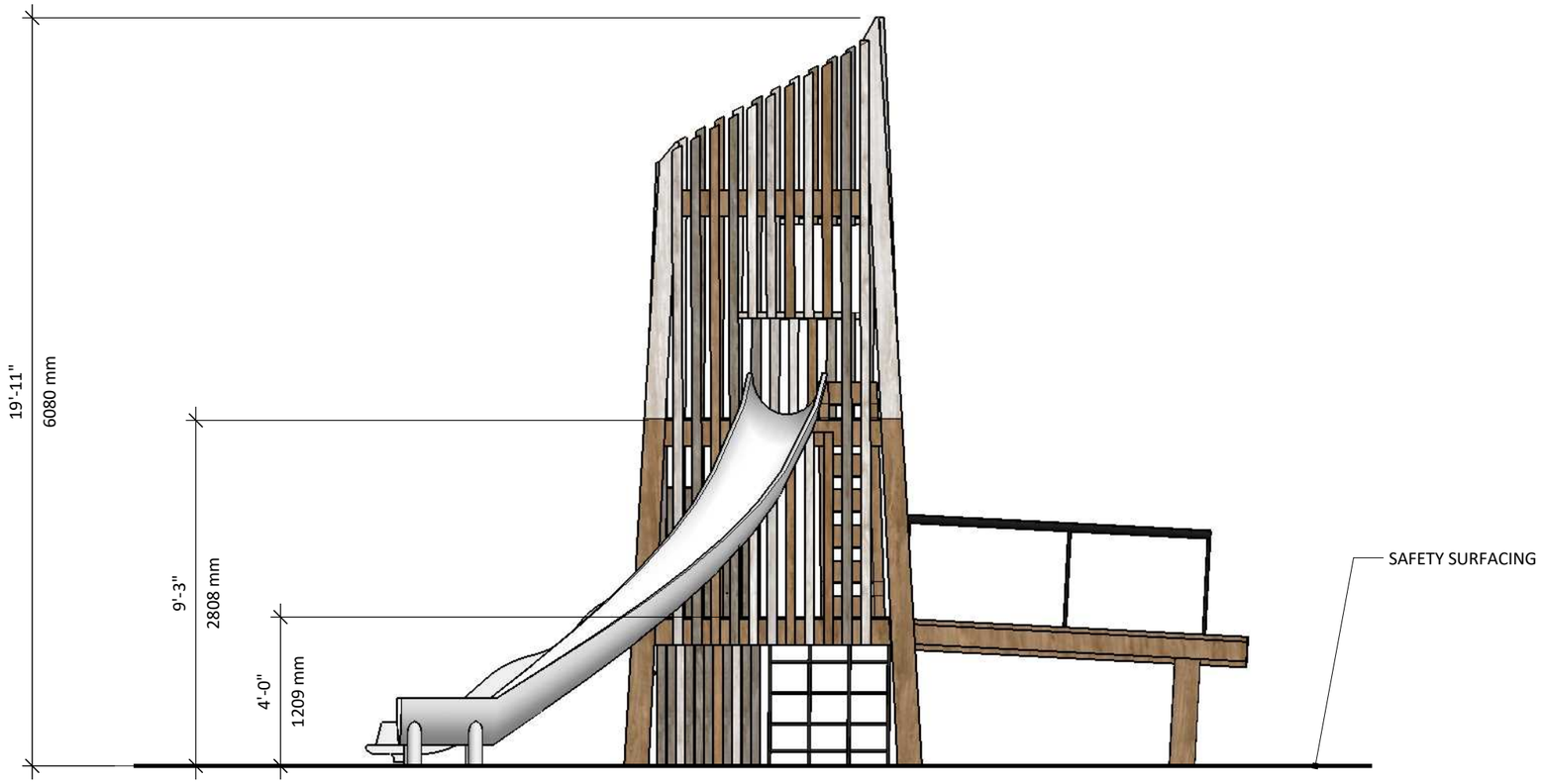

NOTE: FOOTING DETAILS TBD

01 | ELEVATION
P3 | SCALE 1/4" : 1'

PRELIMINARY - NOT FOR CONSTRUCTION

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Hoyt Sullivan Park - Somerville, MA	TOWER - ELEVATION	**CURRENT VERSION**	**P** **04**
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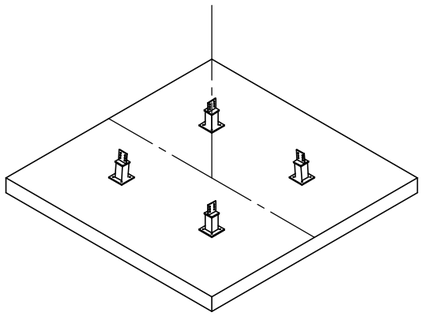

KEY DATA
- INTENDED USER AGE GROUP:
- MAXIMUM HEIGHT OF STRUCTURE:
- MAXIMUM DESIGNATED FALL HEIGHT:
- AREA OF SURFACING:
- WEIGHT (APPROXIMATE):

LEGEND
- RS: ROUGH SAWN
- EWC: EASTERN WHITE CEDAR
- WRC: WESTERN RED CEDAR
- MGP: MARINE GRADE PLYWOOD
- DPS: DESIGNATED PLAY SURFACE (AS DEFINED BY CSA Z614)
- GRK RSS: RUGGED STRUCTURAL SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-2442 APPROVED
- GRK R4: MULTI-PURPOSE SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-3201 APPROVED
- SS: STAINLESS STEEL
- HDG: HOT DIPPED GALVANIZED
- WWM: WELDED WIRE MESH
- TYP: TYPICAL
- C/W: COMPLETE WITH
- UNO: UNLESS NOTED OTHERWISE

GENERAL NOTES

GENERAL NOTES

1. THIS DRAWING IS THE PROPERTY OF EARTHSCAPE. DO NOT COPY OR DISTRIBUTE WITHOUT PERMISSION.
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3. ENGINEERING AND STRUCTURAL REVIEW: EARTHSCAPE PROVIDES STAMPED DRAWINGS AND/OR STRUCTURAL LOAD TESTING FOR ONTARIO, AS REQUIRED BY ASTM F-1487-11. LOCAL ENGINEERING APPROVAL FOR JURISDICTIONS OUTSIDE ONTARIO, IF REQUIRED, TO BE PROVIDED BY OTHERS.
4. EARTHSCAPE HAS NOT DESIGNED THIS PROJECT FOR ANY FROST PENETRATION DEPTH.
5. INSPECTION AND TESTING: INSPECTION, TESTING (INCLUDING CONCRETE TESTING), PRE-CONSTRUCTION SURVERYS TO BE COMPLETED BY OTHERS. ON-SITE REVIEW OR INSPECTION BY ENGINEER IS NOT INCLUDED IN THIS PROPOSAL (BY OTHERS).
6. SURFACING: WHEN AN IMPACT-ABSORBING SURFACE MATERIAL IS REQUIRED, IT MUST COMPLY WITH ASTM F-1292 (MOST RECENT EDITION) FOR THE DEFINED FALL HEIGHT OF THE EQUIPMENT SPECIFIED IN DRAWINGS BY EARTHSCAPE OR A CONTRACTUALLY OBLIGATED CRITICAL HEIGHT SPECIFIED IN ADVANCE. ENSURE USE ZONES, SAFETY ZONES, AND/OR PROTECTIVE SURACING ZONES AROUND ALL PLAY EQUIPMENT ARE COMPLIANT WITH ASTM F-1292 (MOST RECENT EDITION) - BY OTHERS.
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9. ALL MEASUREMENTS ARE IN INCHES UNLESS OTHERWISE STATED
10. EQUIPMENT SHALL COMPLY WITH THE REQUIREMENTS OF ASTM F1487-11"STANDARD CONSUMER SAFETY PERFORMANCE SPECIFICATION FOR PLAYGROUND EQUIPMENT"
11. THE STRUCTURES FEATURED IN THESE PLANS ARE INTENDED FOR CHILDREN AGED 5 - 12 YEARS OLD
12. VISUAL DETAILS INCLUDING BUT NOT LIMITED TO: NET SPACING, ROPE APPEARANCE AND COLOURS ARE FOR CONCEPTUAL PURPOSES ONLY
13. ALL 152X152 VERTICAL MEMBERS SHALL COMPLY WITH NON-DPS REQUIREMENTS
14. ALWAYS WEAR PROPER PPE AND FOLLOW SAFE PRACTICES.
15. ALL WORK SHALL BE COMPELTED IN ACCORDANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT.
16. CONTRACTOR IS RESPONSIBLE FOR CONFIRMING ALL SITE CONDITIONS AND REPORTING DISCREPENCIES TO EARTHSCAPE IMMEDIATELY.
17. EARTHSCAPE IS NOT RESPONSIBLE FOR THIRD PARTY USE OF THESE DRAWINGS
18. DRAWINGS HAVE ONLY BEEN REVIEWING FOR THE PROJECT AND CLIENT AS NOTED ON THIS DRAWING.

WOOD/LUMBER

1. ALL TIMBER TO BE DOUGLAS FIR - SS GRADE (UNLESS OTHERWISE NOTED)
2. ALL CLADDING AND DECKING TO BE 7/8" OR 1" THICK ROBINIA.
3. ALL EXPOSED WOOD EDGES SHALL HAVE A MINIMUM 1/4" RADIUS
4. STRUCTURAL SCREWS ARE 3/8" GRK RUGGED STRUCTURAL SCREWS UNLESS NOTED OTHERWISE.
5. MULTI-PURPOSE SCREWS ARE #10 R4 SCREWS UNLESS NOTED OTHERWISE.
6. ALL BOLT HOLES SHALL BE PRE-DRILLED AND SHALL BE NOT LESS THAN 1/32" AND NOT GREATER THAN 1/16"LARGER THAN THE NOMINAL HOLE DIAMETER
7. ALL LAG SCREWS SHALL HAVE HOLES PREDRILLED TO THE SAME DEPTH OF PENETRATION OF THE SCREW AND THE DIAMETER OF THE HOLE SHALL BE 65-85% THE DIAMETER OF THE SCREW SHANK FOR HARDWOODS, AND 60 TO 75% THE SHANK DIAMETER FOR DOUGLAS FIR.
8. DO NOT OVERDRIVE LAG SCREWS.
9. LAG SCREWS SHALL BE INSTALLED A MINIMUM DEPTH OF 5 TIMES THE SHANK DIAMETER.
10. WOOD SCREWS, UP TO 12 GAUGE (5.48 MM DIAMETER), IN DOUGLAS FIR DO NOT REQUIRE LEAD HOLES BE DRILLED.
11. WOOD SCREWS IN ROBINIA, UP TO 12 GAUGE (5.48 MM DIAMETER), SHALL HAVE HOLES PREDRILLED 90% OF THE ROOT DIAMETER FOR SCREWS LOADED IN WITHDRAWAL, AND HOLES PREDRILLED THE DIAMAETER OF THE SHANK FOR SCREWS LOADED LATERALLY.
12. GRK STRUCTURAL SCREWS SHALL HAVE A PILOT HOLE APPROXIMATELY 70% OF THE ROOT DIAMETER OF THE SCREW THROUGH THE SIDE MEMBER TO A DEPTH OF 50% OF THE THREAD LENGTH OF THE SCREW INTO THE MAIN MEMBER, FOR SCREWS LOADED IN TENSION, IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
13. GRK STRUCTURAL SCREW SHALL HAVE A PILOT HOLE APPROXIMATELY 90% OF THE ROOT DIAMETER OF THE SCREW IN THE MAIN MEMBER AND 70% OF THE ROOT DIAMETER IN THE MAIN MEMBER A MINIMUM OF 70% OF THE THREAD LENGTH, IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

REVISION HISTORY

REV.	MM/DD/YY	COMMENTS
1	1/16/2017	

EXCAVATION AND BACKFILL

1. STRIP ALL TOP SOIL, PAVING, AND DELETEROUS MATERIAL FROM UNDER FOOTINGS.
2. LOCATE ALL SERVICES PRIOR TO COMPLETING EXCAVATION.
3. ALL FOOTINGS SHALL BE PLACED AT A MINIMUM OF 3' BELOW GRADE UNLESS OTHERWISE NOTED ON THE DRAWINGS.
4. SUPPORTING SUBGRADE AND FILL TO HAVE A MINIMUM BEARING CAPACITY OF 3000PSF.
5. ALL FOOTINGS AND SLABS TO BE PLACED ON EITHER NATIVE GRAVEL/SAND/CLAY OR 6" OF GRANULAR A COMPACTED TO A MINIMUM STANDARD PROCTOR DRY DENSITY OF 98%.
6. BENEATH 6" TOP LAYER OF COMPACTED GRANULAR A, GRANULAR B FILL CAN BE USED AS REQUIRED PLACED IN MAXIMUM 8" LIFTS, COMPACTED TO A STANDARD PROCTOR DRY DENSITY OF 96%.
7. CONTRACTOR IS RESPONSIBLE FOR SUPPORT OF EXCAVATIONS DURING CONSTRUCTION AS REQUIRED.

CONCRETE

1. ALL CONCRETE WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH ACI-301
2. ALL REINFORCING STEEL TO BE IN ACCORDANCE WITH ASTM A615 AND ACI-301 INCLUDING FABRICATION, DETAILING, LAP SPLICES, PLACEMENT, FIXING AND COVER.
3. REINFORCING STEEL SHALL COMPLY WITH ASTM A615
4. DO NOT ADD WATER TO CONCRETE ONSITE.
5. ENSURE A MINIMUM COVER OF 3" TO THE GROUND IN ALL BELOW GRADE CONCRETE.
6. CONCRETE MATERIAL TO BE:
   1. FOOTINGS AND SLABS: CONCRETE WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI, MAXIMUM WATER/CEMENT RATIO OF 0.50, MAXIMUM COARSE AGGREGATE SIZE OF 3/4", AND A MAXIMUM SLUMP OF 50-100MM.
7. CONCRETE REINFORCING TO DEFORMED MINIMUM YIELD STRENGTH OF 58000 PSI
8. PIT RUN GRAVEL WILL NOT BE ACCEPTABLE.
9. ALL REINFORCING CHAIRS SHALL BE PLASTIC
10. ALL FORM OIL TO BE NON-STAINING MINERAL OIL, FREE OF KEROSENE.
11. WELDED WIRE MESH SHALL BE IN ACCORDANCE WITH ASTM A1064.
12. VIBRATE ALL CONCRETE TO ENSURE THAT CONCRETE IS FREE FROM VOIDS AND OTHER DEFECTS.
13. MOIST CURE ALL CONCRETE 7 DAYS.
14. IN HOT OR COLD WEATHER CONDITIONS TAKE ADDITIONAL PRECAUTIONS AS PER ACI 305 OR 306 RESPECTIVELY.

STRUCTURAL STEEL

1. ALL ANGLES, CHANNELS, AND PLATES TO BE GRADE 350W STEEL UNLESS NOTED OTHERWISE.
2. ALL WELDS SHALL BE IN ACCORDANCE WITH AWS D1.1 FOR STEEL AND AWS D1.6 FOR STAINLESS STEEL.
3. ALL WELDS SHOULD BE GROUND SMOOTH.
4. STRUCTURAL STEEL FABRICATOR TO BE CERTIFIED BY THE AMERICAN WELDING SOCIETY OR THE CANADIAN WELDING BUREAU FOR THE TYPE OF WORK BEING COMPLETED.
5. CLEAN STEEL TO SSPC SP-3,POWER TOOL CLEANING METHOD,TO REMOVE ALL MILL SCALE, LOOSE RUST, LOOSE PAINT, AND OTHER SUBSTANCES BY POWER WIRE BRUSHING, POWER SANDING, POWER GRINDING, AND POWER TOOL DESCALING.
6. ALL BOLT HOLES SHALL BE 1/16" LARGER THAN NOMINAL FASTENER SIZE UNLESS NOTED OTHERWISE.
7. OVERSIZED AND SLOTTED HOLES WILL NOT BE ALLOWED UNLESS NOTED OTHERWISE.
8. FOUNDATION ANCHOR BOLT HOLES SHALL BE DRILLED IN PLACE AND EPOXIED WITH HILTI HIT-HY 200, OR APPROVED EQUIVALENT.

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EarthScape - Template (2017)

DRAWN: -- CHECKED: --

US NOTES

CURRENT VERSION

V1.0

1

SHEET 1 OF 2

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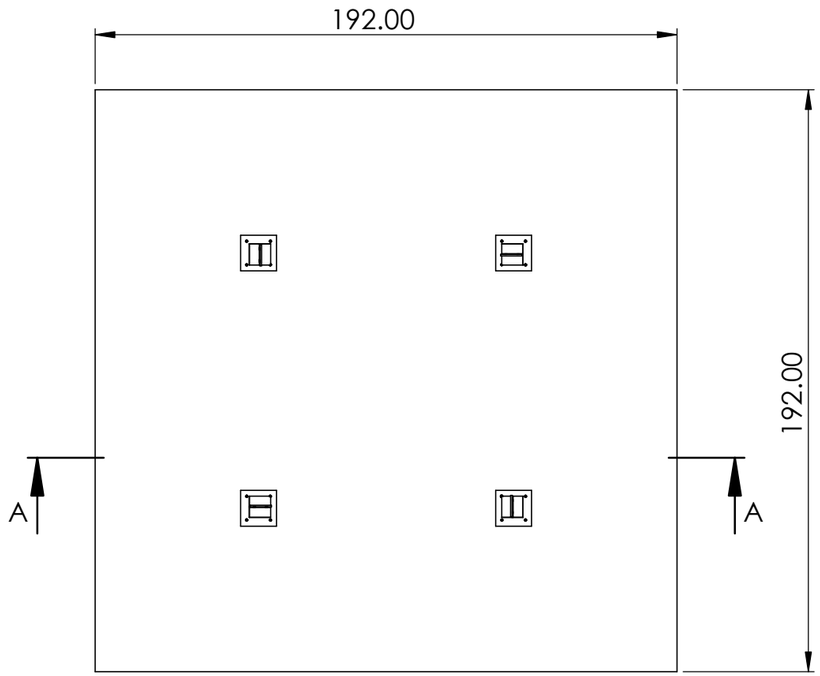
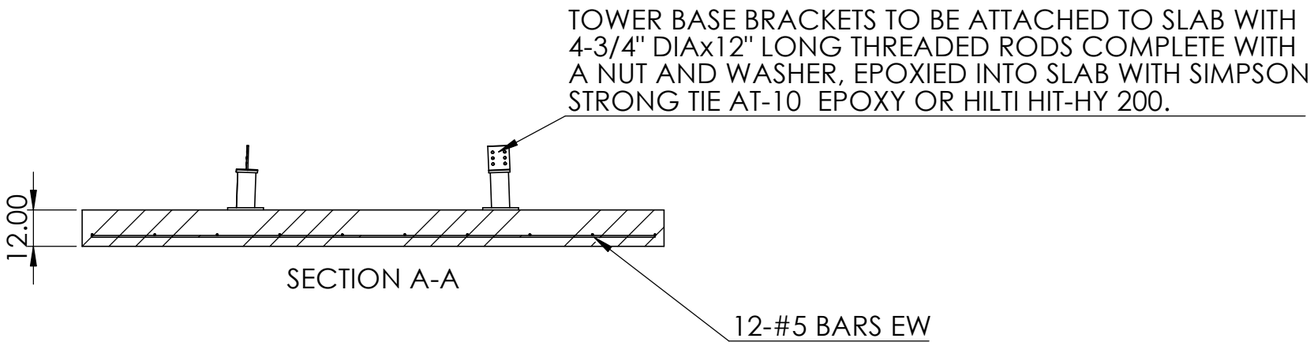


NOTES:
1. FOR GENERAL NOTES SEE PAGE 1
2. CONCRETE SLAB TO BE PLACED A MINIMUM OF 12" BELOW THE TOP OF THE SURFACING.
3. SLAB TO BEAR BELOW THE FROST PENETRATION DEPTH OR BEAR ON FREE DRAINING NON FROST SUSCEPTIBLE MATERIALS.



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EarthScape - Template (2017)	**American Tower Footing**	CURRENT VERSION	2
DRAWN: -- CHECKED: --		V1.0	SHEET 2 OF 2

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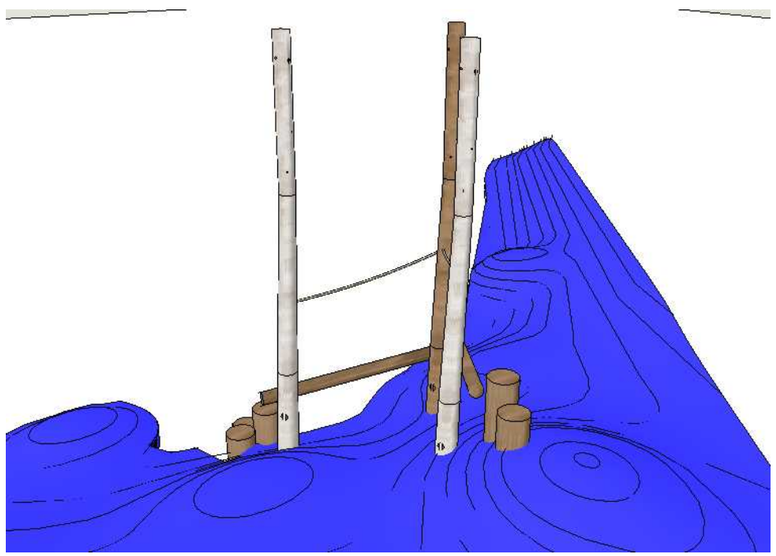

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- STRUCTURAL SCREWS ARE 3/8" (10MM) GRK RSS SCREWS UNLESS OTHERWISE STATED.
- MULTI-PURPOSE SCREWS ARE #10 R4 SCREWS UNLESS OTHERWISE STATED.
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- ALWAYS WEAR PROPER PPE AND FOLLOW SAFE PRACTICES.

REVISION HISTORY

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KEY DATA

MAXIMUM HEIGHT: 13' 8" / 4200mm

FALL HEIGHT: 30" / 750mm

AREA OF SURFACING: 285 ft² / 25 m²

LEGEND

- EWC: EASTERN WHITE CEDAR
- WRC: WESTERN RED CEDAR
- DPS: DESIGNATED PLAY SURFACE
- GRK RSS: RUGGED STRUCTURAL SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-2442 APPROVED
- GRK R4: MULTI-PURPOSE SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-3201 APPROVED

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email: play@earthscape.ca

Hoyt Sullivan Park - Somerville, MA

DRAWN BY: LW CHECKED BY:

POST AND ROPE - GENERAL NOTES, REVISIONS

CURRENT VERSION v1.0

P

01

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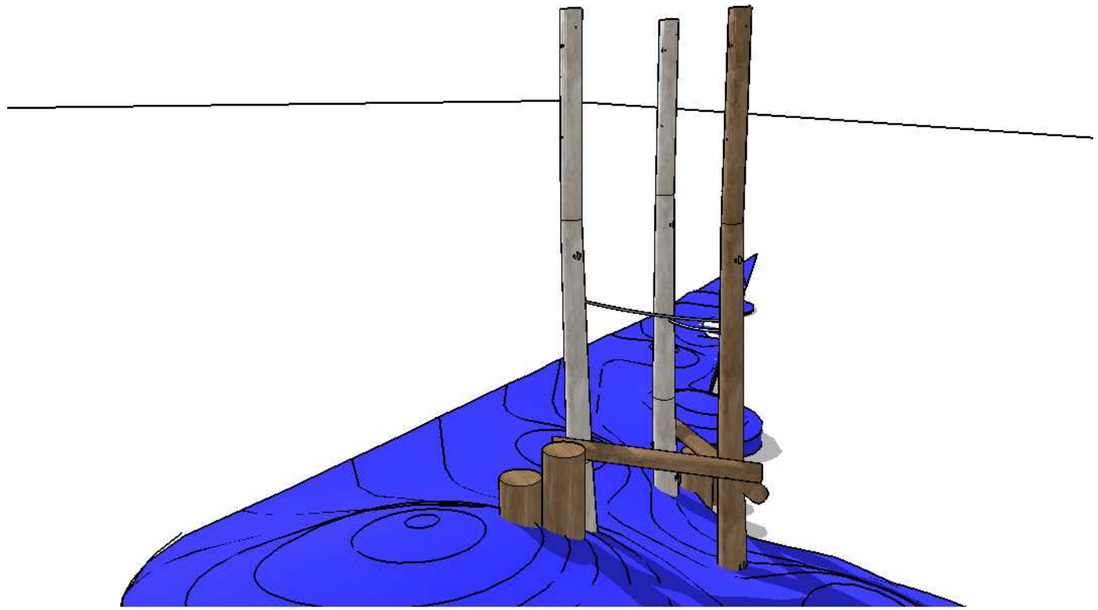

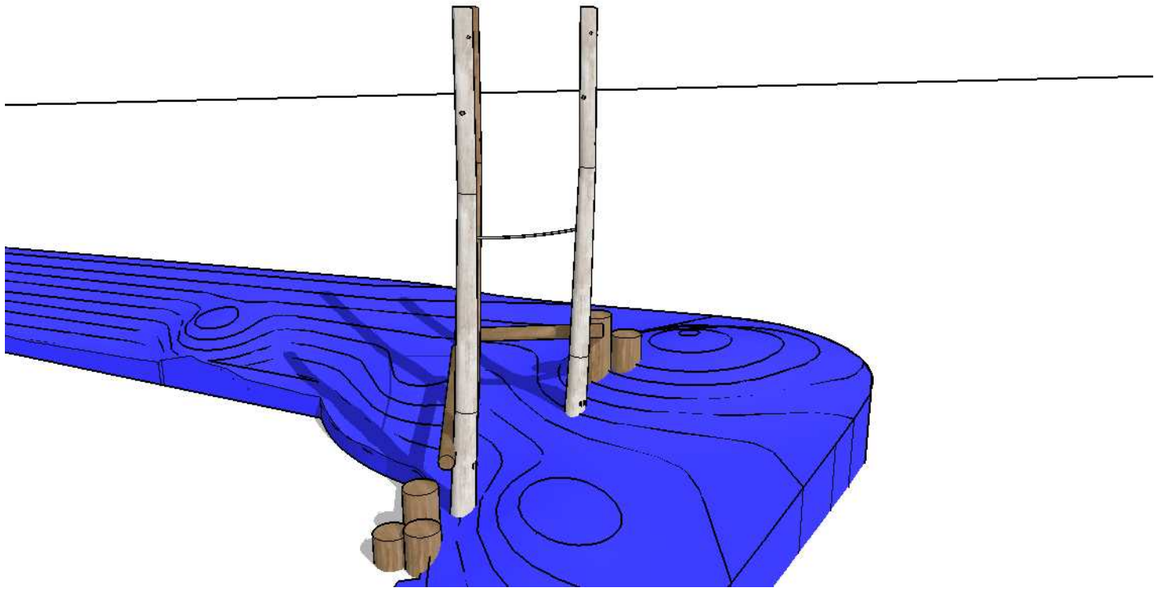

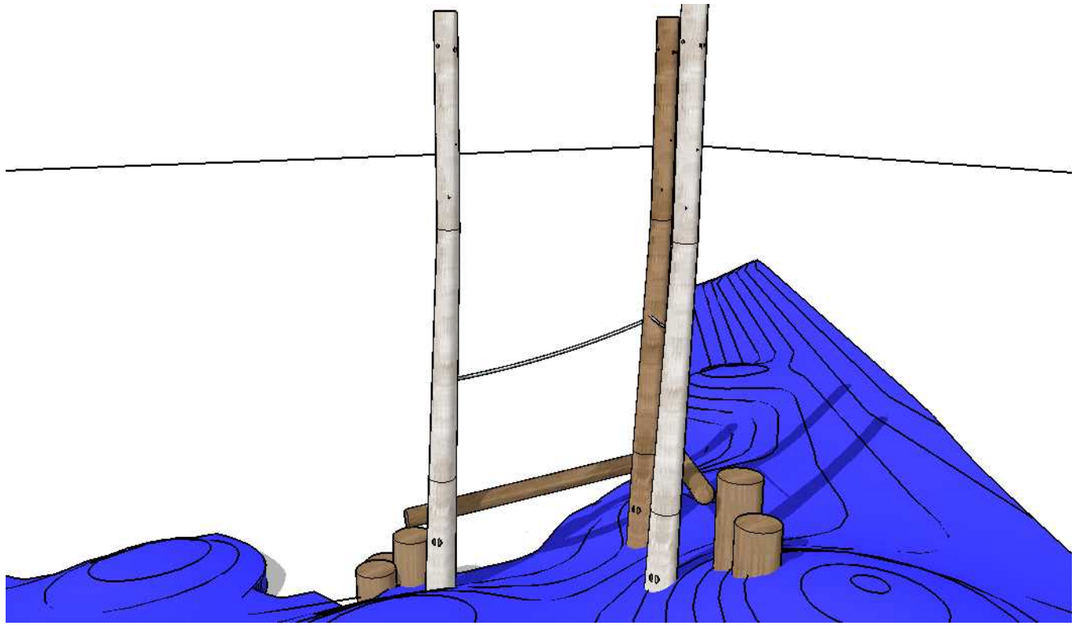

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Hoyt Sullivan Park - Somerville, MA

DRAWN BY: LW CHECKED BY:

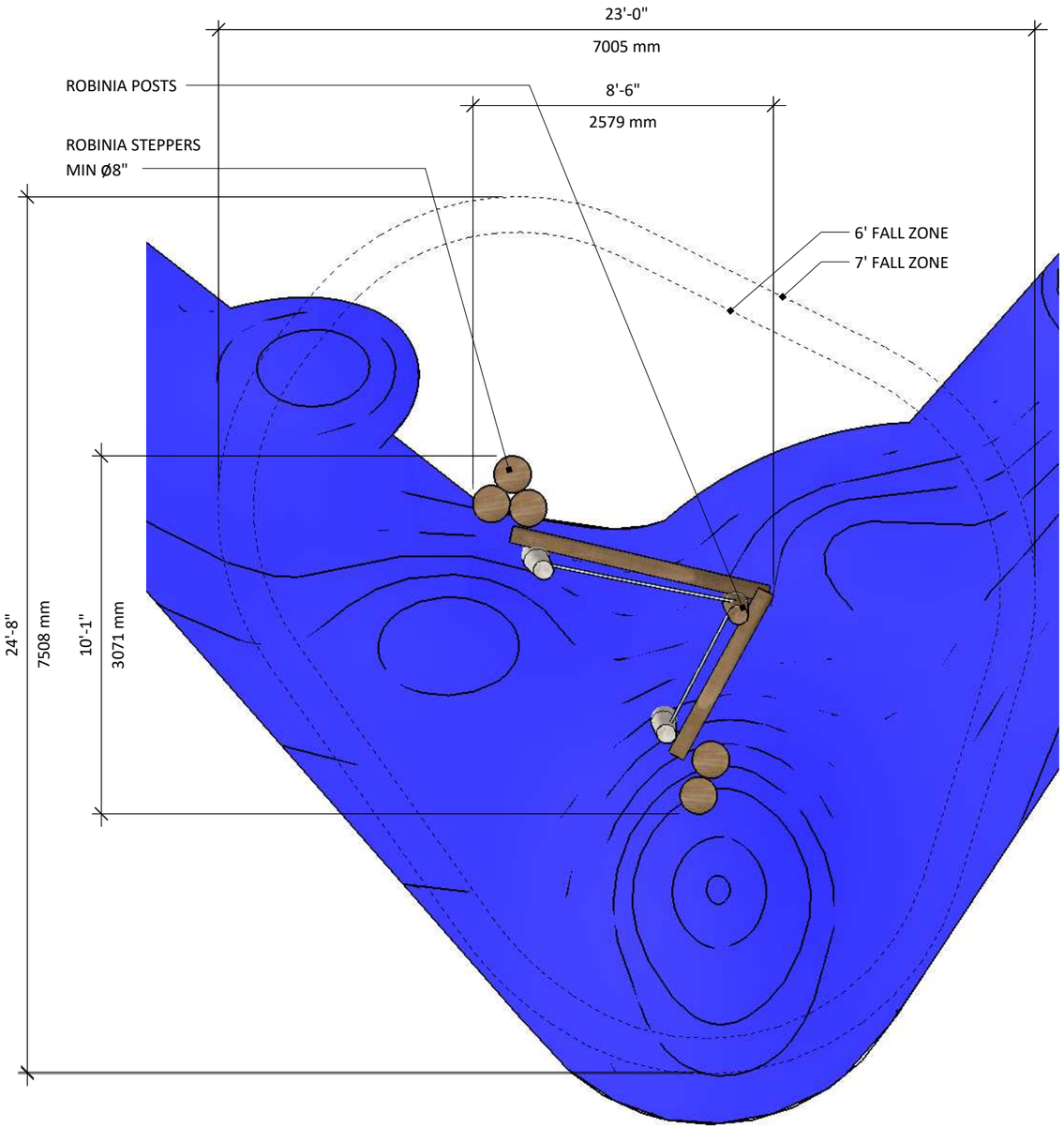
POST AND ROPE - PERSPECTIVES

CURRENT VERSION

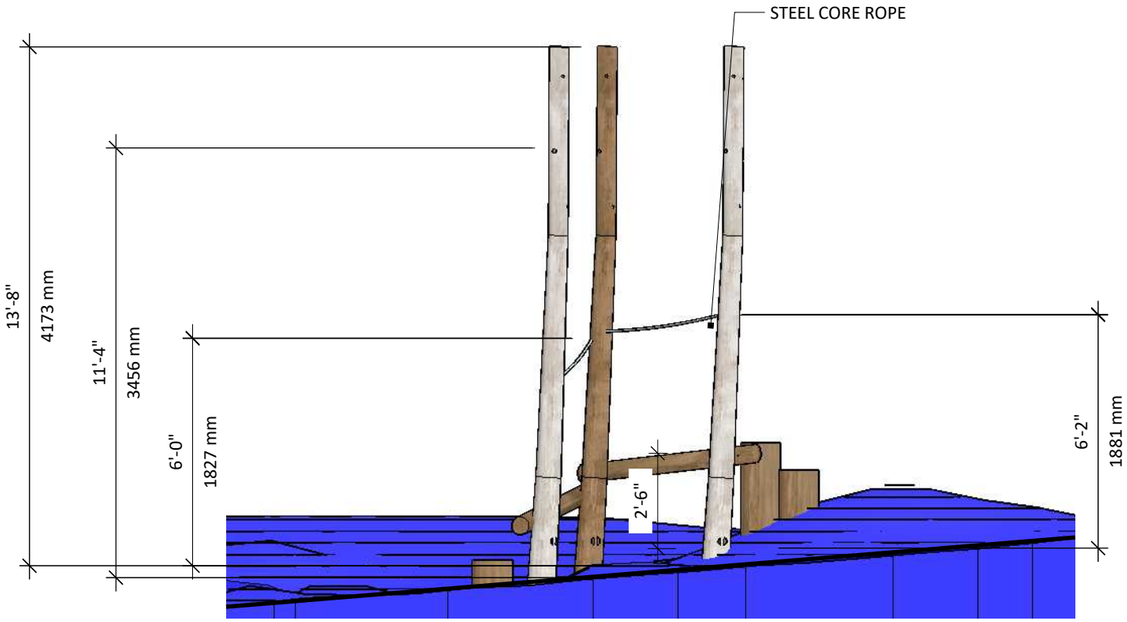
v1.0

P

02



01 | PLAN VIEW
P3 | SCALE 1/4" : 1'



NOTE: FOOTING DETAILS TBD

02 | ELEVATION
P4 | SCALE 1/4" : 1'

PRELIMINARY - NOT FOR CONSTRUCTION

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Hoyt Sullivan Park - Somerville, MA	POST AND ROPE - PLAN AND ELEVATION	**CURRENT VERSION**	**P**
DRAWN BY: LW CHECKED BY:		v1.0	**03**

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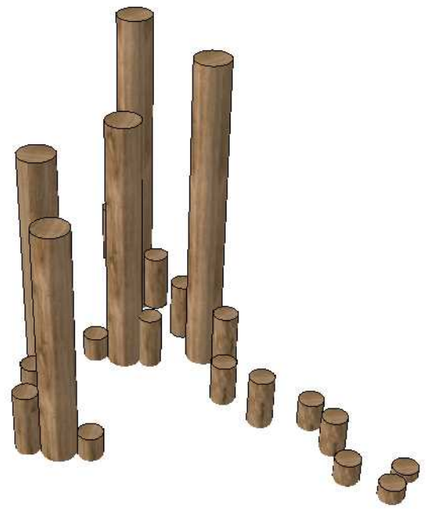

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KEY DATA

MAXIMUM HEIGHT: 8' / 2400mm

FALL HEIGHT: 28"/ 710mm

AREA OF SURFACING: 310 ft² / 30 m²

LEGEND

- EWC: EASTERN WHITE CEDAR
- WRC: WESTERN RED CEDAR
- DPS: DESIGNATED PLAY SURFACE
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Hoyt Sullivan Park - Somerville, MA

DRAWN BY: LW CHECKED BY:

LOG STEPPERS - GENERAL NOTES, REVISIONS

CURRENT VERSION v1.0

P **01**

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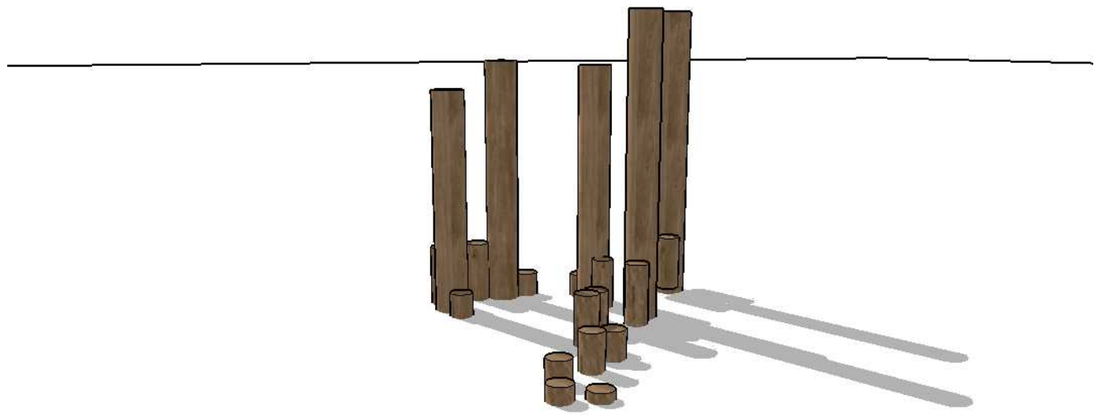

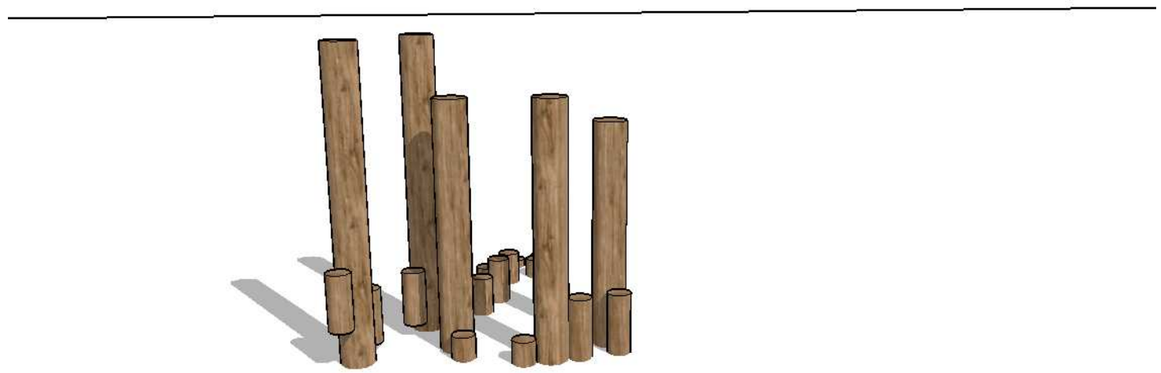

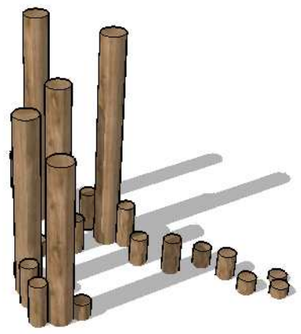

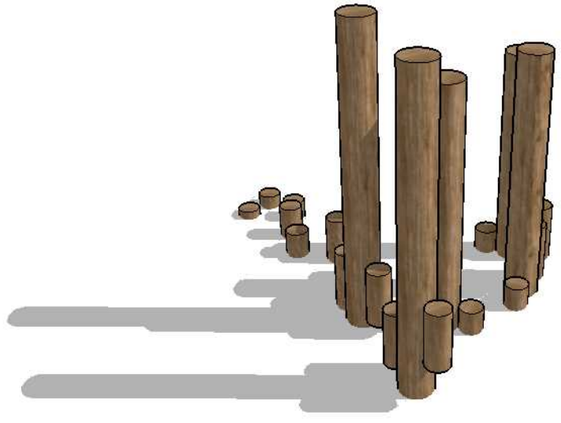

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web: earthscape**play**.ca
email: play@earthscape.ca

Hoyt Sullivan Park - Somerville, MA

DRAWN BY: LW CHECKED BY:

LOG STEPPERS - PERSPECTIVES

CURRENT VERSION

v1.0

P

02

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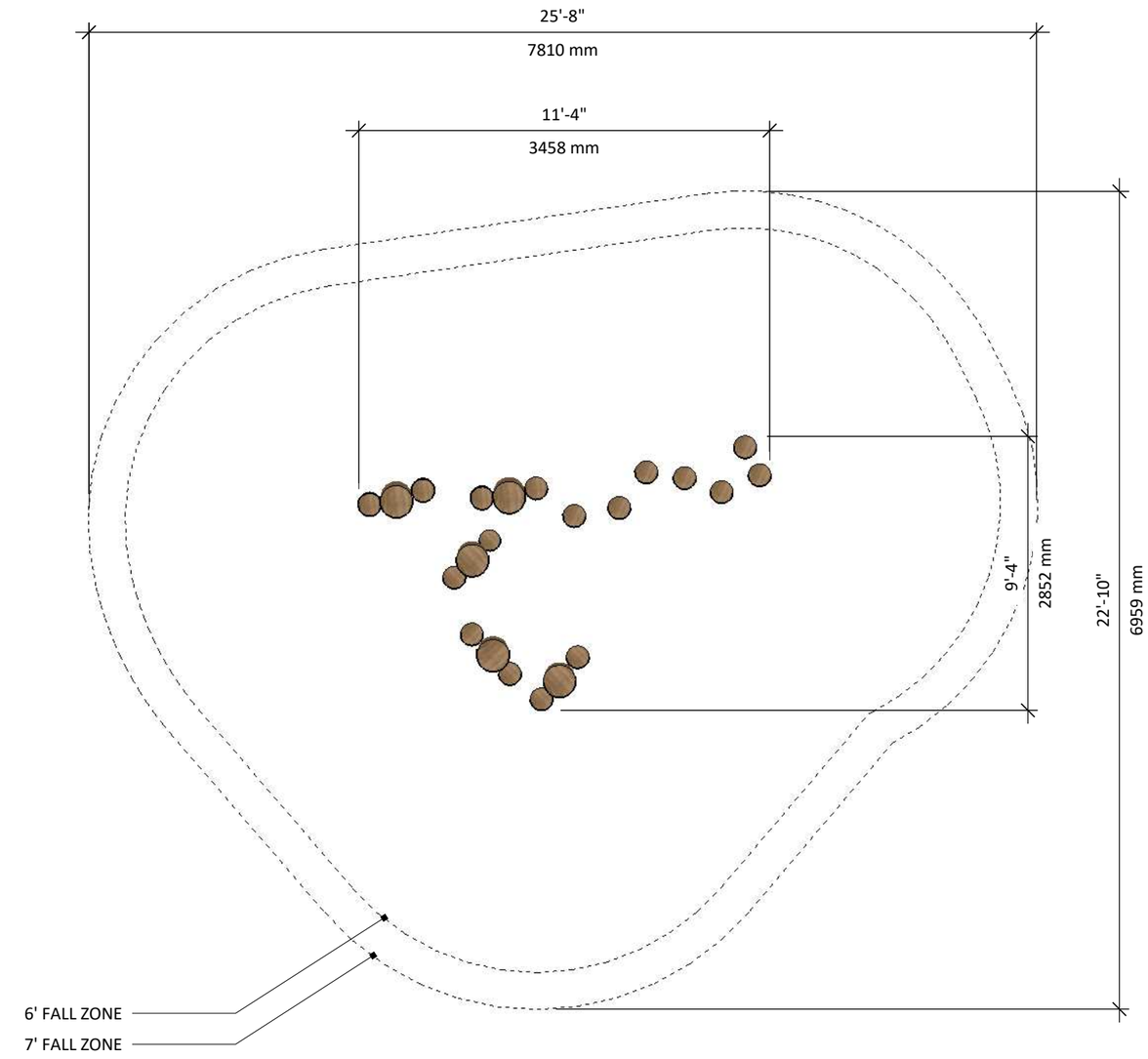
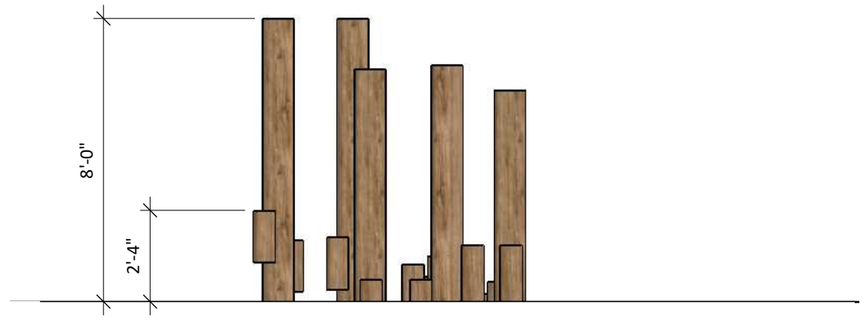


01 | PLAN VIEW
P3 | SCALE 1/4" : 1'



NOTE: FOOTING DETAILS TBD

02 | ELEVATION
P4 | SCALE 1/4" : 1'

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Hoyt Sullivan Park - Somerville, MA	LOG STEPPERS - PLAN AND ELEVATION	**CURRENT VERSION**	**P** **03**
DRAWN BY: LW CHECKED BY:		v1.0	

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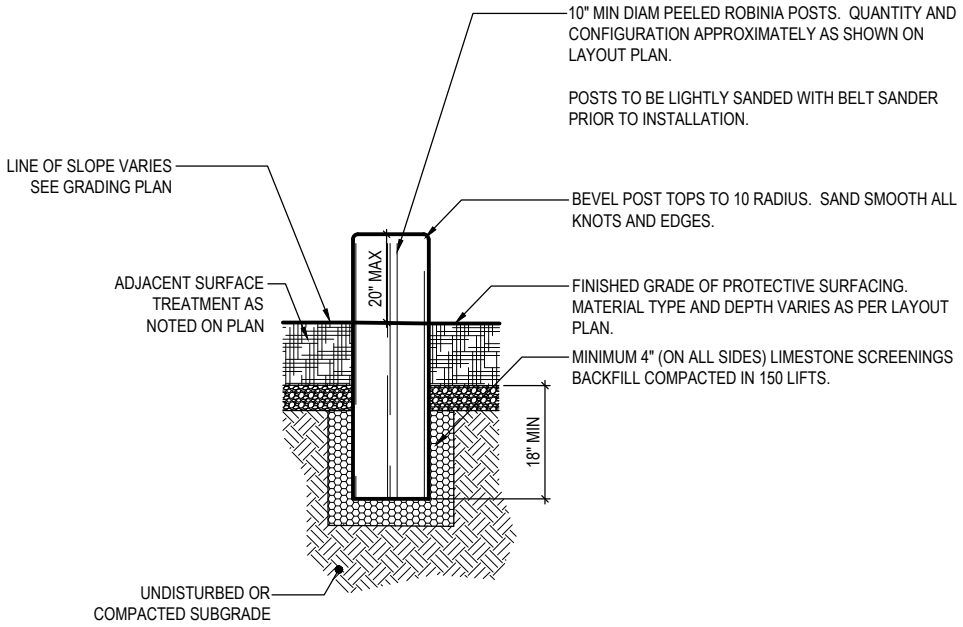
escape outside

7215 Wellington Rd 86
Wallenstein, ON
N0B 2S0

T. 519.669.2972
TF. 1.877.269.2972
F. 519.669.5085

NOTES

1. ALL POSTS TO BE INSTALLED VERTICALLY AND WITH TOPS CUT HORIZONTALLY. VARY HEIGHTS AS INDICATED WITHIN MINIMUM AND MAXIMUM STEPS AS SHOWN.
2. NUMBER OF POST VARIES. REFER TO PROJECT DRAWINGS AND MATERIAL LIST.
3. ALL POSTS TO BE ROBINIA PSEUDOACACIA (BLACK LOCUST), PEELED AND SANDED TO REMOVE IRREGULARITIES SUCH AS BRANCH STUBS.



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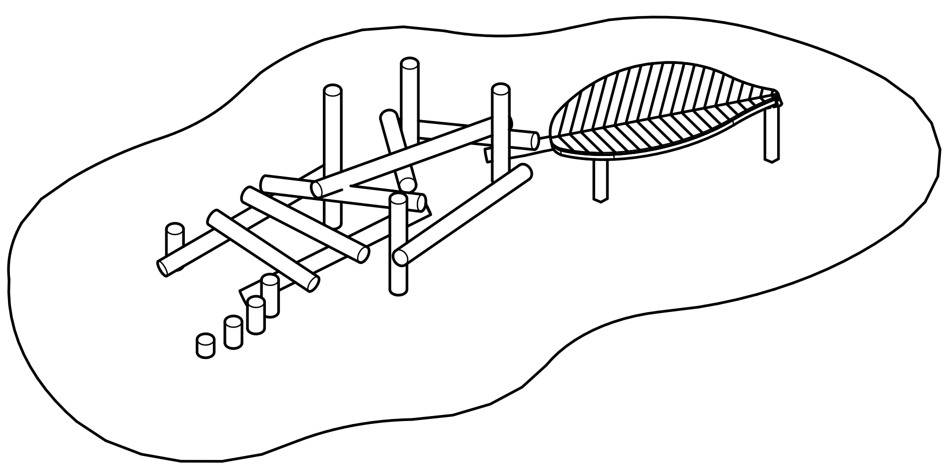

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- INSPECTION AND TESTING: INSPECTION, TESTING (INCLUDING CONCRETE TESTING), PRE-CONSTRUCTION SURVEYS TO BE COMPLETED BY OTHERS. ON-SITE REVIEW OR INSPECTION BY ENGINEER IS NOT INCLUDED IN THIS PROPOSAL.
- SURFACING: WHEN AN IMPACT-ABSORBING SURFACE MATERIAL IS REQUIRED, IT MUST COMPLY WITH ASTM F-1292 (MOST RECENT EDITION) FOR THE DEFINED FALL HEIGHT OF THE EQUIPMENT SPECIFIED IN DRAWINGS BY EARTHSCAPE OR A CONTRACTUALLY OBLIGATED CRITICAL HEIGHT SPECIFIED IN ADVANCE. ENSURE USE ZONES, SAFETY ZONES, AND/OR PROTECTIVE SURFACING ZONES AROUND ALL PLAY EQUIPMENT ARE COMPLIANT WITH ASTM F-1292 (MOST RECENT EDITION) - BY OTHERS.
- SURVEY AND FACILITIES: SURVEY WORK INCLUDING BENCHMARKS, LINES AND LEVELS, PRE-CONSTRUCTION SURVEY, AS-BUILT DRAWINGS BY OTHERS.
- THESE DRAWINGS ARE INTENDED TO BE PRINTED AT 11" X 17" PAGE SIZE. DO NOT SCALE.
- ALL MEASUREMENTS ARE IN MM UNLESS OTHERWISE STATED.
- ALL EXPOSED WOOD EDGES SHALL HAVE A MIN 1/4" (6MM) RADIUS.
- BOLTS ARE 3/4" (19MM) HDG CARRIAGE BOLTS UNLESS OTHERWISE STATED.
- STRUCTURAL SCREWS ARE 3/8" (10MM) GRK RSS SCREWS UNLESS OTHERWISE STATED.
- MULTI-PURPOSE SCREWS ARE #10 R4 SCREWS UNLESS OTHERWISE STATED.
- 28 DAY CONCRETE STRENGTH IS 35 MPA MINIMUM, EXPOSURE CLASS C-1 WITH 5-8% ENTRAINED AIR.
- EQUIPMENT SHALL COMPLY WITH THE REQUIREMENTS OF ASTM F-1487-11.
- THE STRUCTURES FEATURED IN THESE PLANS ARE INTENDED FOR CHILDREN AGED 2-5 YEARS OLD.
- VISUAL DETAILS INCLUDING BUT NOT LIMITED TO: NET SPACING, ROPE APPEARANCE AND COLOURS ARE FOR CONCEPTUAL PURPOSES ONLY.
- ALL 6"X6" (152X152) VERTICAL MEMBERS SHALL COMPLY WITH NON-DPS REQUIREMENTS.
- ALWAYS WEAR PROPER PPE AND FOLLOW SAFE PRACTICES.

REVISION HISTORY

V. NO	MM/DD/YY	COMMENTS
1.2.3	01/12/17	Issued for Review
#.#	../../..	...
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KEY DATA

MAXIMUM HEIGHT: 7' 11" / 2400mm

FALL HEIGHT: 4' 7" / 1400mm

AREA OF SURFACING: 805 ft² / 75 m²

LEGEND

- EWC: EASTERN WHITE CEDAR
- WRC: WESTERN RED CEDAR
- DPS: DESIGNATED PLAY SURFACE
- GRK RSS: RUGGED STRUCTURAL SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-2442 APPROVED
- GRK R4: MULTI-PURPOSE SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-3201 APPROVED

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Hoyt Sullivan Park - Somerville, MA

DRAWN: MT CHECKED: -

LOG JAM - GENERAL NOTES, REVISIONS

CURRENT VERSION v1.2.3

P 01

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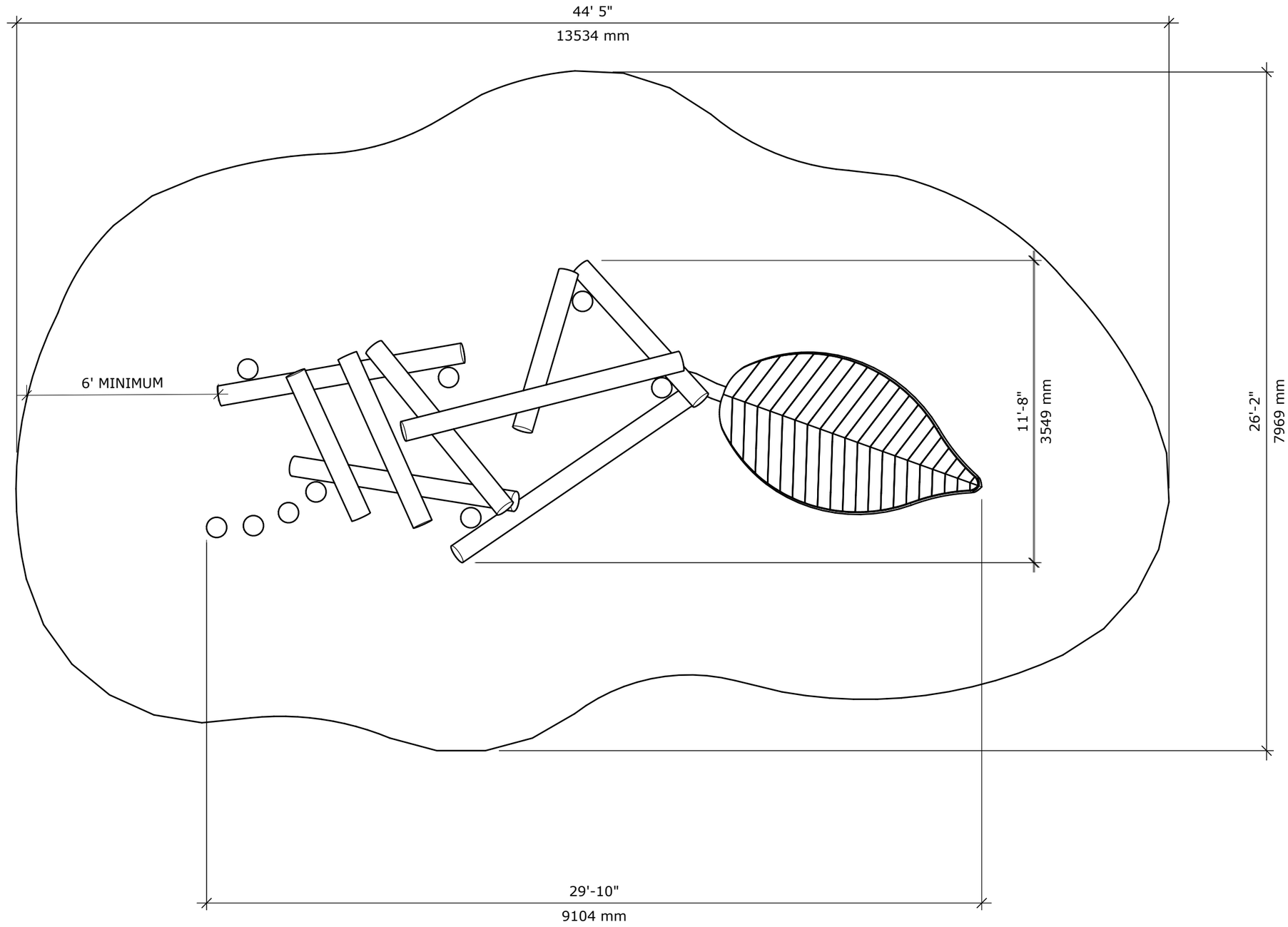

01 | Plan View
P02 | SCALE 1/4" = 1'

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Hoyt Sullivan Park - Somerville, MA	LOG JAM - PLAN VIEW	CURRENT VERSION	P 02
DRAWN: MT CHECKED: -		v1.2.3	

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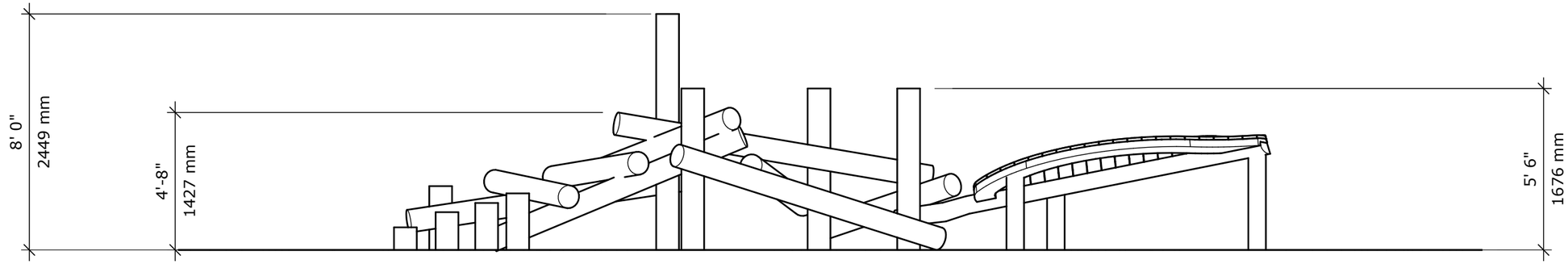

01 Elevation
P03 SCALE 1:40

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Hoyt Sullivan Park - Somerville, MA	LOG JAM - ELEVATION	CURRENT VERSION	P 03
DRAWN: MT CHECKED: -		v1.2.3	

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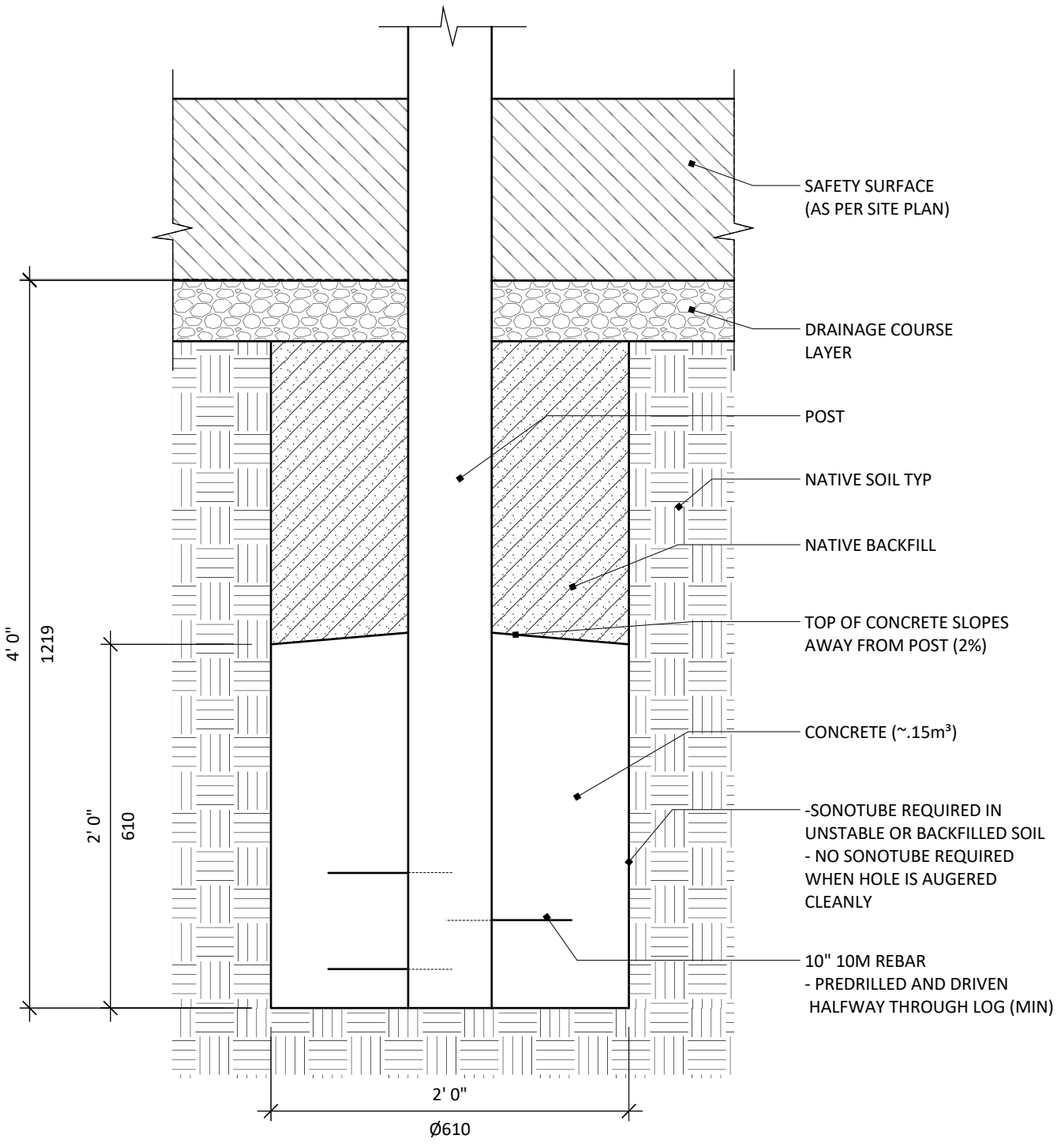

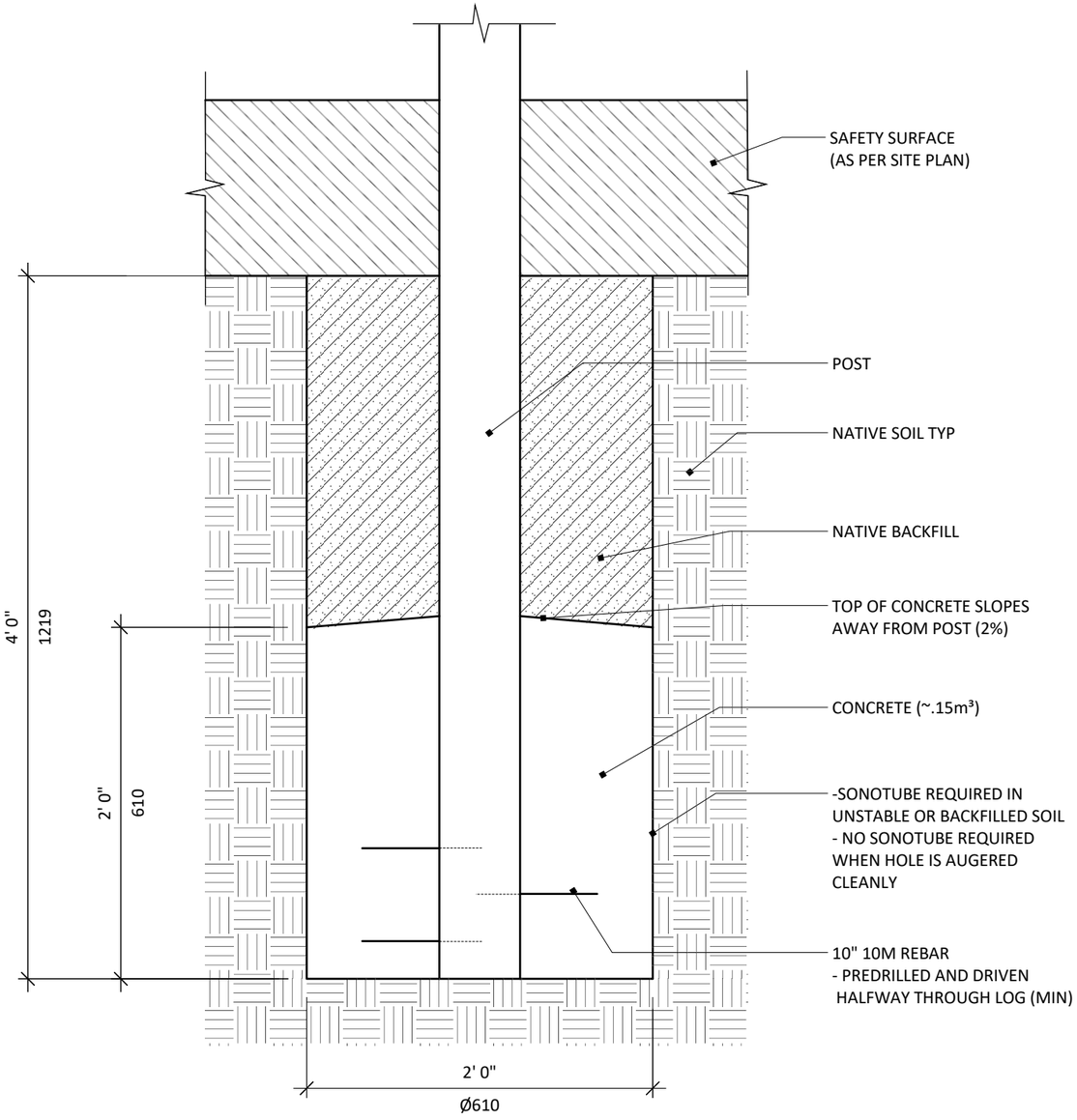

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Ø600MM POST FOOTING	SECTION VIEW, NOTES	**CURRENT VERSION**	**P** **5**
DRAWN BY: MT CHECKED BY:		v1.0.1	

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KOMPAN Product Info

MULE - NRO101

ROBINIA

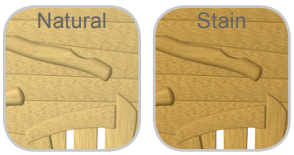
Best User Age: **2-12 years**

Footings: In-ground installation
Surface installation also available

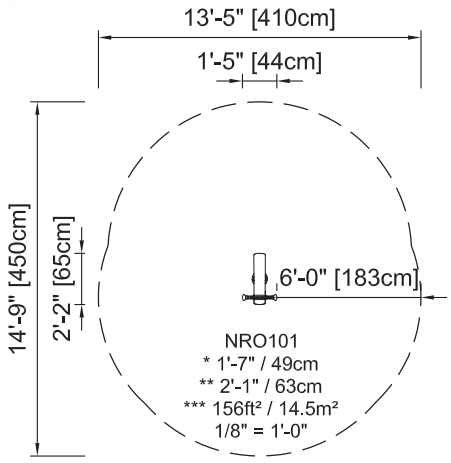
Technical information available at kompan.com

ADA ANALYSIS	Elevated Activities	Ground Level Activities	Ground Level Play Types
Present	**0**	**1**	**1**
Accessible	**0**	**1**	**1**
Required	**0**	**1**	**1**

Available Options:



-XX01 -XX11



IPEMA CERTIFIED to ASTM F1487

IPEMA CERTIFIED to CAN/CSA-Z614

To verify product certification, visit www.ipema.org

* = Highest designated play surface.
** = Total height of product.
*** = Total area of safety zone.

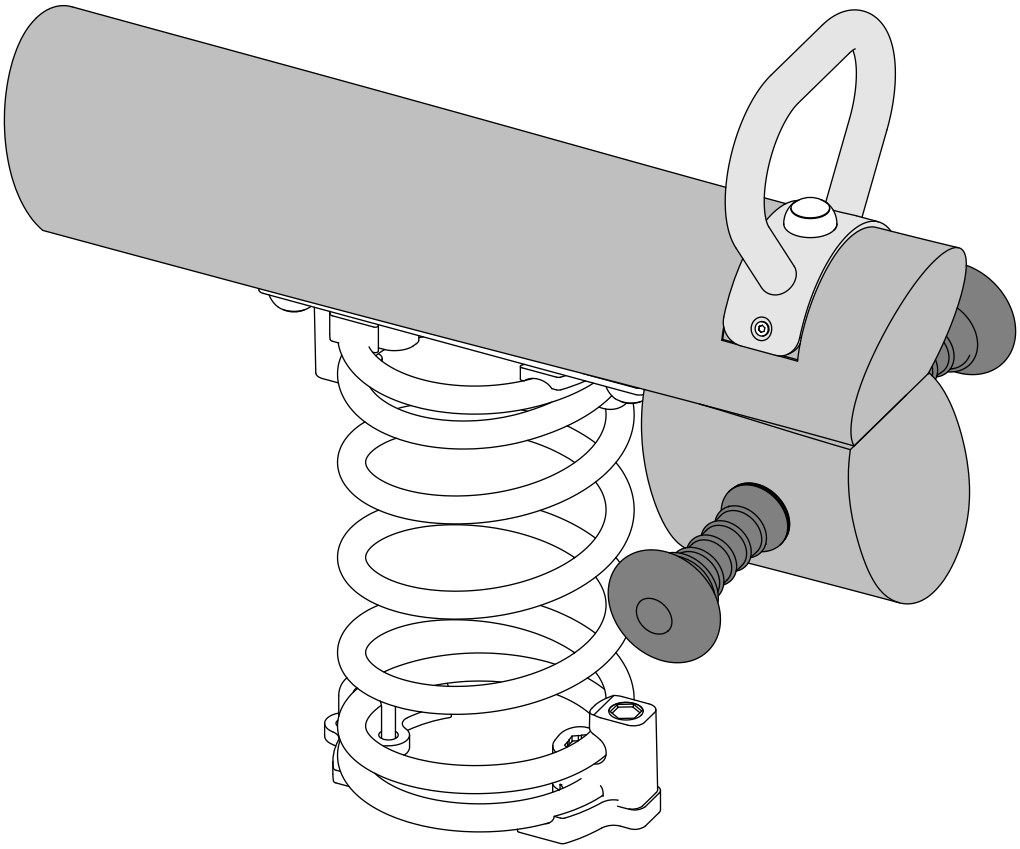
Highest designated play surface, space required and total area of safety zone are according to ASTM F1487.

Equipment must be installed over resilient surfacing appropriate to the safety guidelines in your area.

Product development is an ongoing process. We reserve the right to make modifications on all our products. This product may not be mirrored, scaled or altered in any way. Safety zones must be retained for proper placement of equipment. If any changes are required, please contact your KOMPAN representative at 1.800.426.9788.

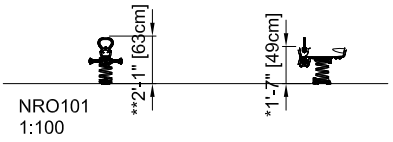
KOMPAN

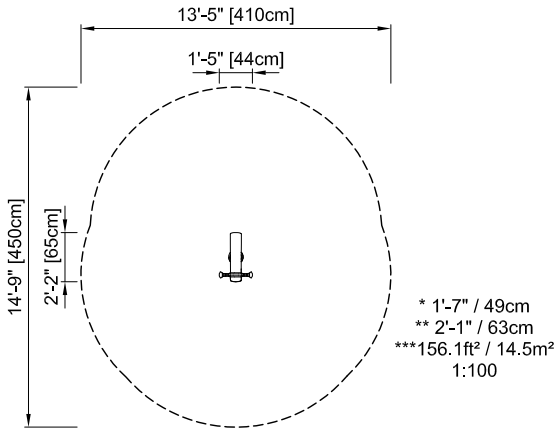
NRO101-0001
NRO101-0011
NRO101-0401/FSC
NRO101-0411
NRO101-0601
ART119-0001
ART119-0401



VNRO101XXXX 20140602 PetrJu

Safety zone in accordance with ASTM 1487
Sicherheitsabstand gemäß ASTM 1487
Espace d'évolution selon ASTM 1487
Zona de seguridad según ASTM 1487
Distanze di sicurezza in conformità con lo standard ASTM 1487
Veiligheidsgebied in overeenstemming met ASTM 1487
Säkerhetsområde enl ASTM 1487
Sikkerhedsareal iht. ASTM 1487
Зона безопасности в соответствии с ASTM 1487
ASTM 1487-normin mukainen turva-alue





* Free height of fall
Freie Fallhöhe
Hauteur de chute libre
Altura de caída libre
Altezza di caduta libera
Vrije valhoogte
Fri fallhöjd
Fri faldhøjde
Высота свободного падения
Vapaa putoamiskorkeus

Please note: The safety zone shown on this drawing is in accordance with ASTM 1487. There may be some locations where a larger safety zone is required. If in doubt, please contact your play consultant.

Achtung: Der angegebene Sicherheitsabstand entspricht ASTM 1487. Bestimmte Länder schreiben größere Sicherheitsabstände vor. Bitte wenden Sie sich in Zweifelsfällen an Ihren Berater.

Attention : l'espace d'évolution montré est conforme à ASTM 1487. Dans certains pays, un espace d'évolution plus grand peut être exigé. Prière de contacter notre conseiller en cas de doute.

Observe: La zona de seguridad demostrada en este dibujo cumple con ASTM 1487. En algunos sitios puede ser necesaria una zona de seguridad más grande. En caso de tener alguna duda, por favor póngase en contacto con nuestro consultor.

Attenzione: la distanza di sicurezza specificata è conforme ai requisiti ASTM 1487. In alcuni paesi, le norme locali possono richiedere distanze di sicurezza maggiori. In caso di dubbi, contattare il nostro consulente.

N.B.: het getoonde veiligheidsgebied is in overeenstemming met ASTM 1487. In sommige landen kan een groter veiligheidsgebied vereist zijn. In geval van twijfel onze adviseur raadplegen.

Obs: Det markerade säkerhetsområdet följer ASTM 1487. I vissa länder kan det finnas krav på större säkerhetsområde. Kontakta vänligen vår konsulent om du är osäker.

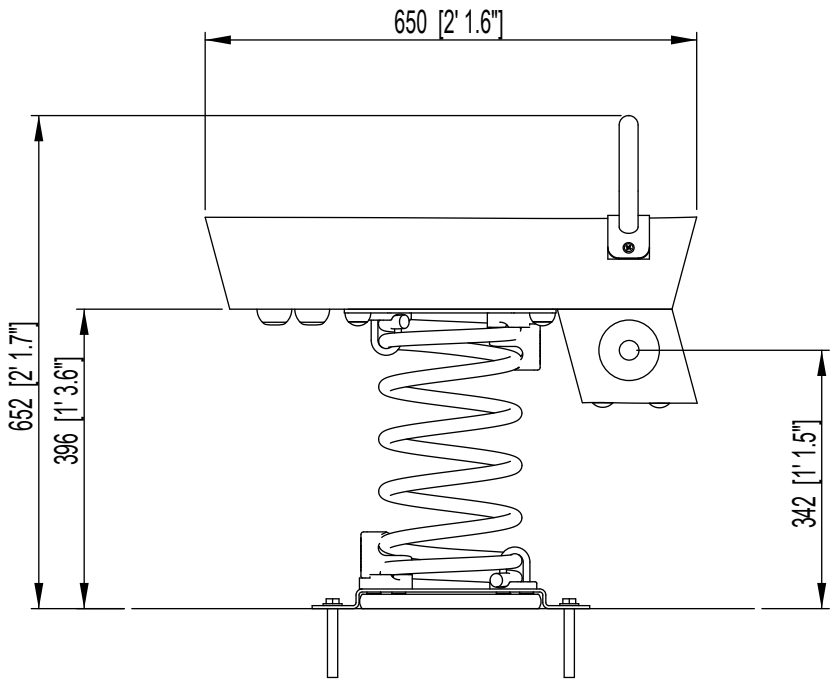
Obs.: Det viste sikkerhedsareal er i overensstemmelse med ASTM 1487. I nogle lande kan der være krav om større sikkerhedsareal. Kontakt venligst vores konsulent ved tvivlsspørgsmål.

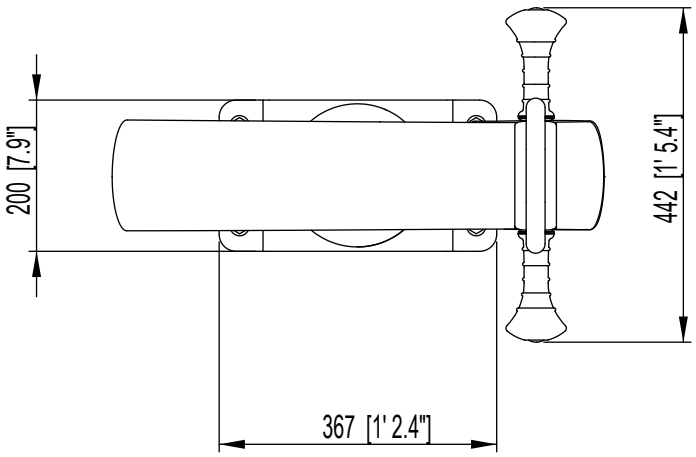
Внимание: Зона безопасности указана в соответствии с ASTM 1487. Возможны случаи, когда требуется увеличение зоны безопасности. В затруднительных случаях обращайтесь к Вашему консультанту.

Huom: Tämän piirustuksen turva-alue on ASTM 1487-normin mukainen. Joissain sijoituspaikoissa saatetaan edellyttää suurempaa turva-aluetta. Jos olet epävarma, otathan yhteyttä KOMPANiin.

VNRO101XXXX 20140602 PetrJu

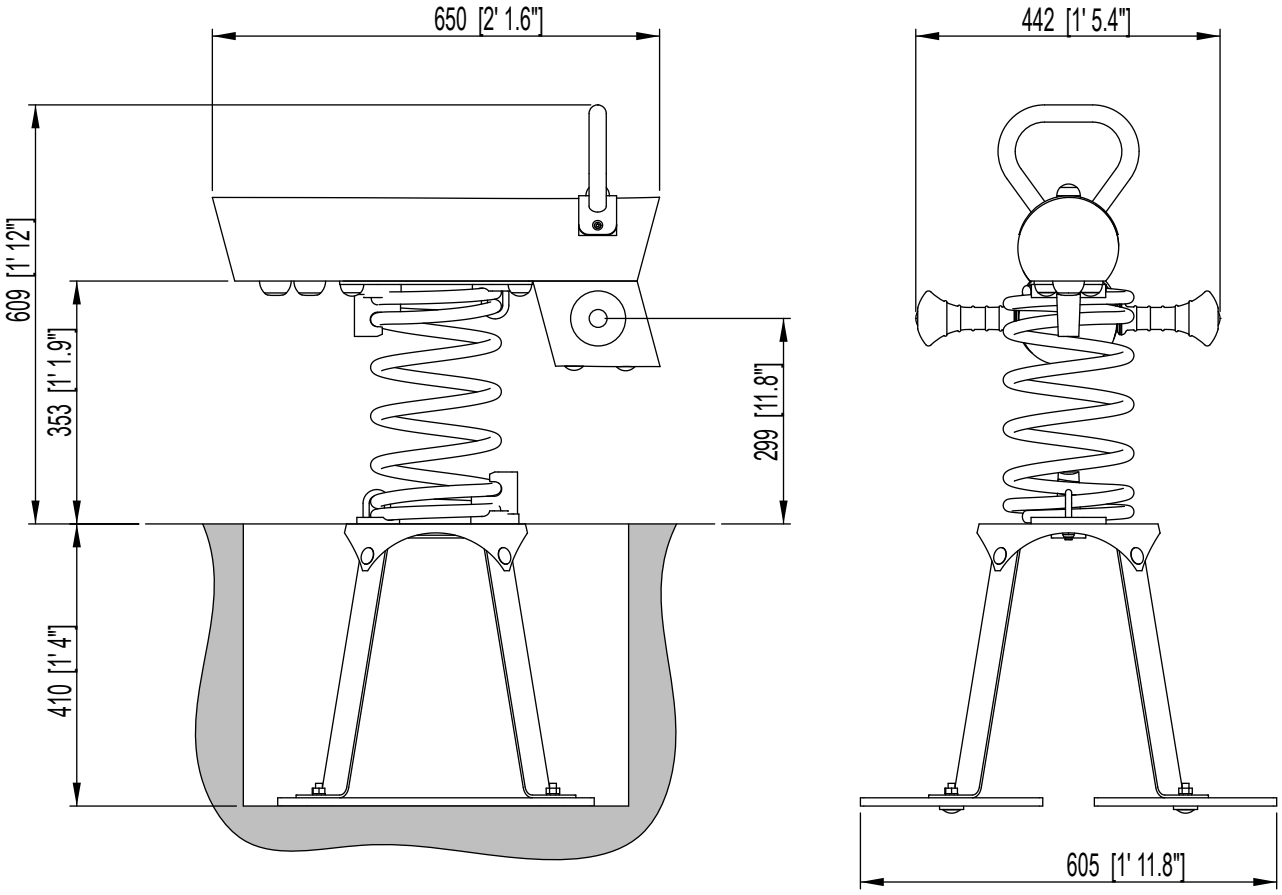
NRO101-00X1
ART119-0001

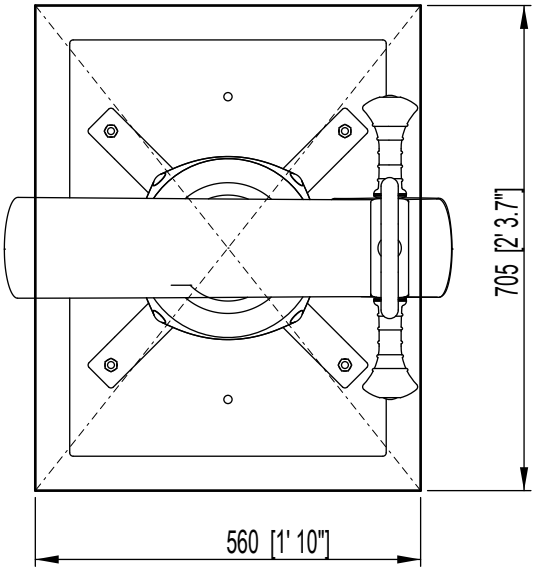




VNRO101XXXX 20140602 PetrJu

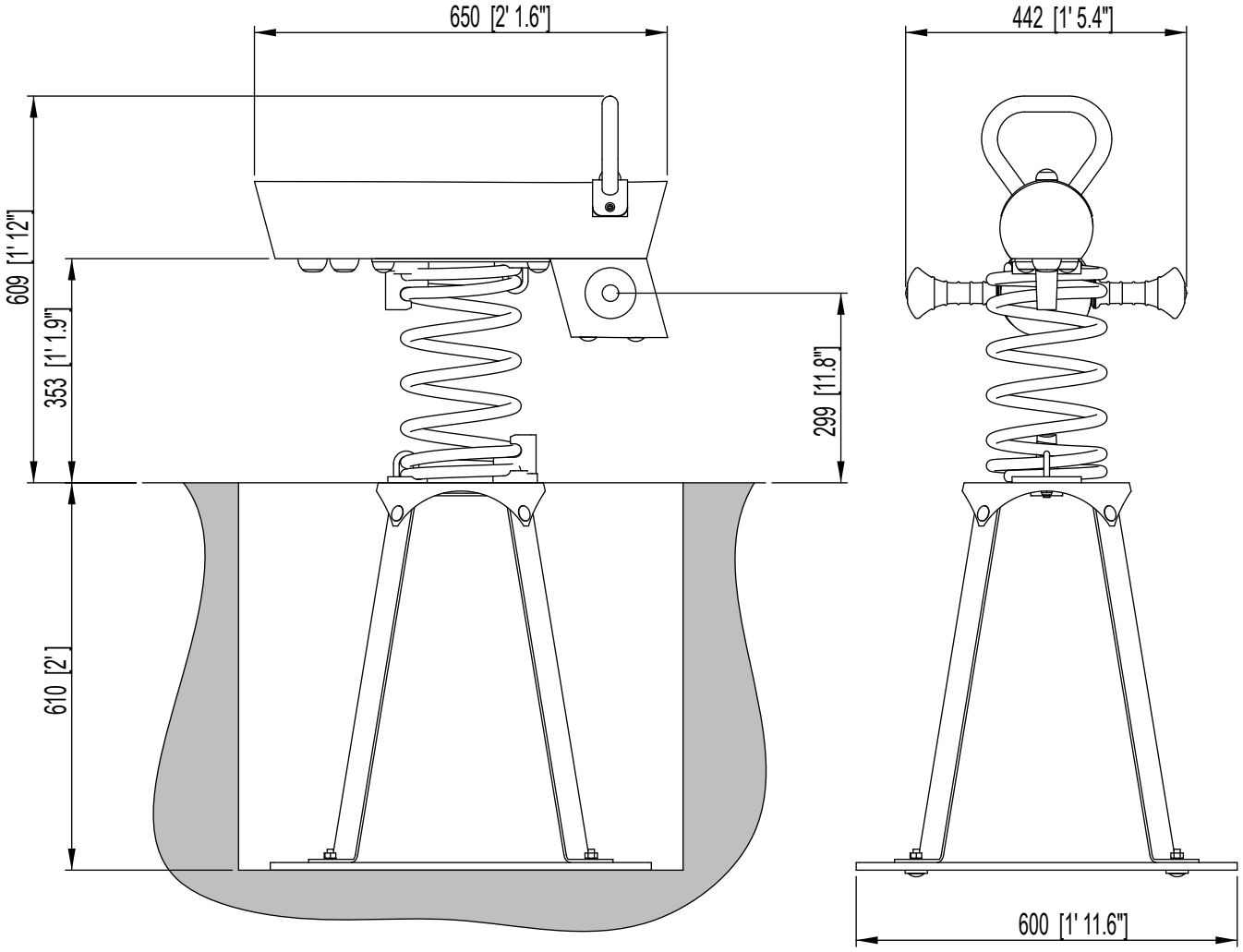
NRO101-04X1
NRO101-0401FSC
ART119-0401

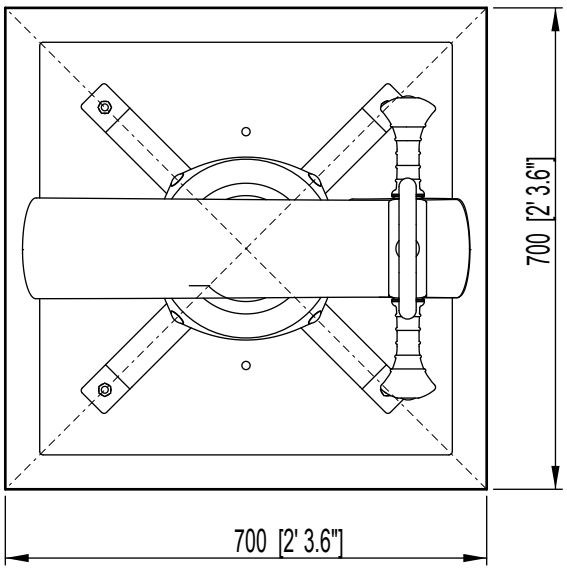




VNRO101XXXX 20140602 PetrJu

NRO101-0601





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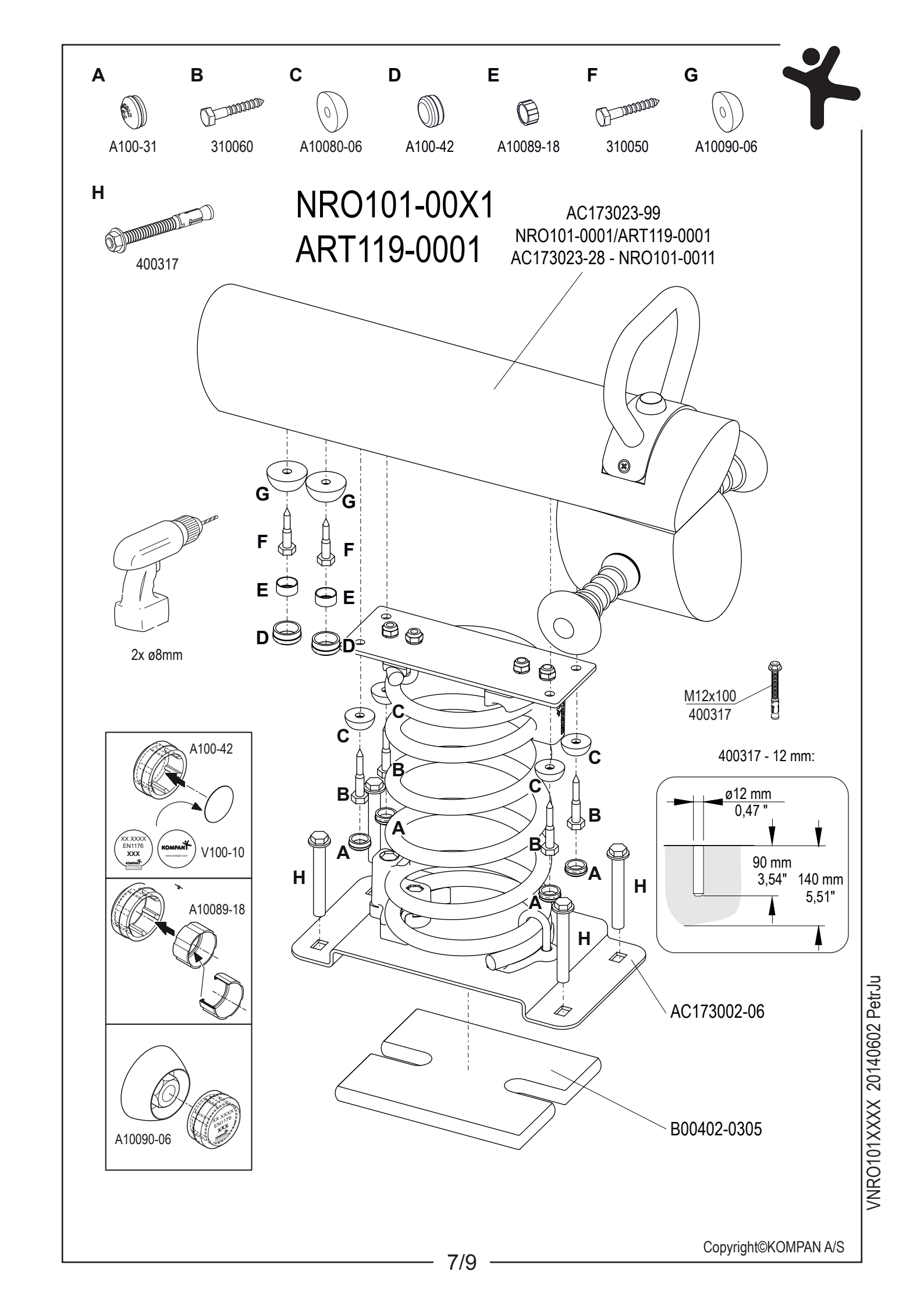
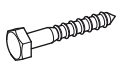


A	B	C	D	E	F	G
						
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H	I	J	K	L
				
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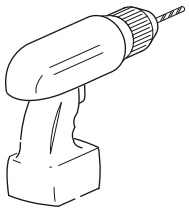
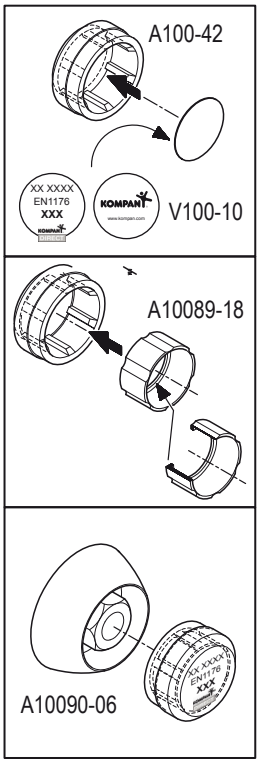
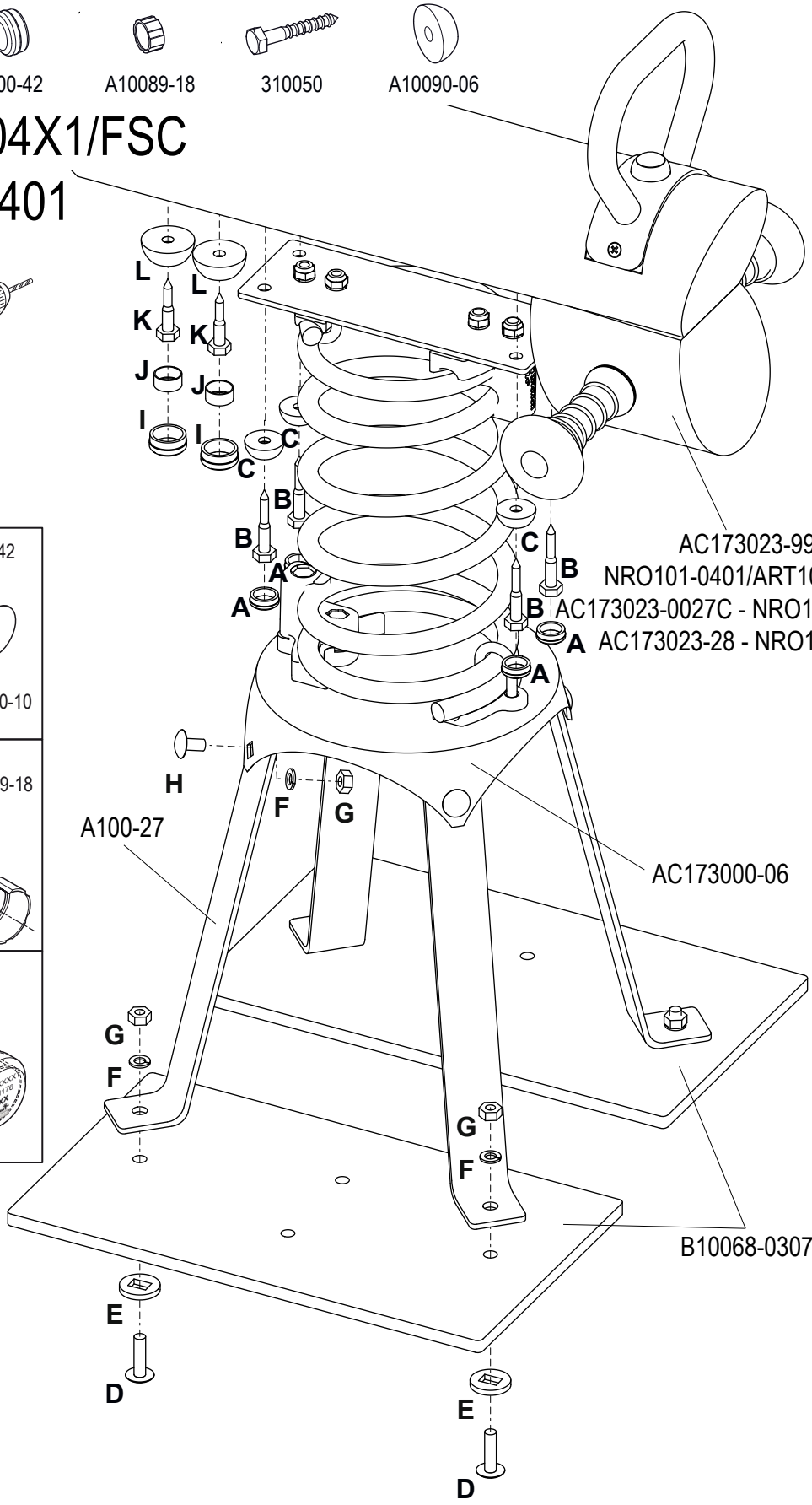
NRO101-04X1/FSC
ART101-0401



2x ø8mm





VNRO101XXXX 20140602 PetrJu

A	B	C	D	E	F	G
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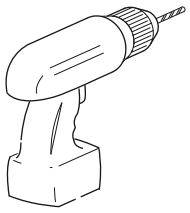
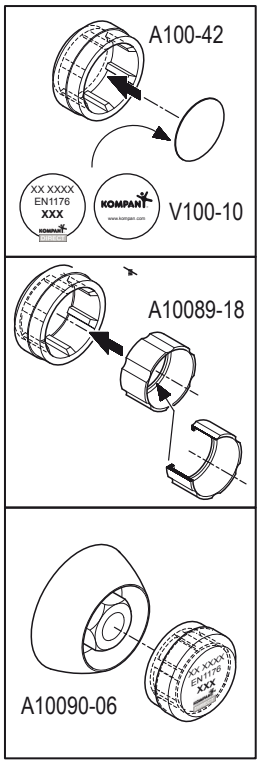
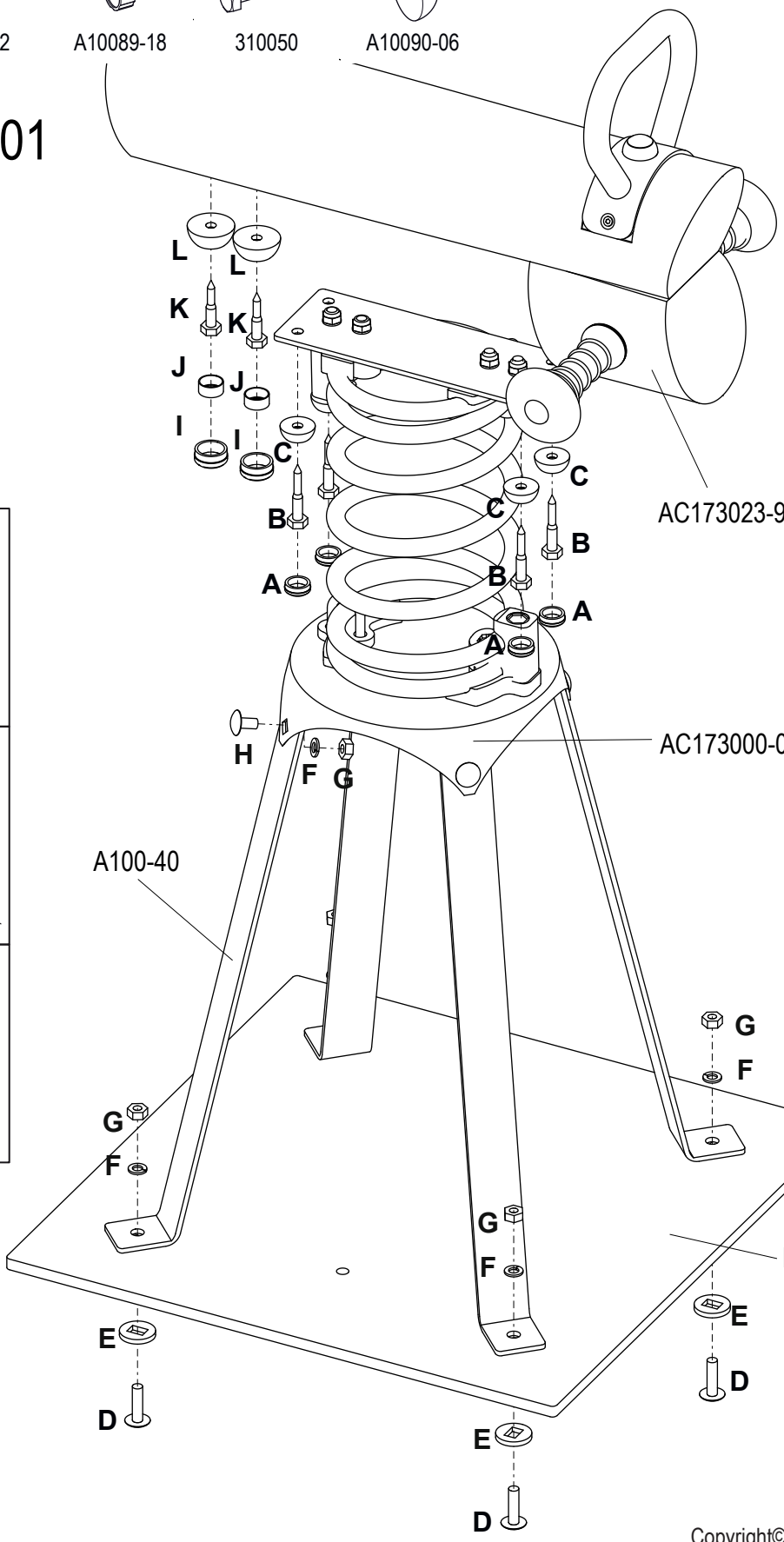
H	I	J	K	L
110020-A2	A100-42	A10089-18	310050	A10090-06

NRO101-0601



2x ø8mm





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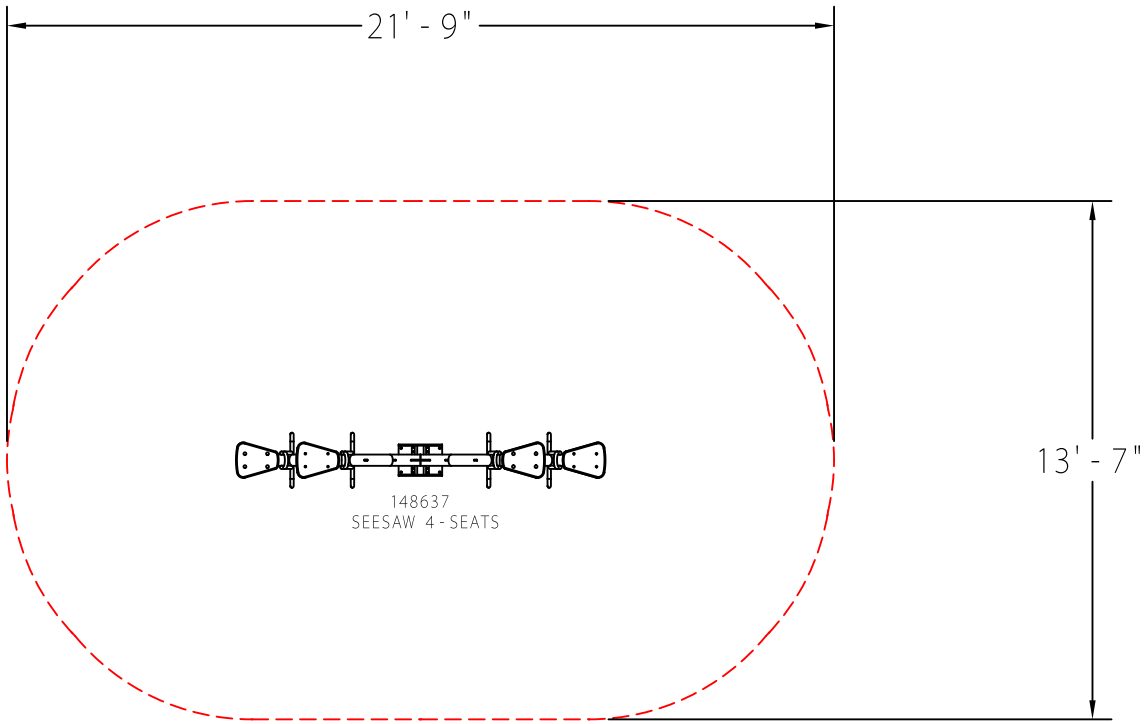


TOTAL ELEVATED PLAY COMPONENTS	0		
TOTAL ELEVATED COMPONENTS ACCESSIBLE BY RAMP	0	REQUIRED	0
TOTAL ELEVATED COMPONENTS ACCESSIBLE BY TRANSFER	0	REQUIRED	0
TOTAL ACCESSIBLE GROUND LEVEL COMPONENTS SHOWN	1	REQUIRED	0
TOTAL DIFFERENT TYPES OF GROUND LEVEL COMPONENTS	1	REQUIRED	0

IPEMA CERTIFIED to ASTM F1487

The play components identified on this plan are IPEMA certified. The use and layout of these components conform to the requirements of ASTM F1487.

THIS PLAY AREA & EQUIPMENT IS DESIGNED FOR AGES 2-12 YEARS

IT IS THE MANUFACTURERS OPINION THAT THIS PLAY AREA DOES CONFORM TO THE A.D.A. ACCESSIBILITY GUIDELINES (ADAAG) ASSUMING AN ACCESSIBLE PROTECTIVE SURFACING IS PROVIDED, AS INDICATED, OR WITHIN THE ENTIRE USE ZONE.

THIS CONCEPTUAL PLAN WAS BASED ON INFORMATION AVAILABLE TO US. PRIOR TO CONSTRUCTION, DETAILED SITE INFORMATION INCLUDING SITE DIMENSIONS, TOPOGRAPHY EXISTING UTILITIES, SOIL CONDITIONS, AND DRAINAGE SOLUTIONS SHOULD BE OBTAINED EVALUATED, & UTILIZED IN THE FINAL DESIGN. PLEASE VERIFY ALL DIMENSIONS OF PLAY AREA, SIZE, ORIENTATION, AND LOCATION OF ALL EXISTING UTILITIES, EQUIPMENT, AND SITE FURNISHINGS PRIOR TO ORDERING. SLIDES SHOULD NOT FACE THE HOT AFTERNOON SUN.

CHOOSE A PROTECTIVE SURFACING MATERIAL THAT HAS A CRITICAL HEIGHT VALUE OF AT LEAST THE HEIGHT OF THE HIGHEST ACCESSIBLE PART/FALL HEIGHT OF THE ADJACENT EQUIPMENT. (REF. CONSUMER PRODUCT SAFETY COMMISSION (CPSC) GUIDELINES, SECTION 10: SURFACING.)

DESIGNED BY:
LSI

LANDSCAPE STRUCTURES INC
601 7th STREET SOUTH • P.O. BOX 198
DELANO, MINNESOTA 55328
PH: 1-800-328-0035 FAX: 1-763-972-6091

SCALE:
SCALE: IN FEET
SNAP TIES AT
0' 1' 5' 10'

NORTH ARROW

DESIGN # 1228

LANDSCAPE STRUCTURES INC.

SYSTEM TYPE:
NO-STRUCTURE

DRAWING #:

ISO 14001 CERTIFIED

ISO 9001 Certified

KOMPAN Product Info

JUNIOR SPICA - ELE400158

ELEMENTS

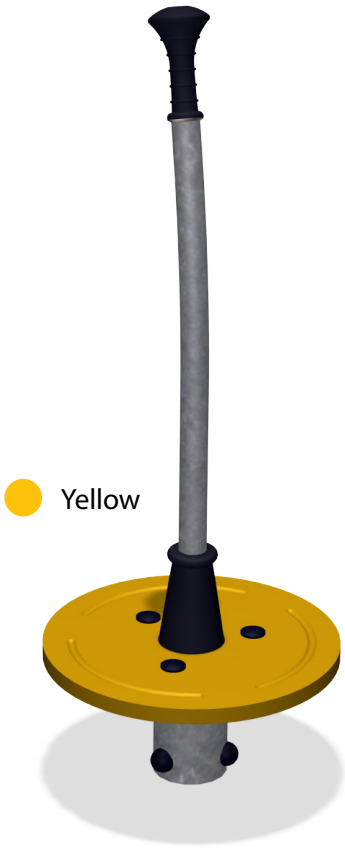
Best User Age: **2-5 years**

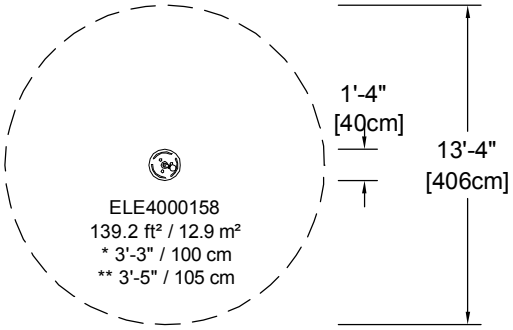
Footings: In-ground posts
Surface installation also available

Technical information available at kompan.com

ADA ANALYSIS

Elevated Activities: **0**	Accessible Elevated Activities	Accessible Ground Level Activities	Accessible Ground Level Play Types
Present	**0**	**1**	**1**
Required	**0**	**1**	**1**





Scale: 1/8"=1'

To verify product certification, visit www.ipema.org

* = Highest designated play surface.

** = Total height of product.

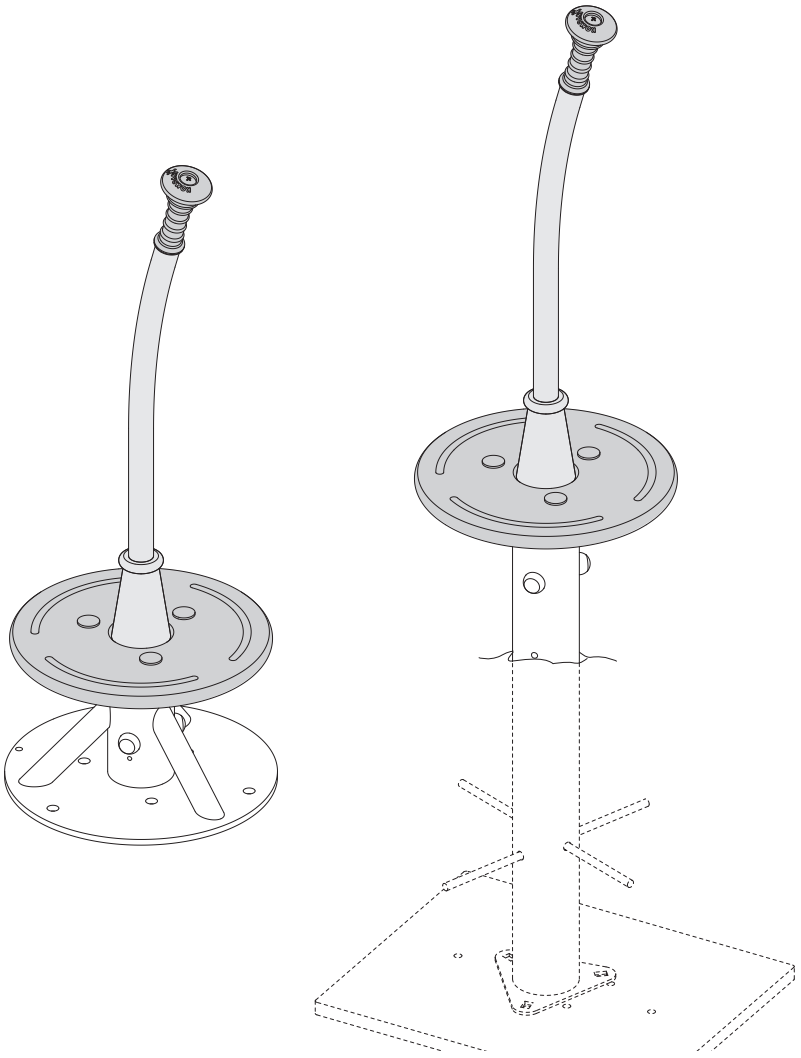
Highest designated play surface and space required are according to ASTM F1487.

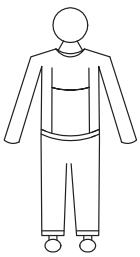
Equipment must be installed over resilient surfacing appropriate to the safety guidelines in your area.

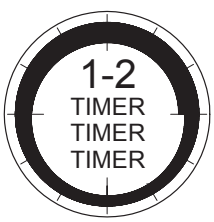
Product development is an ongoing process. We reserve the right to make modifications on all our products. This product may not be mirrored, scaled or altered in any way. Safety zones must be retained for proper placement of equipment. If any changes are required, please contact your KOMPAN representative at 1.800.426.9788.

KOMPAN
Playful Living

ELE400158-3017E
ELE400158-3017F
ELE400158-3517E
ELE400158-3517F







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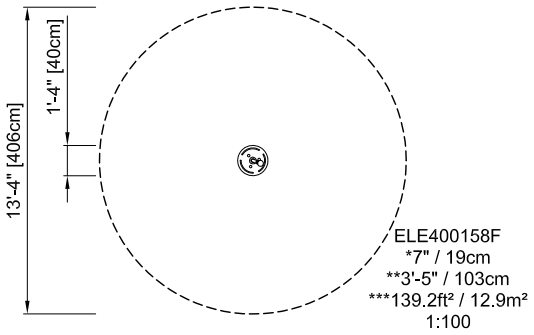
Safety zone in accordance with ASTM 1487
Sicherheitsabstand gemäß ASTM 1487
Espace d'évolution selon ASTM 1487
Zona de seguridad según ASTM 1487
Distanze di sicurezza in conformità con lo standard ASTM 1487
Veiligheidsgebied in overeenstemming met ASTM 1487
Säkerhetsområde enl ASTM 1487
Sikkerhedsareal iht. ASTM 1487
Зона безопасности в соответствии с ASTM 1487
ASTM 1487-normin mukainen turva-alue



* Free height of fall
Freie Fallhöhe
Hauteur de chute libre
Altura de caída libre
Altezza di caduta libera
Vrije valhoogte
Fri fallhöjd
Fri faldhøjde
Высота свободного падения
Vapaa putoamiskorkeus

Please note: The safety zone shown on this drawing is in accordance with ASTM 1487. There may be some locations where a larger safety zone is required. If in doubt, please contact your play consultant.

Achtung: Der angegebene Sicherheitsabstand entspricht ASTM 1487. Bestimmte Länder schreiben größere Sicherheitsabstände vor. Bitte wenden Sie sich in Zweifelsfällen an Ihren Berater.

Attention : l'espace d'évolution montré est conforme à ASTM 1487. Dans certains pays, un espace d'évolution plus grand peut être exigé. Prière de contacter notre conseiller en cas de doute.

Observe: La zona de seguridad demostrada en este dibujo cumple con ASTM 1487. En algunos sitios puede ser necesaria una zona de seguridad más grande. En caso de tener alguna duda, por favor póngase en contacto con nuestro consultor.

Attenzione: la distanza di sicurezza specificata è conforme ai requisiti ASTM 1487. In alcuni paesi, le norme locali possono richiedere distanze di sicurezza maggiori. In caso di dubbi, contattare il nostro consulente.

N.B.: het getoonde veiligheidsgebied is in overeenstemming met ASTM 1487. In sommige landen kan een groter veiligheidsgebied vereist zijn. In geval van twijfel onze adviseur raadplegen.

Obs: Det markerade säkerhetsområdet följer ASTM 1487. I vissa länder kan det finnas krav på större säkerhetsområde. Kontakta vänligen vår konsulent om du är osäker.

Obs.: Det viste sikkerhedsareal er i overensstemmelse med ASTM 1487. I nogle lande kan der være krav om større sikkerhedsareal. Kontakt venligst vores konsulent ved tvivlsspørgsmål.

Внимание: Зона безопасности указана в соответствии с ASTM 1487. Возможны случаи, когда требуется увеличение зоны безопасности. В затруднительных случаях обращайтесь к Вашему консультанту.

Huom: Tämän piirustuksen turva-alue on ASTM 1487-normin mukainen. Joissain sijoituspaikoissa saatetaan edellyttää suurempaa turva-aluetta. Jos olet epävarma, otathan yhteyttä KOMPANiin.

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Important! The concrete must be sufficiently hardened before the play item may be used.
Total volume of concrete: Min 7,42 cu. ft.

Wichtig! Vor der Inbetriebnahme des Spielreräts muß der Beton ausreichend abgebunden haben.
Betonverbrauch insgesamt: mind. 0,21 m³

Important! Le béton doit avoir suffisamment durci avant de mettre en service l'équipment de jeux.
Consommation totale de bèton: au minimum 0,21 m³

Importante! El hormigón debe estar suficentemente endurecido antes de comenzar a utilizar el equipo de juego. Consumo total de hormigón: Min. 0,21 m³

Importante! Prima de utilizzare le attrezzature da gioco, il cemento dve essere sufficientemente solidificato. Volume totale di cemento: min. 0,21 m³

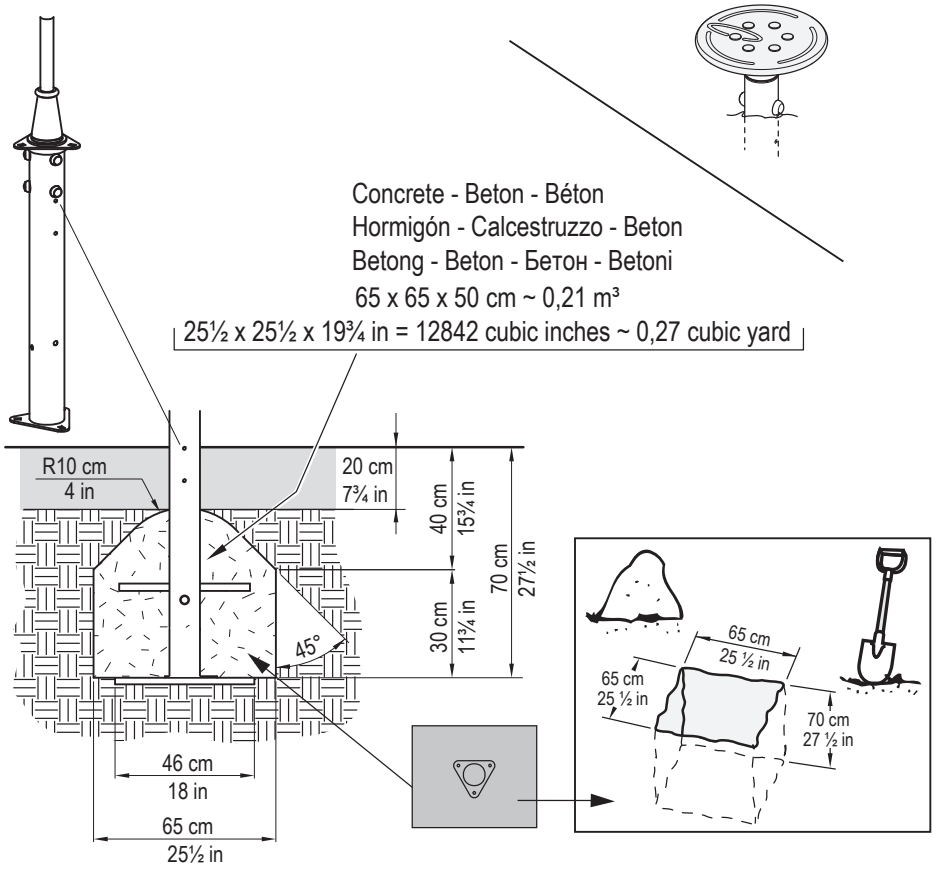
Belangrijk! Het beton moet voldoende gehard zijn voordat het speeltoestel in gebruik wordt genomen.
Totale benodigde hoeveelheid beton: min. 0,21 m³

Viktigt! Betongen måste ha härdat tillräckligt innan lekredskapet börjar användas.
Total betongåtgång: min. 0,21 m³

Vigtigt! Betonen skal være tilstrækkeligt hærdet, før legeredskabet tages i brug.
Totalt betonforbrug: Min. 0,21 m³

Важно! Перед использованием сооружений убедитесь, что бетон затвердел.
Сумарный объем бетона: мин. 210 л.

HUOM! Betonivalun on oltava tarpeeksi kuiva, ennen kuin leikkivälinettä saa käyttää. Betonoinnin minimikokonaismäärä; 0,21 m³



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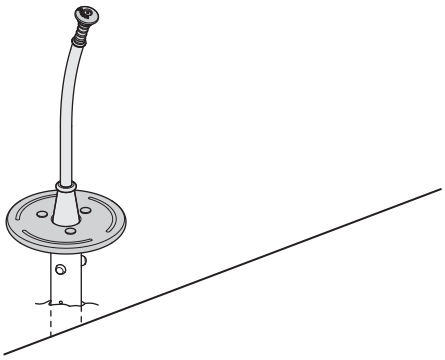

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A100-02

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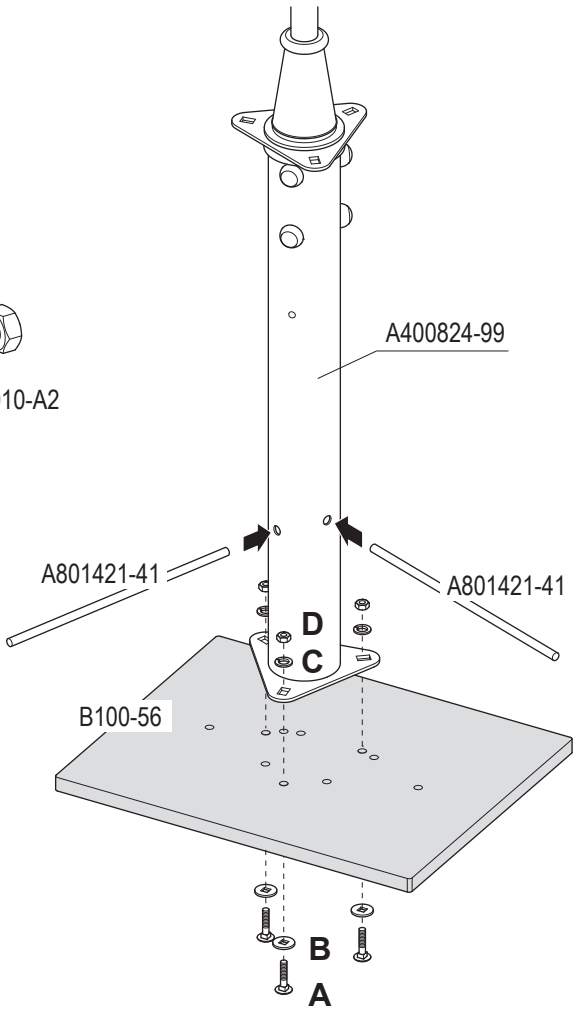

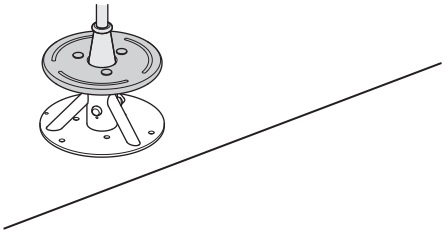

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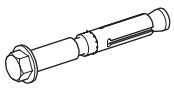

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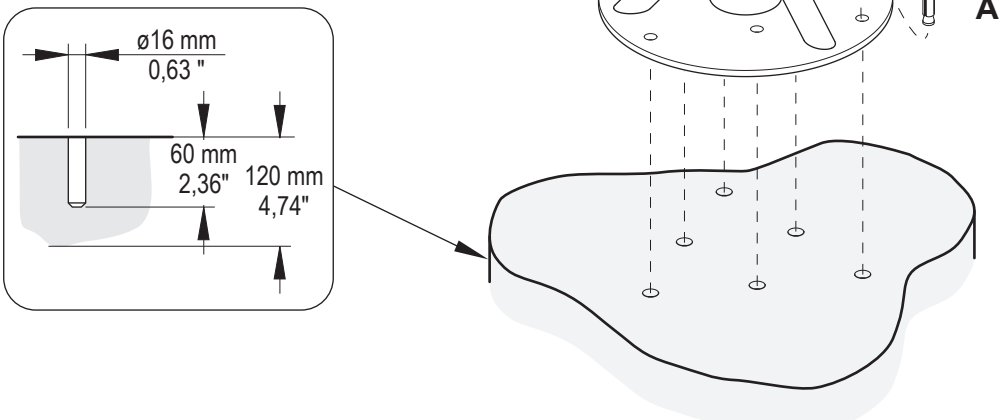

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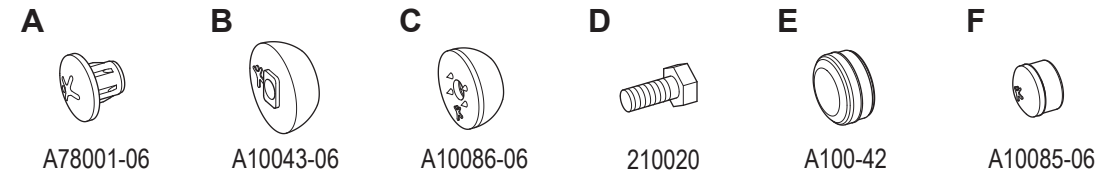
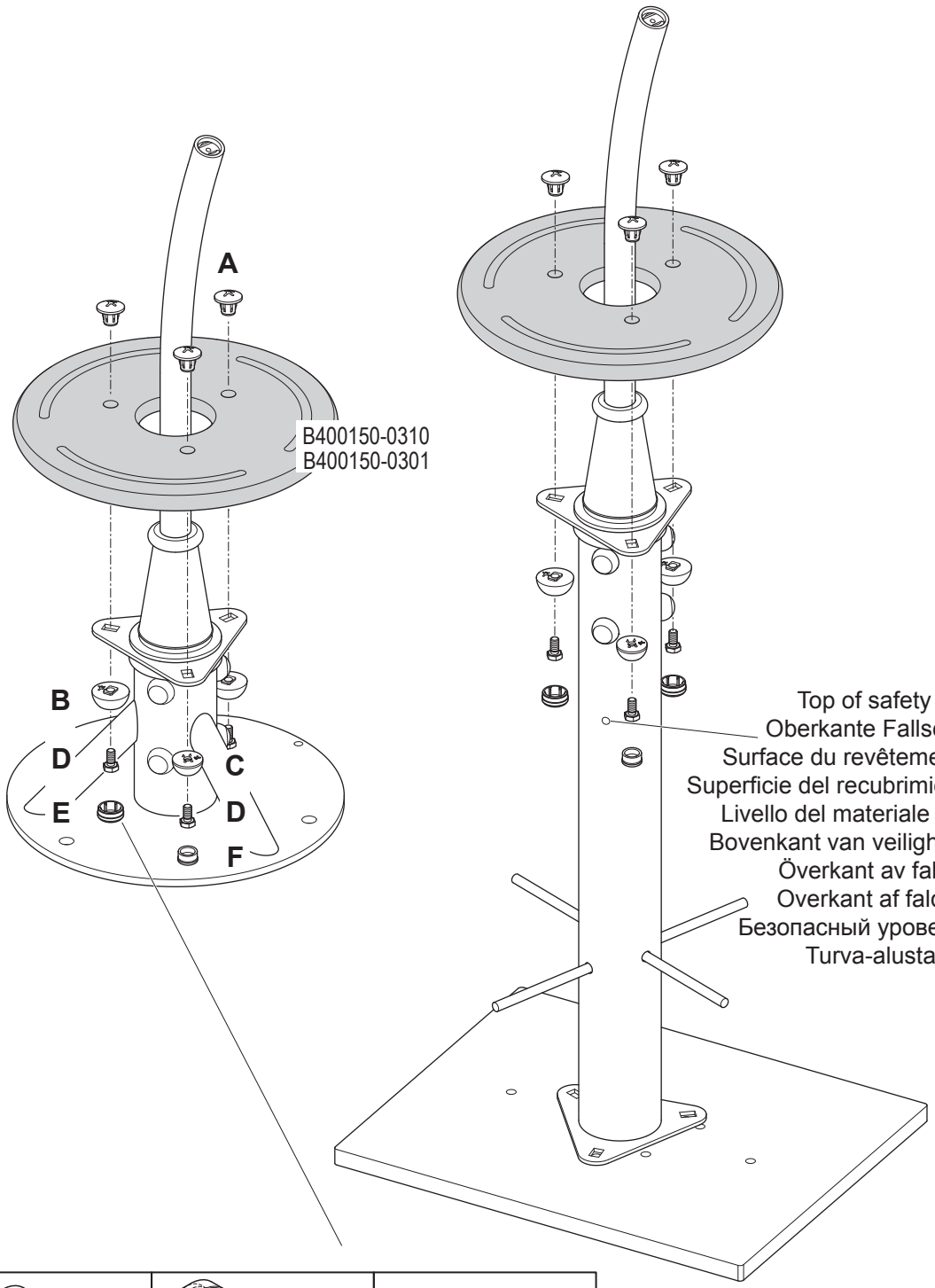
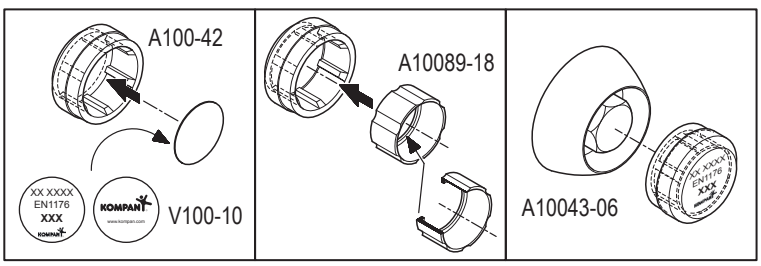
3







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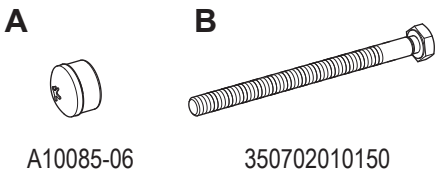

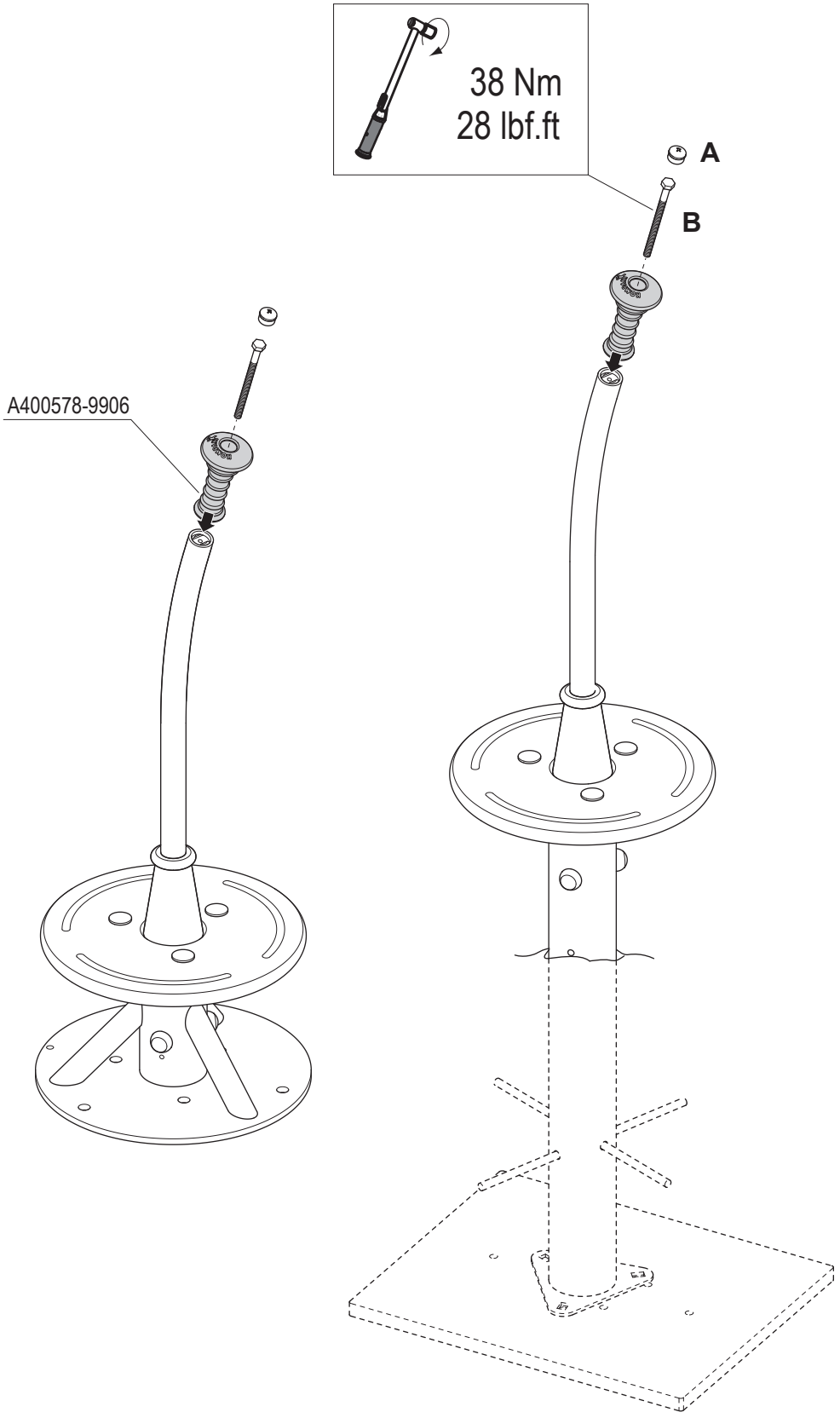

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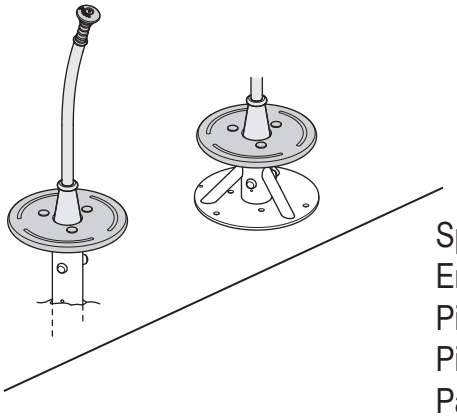
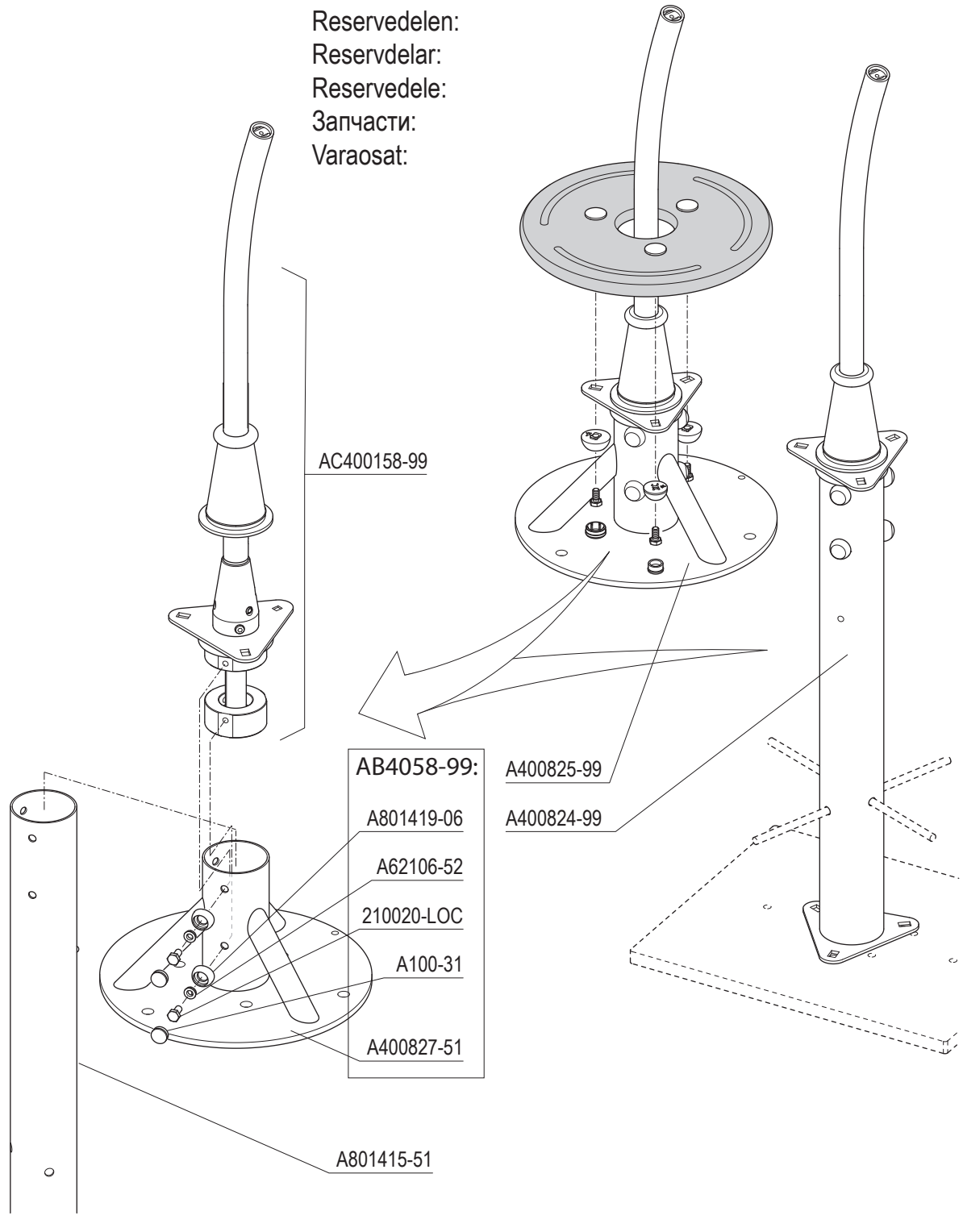


Spare parts:
Ersatzteile:
Pièces de rechange:
Piezas de recambio:
Parti di ricambio:
Reservedelen:
Reservdelar:
Reservedele:
Запчасти:
Varaosat:



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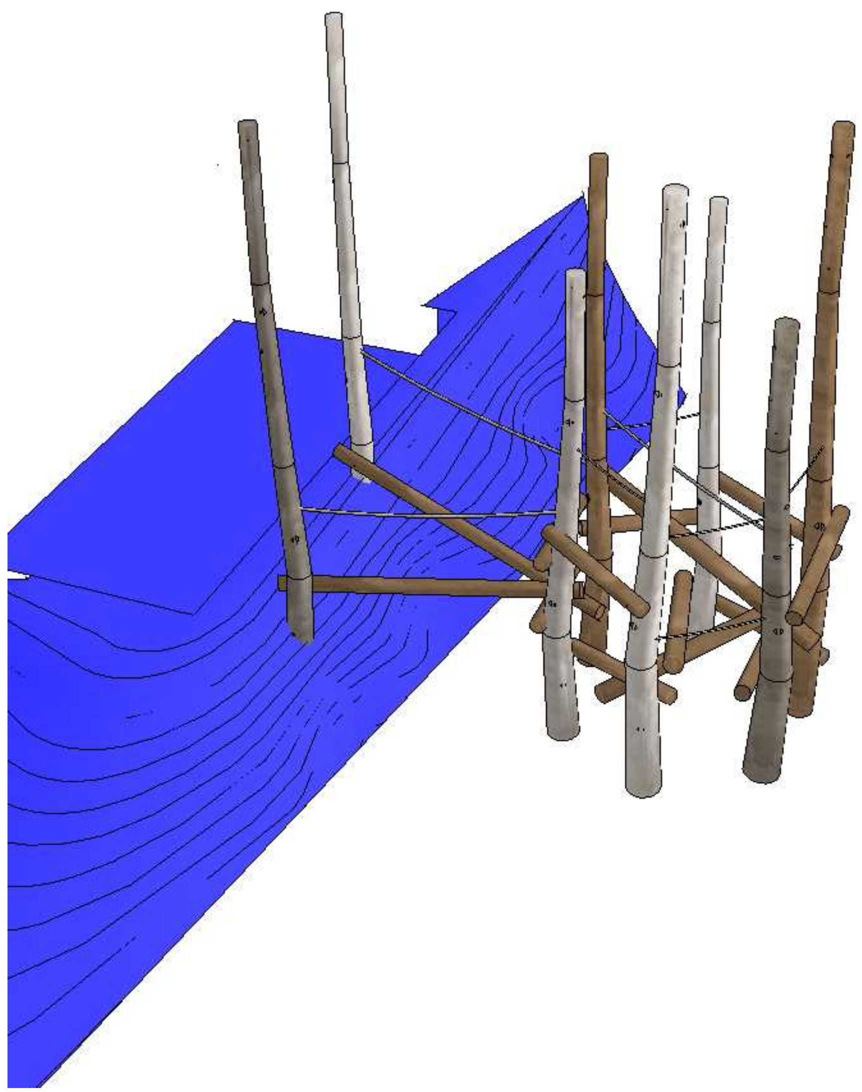

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- THESE DRAWINGS ARE INTENDED TO BE PRINTED AT 11" X 17" PAGE SIZE. DO NOT SCALE.
- ALL MEASUREMENTS ARE IN MM UNLESS OTHERWISE STATED.
- ALL EXPOSED WOOD EDGES SHALL HAVE A MIN 1/4" (6MM) RADIUS.
- BOLTS ARE 3/4" (19MM) HDG CARRIAGE BOLTS UNLESS OTHERWISE STATED.
- STRUCTURAL SCREWS ARE 3/8" (10MM) GRK RSS SCREWS UNLESS OTHERWISE STATED.
- MULTI-PURPOSE SCREWS ARE #10 R4 SCREWS UNLESS OTHERWISE STATED.
- 28 DAY CONCRETE STRENGTH IS 35 MPA MINIMUM, EXPOSURE CLASS C-1 WITH 5-8% ENTRAINED AIR.
- EQUIPMENT SHALL COMPLY WITH THE REQUIREMENTS OF ASTM F-1487-11.
- THE STRUCTURES FEATURED IN THESE PLANS ARE INTENDED FOR CHILDREN AGED 5 - 12 YEARS OLD.
- VISUAL DETAILS INCLUDING BUT NOT LIMITED TO: NET SPACING, ROPE APPEARANCE AND COLOURS ARE FOR CONCEPTUAL PURPOSES ONLY.
- ALL 6"X6" (152X152) VERTICAL MEMBERS SHALL COMPLY WITH NON-DPS REQUIREMENTS.
- ALWAYS WEAR PROPER PPE AND FOLLOW SAFE PRACTICES.

REVISION HISTORY

V. NO	MM/DD/YY	COMMENTS
1.0	01/12/17	INITIAL DESIGN
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KEY DATA

MAXIMUM HEIGHT: 18' 9" / 5700mm

FALL HEIGHT: 9' 9"/ 2900mm

AREA OF SURFACING: 515 ft² / 48 m²

LEGEND

- EWC: EASTERN WHITE CEDAR
- WRC: WESTERN RED CEDAR
- DPS: DESIGNATED PLAY SURFACE
- GRK RSS: RUGGED STRUCTURAL SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-2442 APPROVED
- GRK R4: MULTI-PURPOSE SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-3201 APPROVED

earthscape nature inspired play
tel: 519.669.2972
toll free: 1.877.269.2972
fax: 519.669.5085
web: earthscapeplay.ca
email: play@earthscape.ca

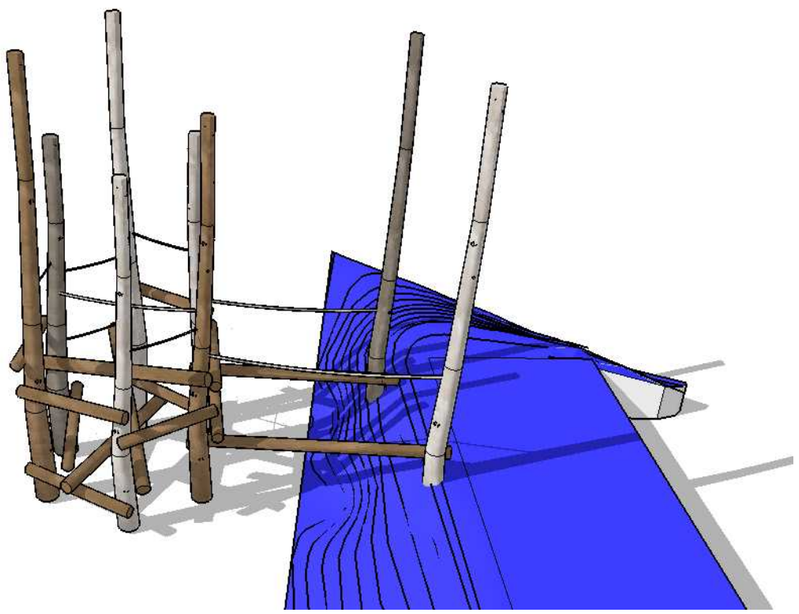
Hoyt Sullivan Park - Somerville, MA

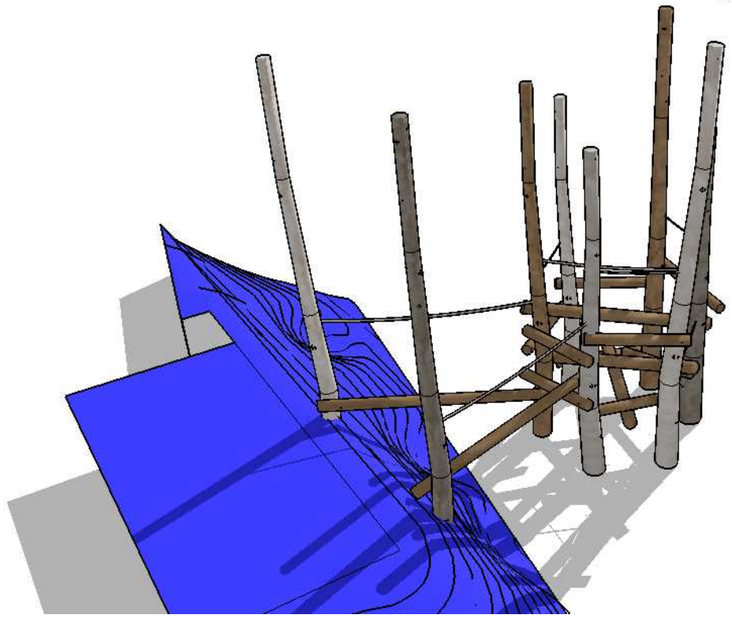
DRAWN BY: AW CHECKED BY:

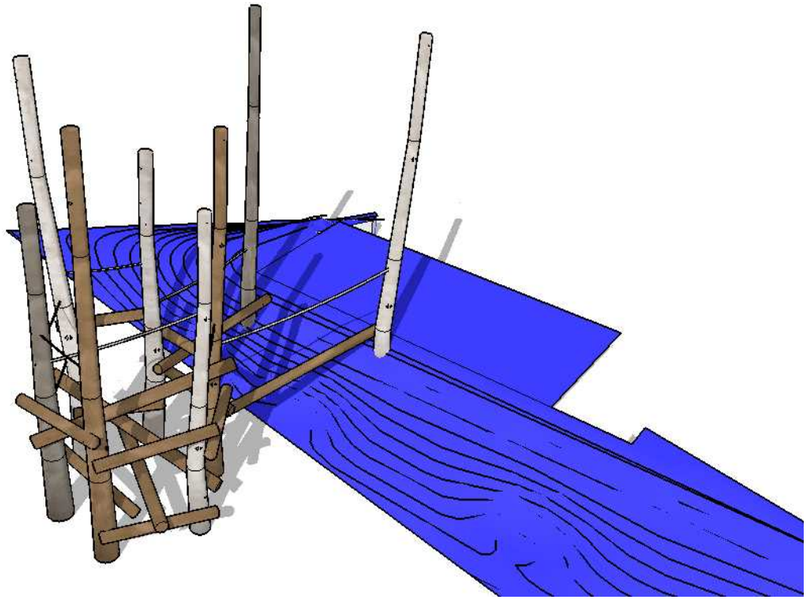
LUMBERJACK CLIMBER Base Bid-
GENERAL NOTES, REVISIONS

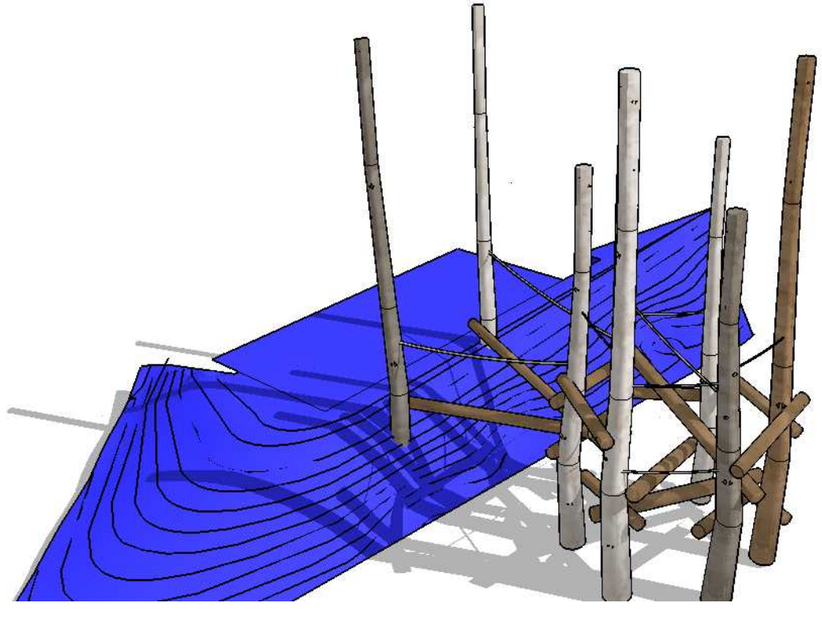
CURRENT VERSION v1.0

P **01**









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email: play@earthscape.ca

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LUMBERJACK CLIMBER Base Bid - PERSPECTIVES

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v1.0

P

02

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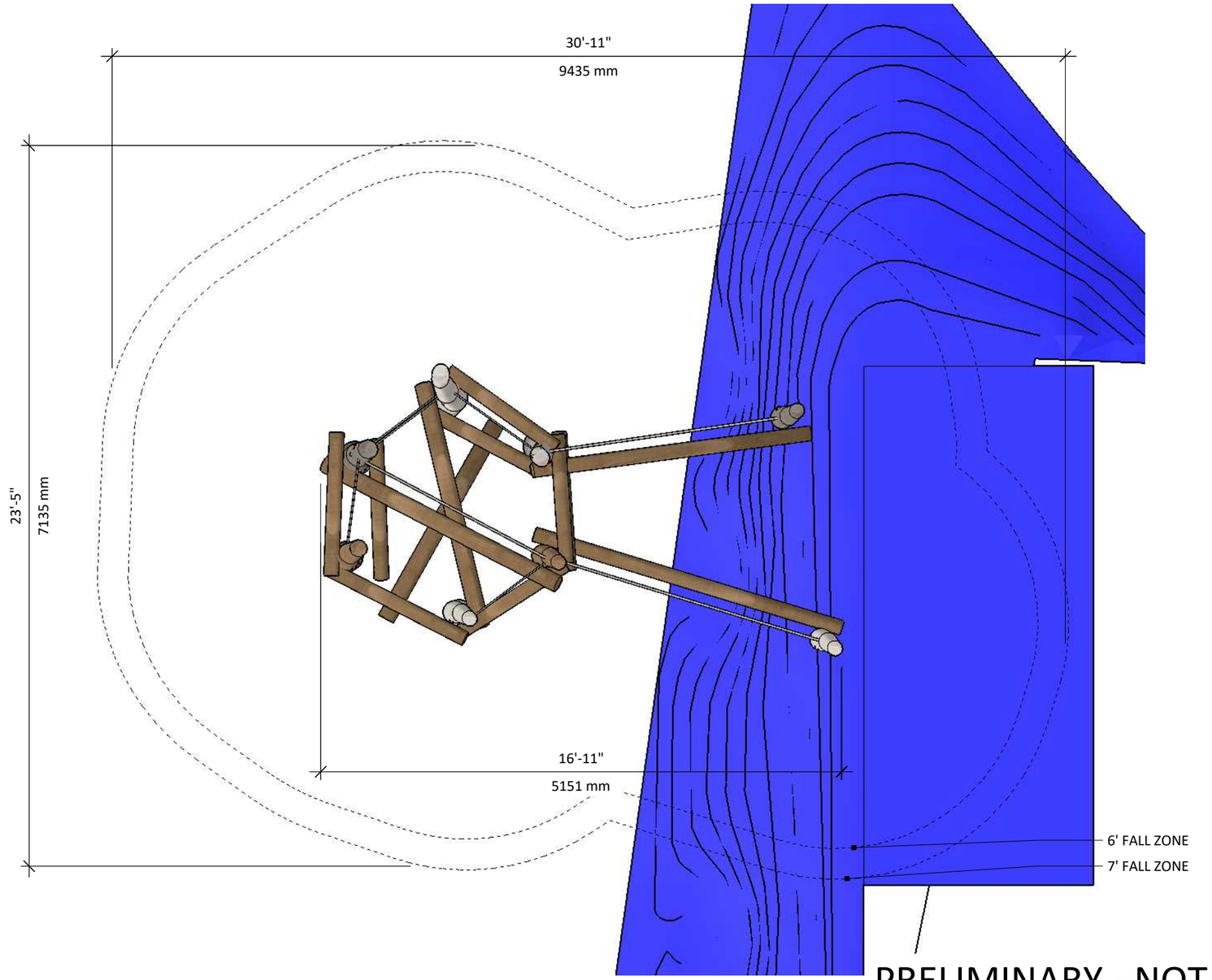

01 | PLAN VIEW
P3 | SCALE 1/4" : 1'

PRELIMINARY - NOT FOR CONSTRUCTION

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toll free: **1.877.269.2972**
fax: **519.669.5085**
web: earthscape**play**.ca
email: play@earthscape.ca

Hoyt Sullivan Park - Somerville, MA	LUMBERJACK CLIMBER Base Bid - PLAN	**CURRENT VERSION**	**P** **03**
DRAWN BY: AW CHECKED BY:		v1.0	

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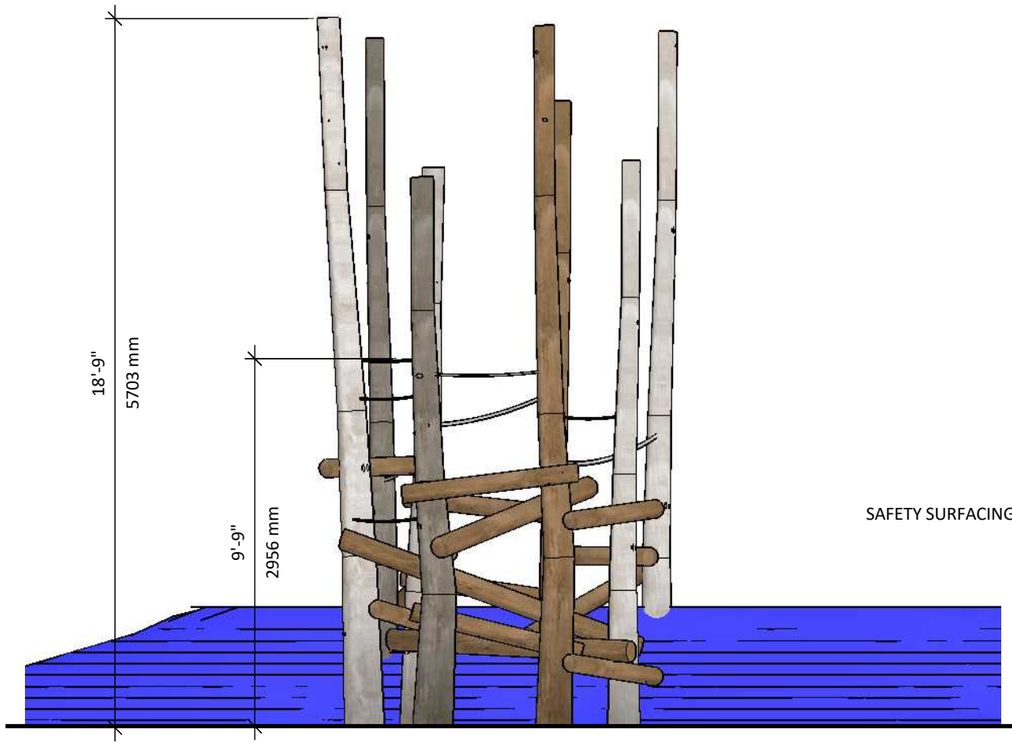
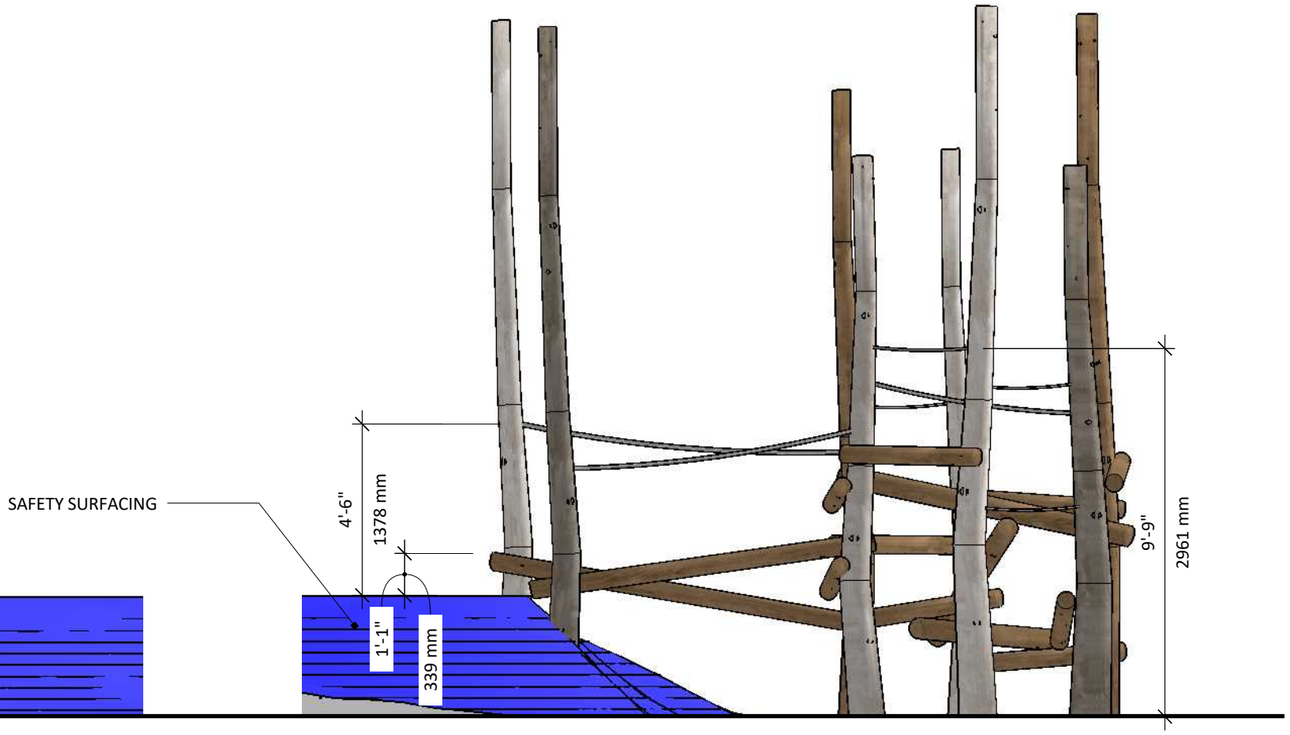


01 | FRONT ELEVATION
P3 | SCALE 1/4" : 1'



02 | SIDE ELEVATION
P3 | SCALE 1/4" : 1'

PRELIMINARY - NOT FOR CONSTRUCTION

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Hoyt Sullivan Park - Somerville, MA	LUMBERJACK CLIMBER Base Bid - ELEVATION	**CURRENT VERSION**	**P**	**04**
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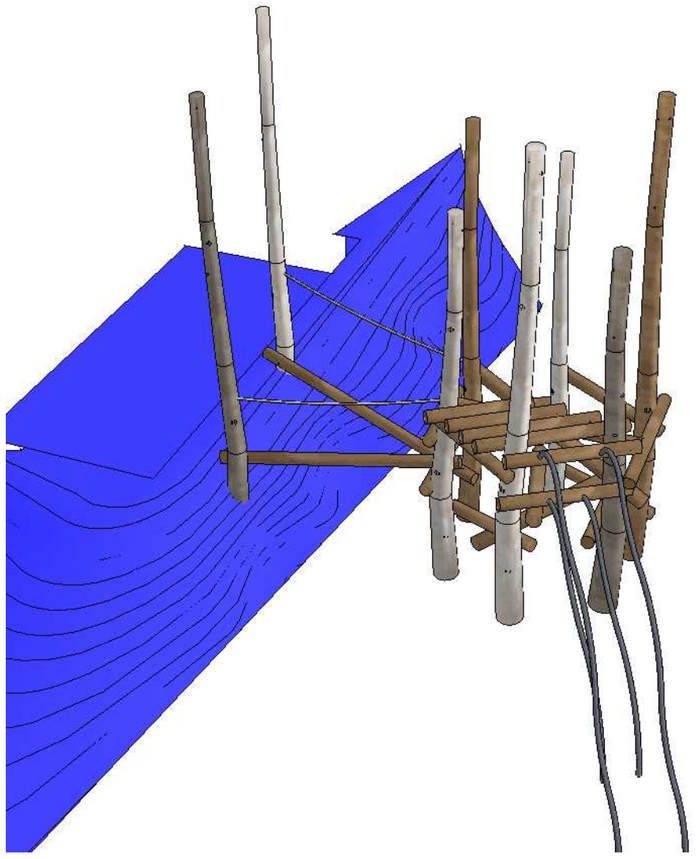

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- STRUCTURAL SCREWS ARE 3/8" (10MM) GRK RSS SCREWS UNLESS OTHERWISE STATED.
- MULTI-PURPOSE SCREWS ARE #10 R4 SCREWS UNLESS OTHERWISE STATED.
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- VISUAL DETAILS INCLUDING BUT NOT LIMITED TO: NET SPACING, ROPE APPEARANCE AND COLOURS ARE FOR CONCEPTUAL PURPOSES ONLY.
- ALL 6"X6" (152X152) VERTICAL MEMBERS SHALL COMPLY WITH NON-DPS REQUIREMENTS.
- ALWAYS WEAR PROPER PPE AND FOLLOW SAFE PRACTICES.

REVISION HISTORY

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KEY DATA

MAXIMUM HEIGHT: 18' 9" / 5700mm

FALL HEIGHT: 8' 1"/ 2900mm

AREA OF SURFACING: 664 ft² / 48 m²

LEGEND

- EWC: EASTERN WHITE CEDAR
- WRC: WESTERN RED CEDAR
- DPS: DESIGNATED PLAY SURFACE
- GRK RSS: RUGGED STRUCTURAL SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-2442 APPROVED
- GRK R4: MULTI-PURPOSE SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-3201 APPROVED

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Hoyt Sullivan Park - Somerville, MA

DRAWN BY: AW CHECKED BY:

LUMBERJACK CLIMBER Add. Alt. - GENERAL NOTES, REVISIONS

CURRENT VERSION v1.0

P

01

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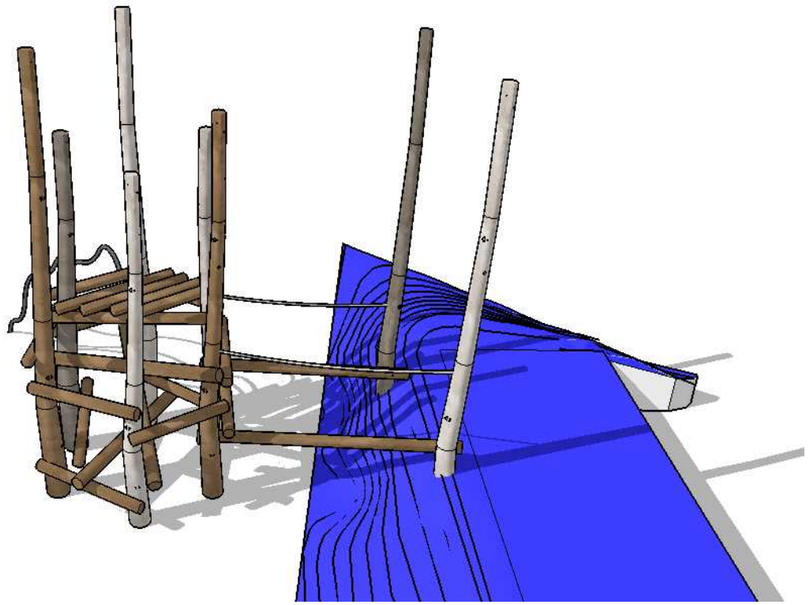

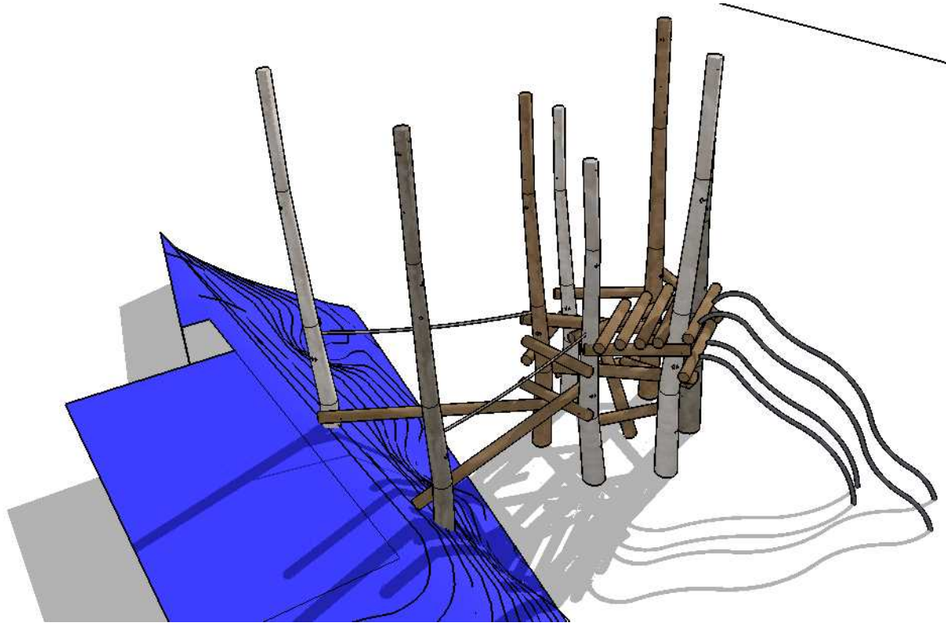

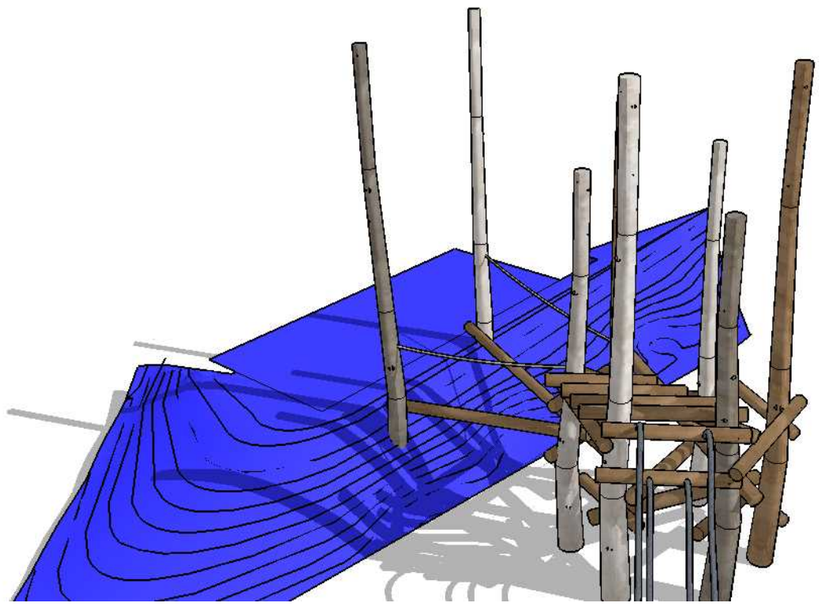

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Hoyt Sullivan Park - Somerville, MA	LUMBERJACK CLIMBER Add. Alt. - PERSPECTIVES	**CURRENT VERSION**	**P**
DRAWN BY: AW CHECKED BY:		v1.0	**02**

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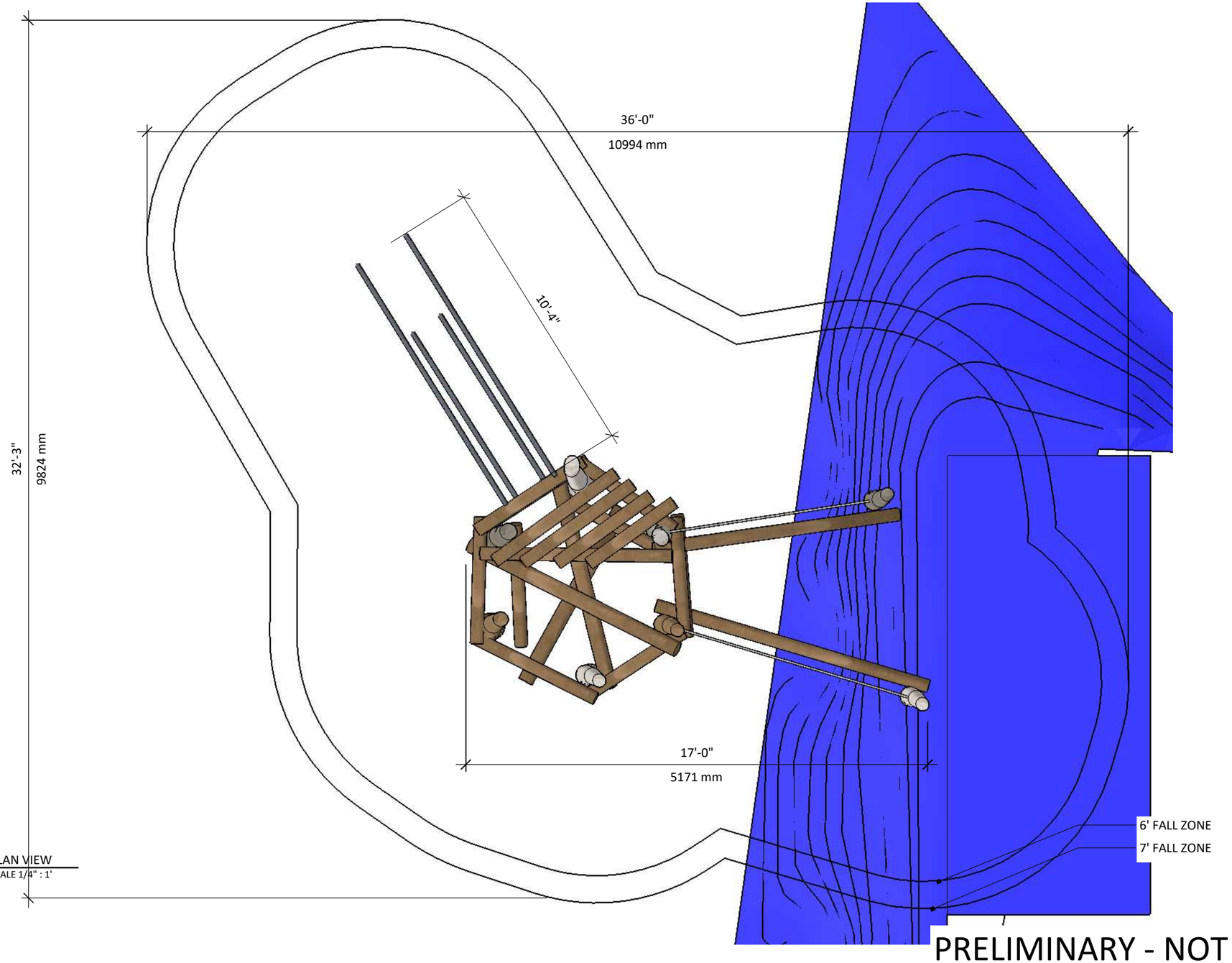

01 | PLAN VIEW
P3 | SCALE 1/4" : 1'

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Hoyt Sullivan Park - Somerville, MA	LUMBERJACK CLIMBER Add. Alt. - PLAN	**CURRENT VERSION**	**P**	**03**
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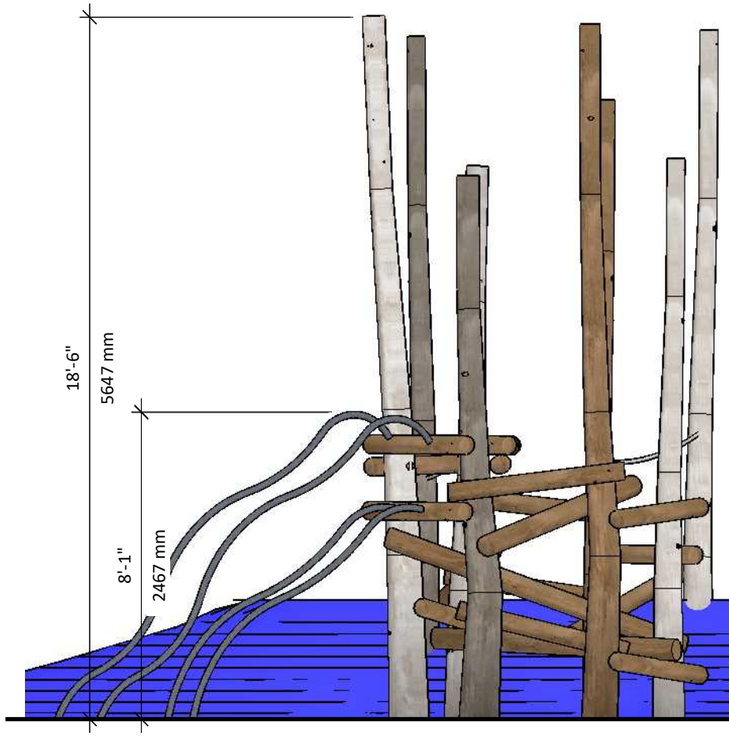
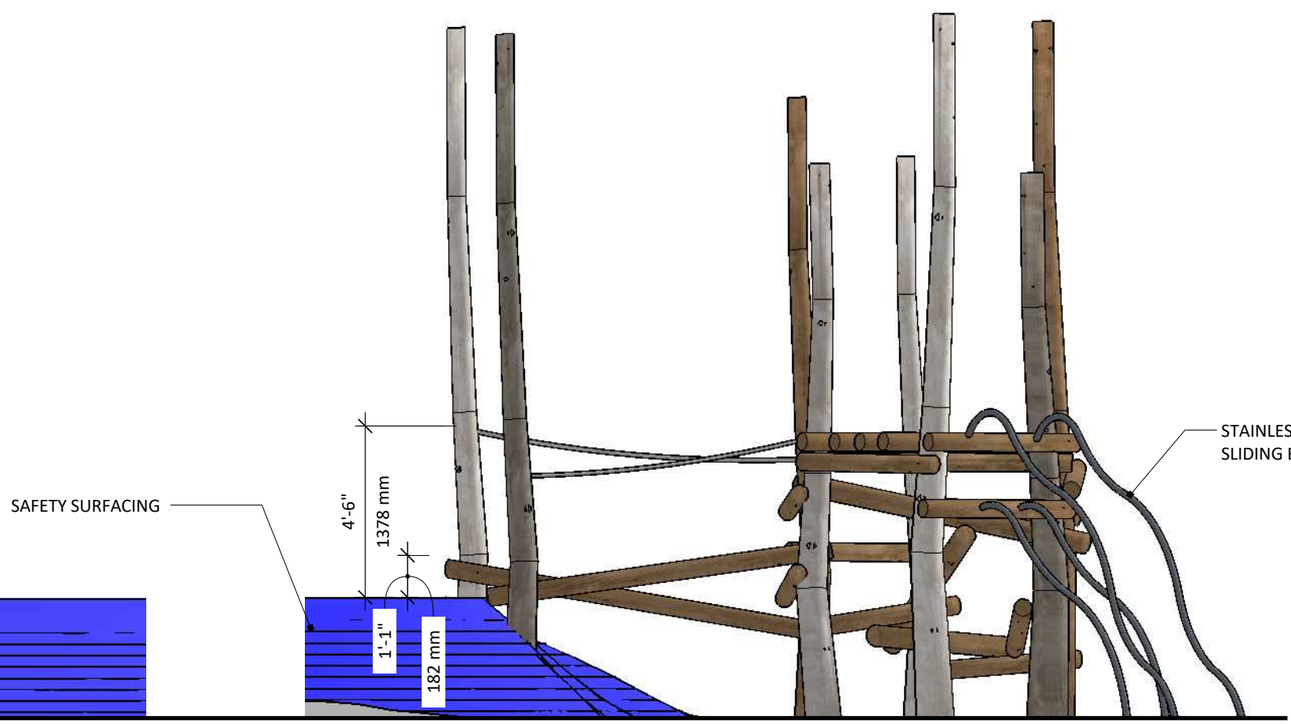


01 | FRONT ELEVATION
P3 | SCALE 1/4" : 1'



02 | SIDE ELEVATION
P3 | SCALE 1/4" : 1'

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Hoyt Sullivan Park - Somerville, MA	LUMBERJACK CLIMBER Add. Alt. - ELEVATION	**CURRENT VERSION**	**P** **04**
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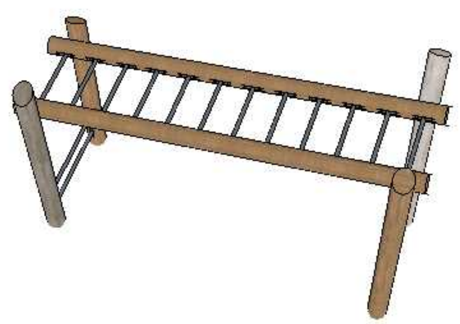

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KEY DATA

MAXIMUM HEIGHT: 9' 3" / 2800mm

FALL HEIGHT: 7' 5" / 2300mm

AREA OF SURFACING: 370 ft² / 35 m²

LEGEND

- EWC: EASTERN WHITE CEDAR
- WRC: WESTERN RED CEDAR
- DPS: DESIGNATED PLAY SURFACE
- GRK RSS: RUGGED STRUCTURAL SCREW. CLIMATEK™ COATED AC257 APPROVED. CASE HARDENED STEEL, ESR-2442 APPROVED
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Hoyt Sullivan Park - Somerville, MA

DRAWN BY: LW CHECKED BY:

MONKEY BARS - GENERAL NOTES, REVISIONS

CURRENT VERSION v1.0

P **01**

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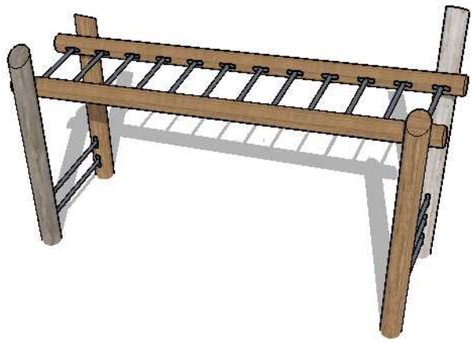

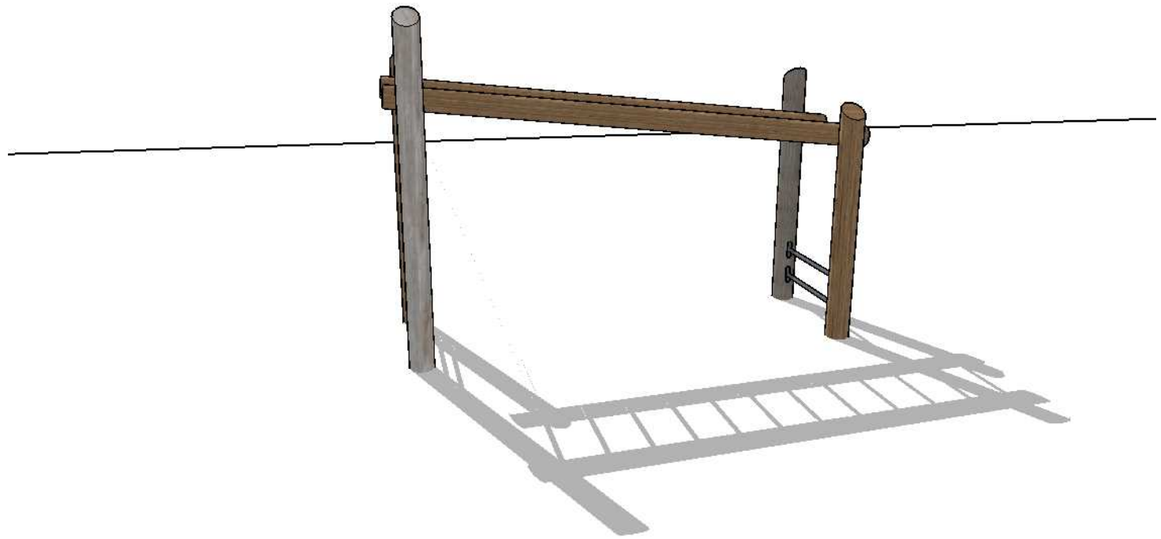

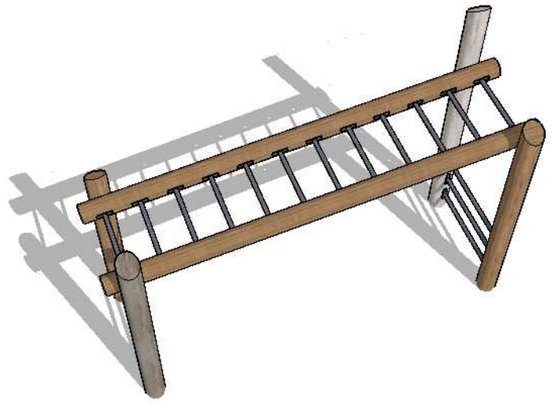

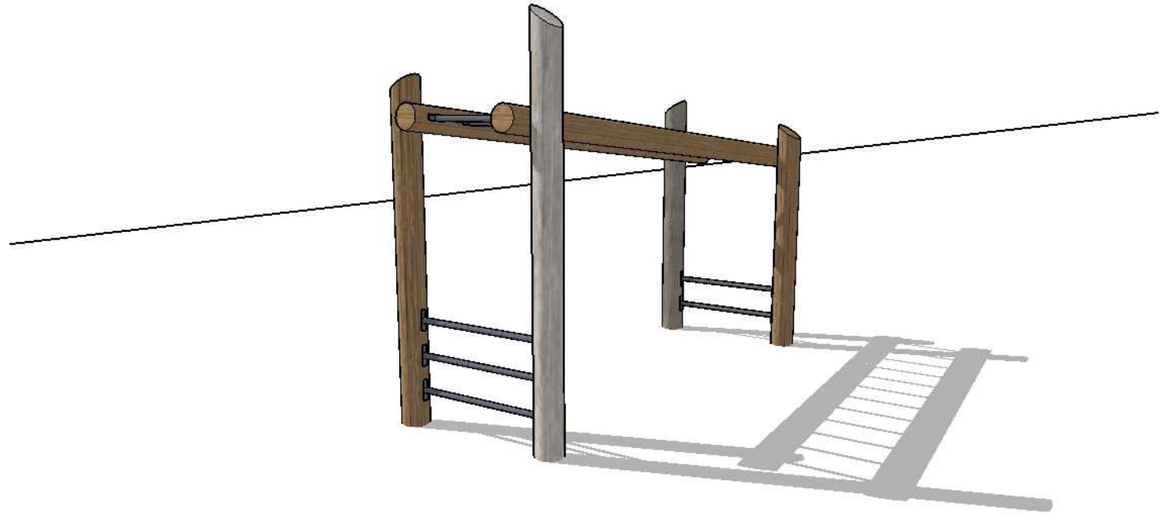

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Hoyt Sullivan Park - Somerville, MA

DRAWN BY: LW CHECKED BY:

MONKEY BARS - PERSPECTIVES

CURRENT VERSION

v1.0

P

02

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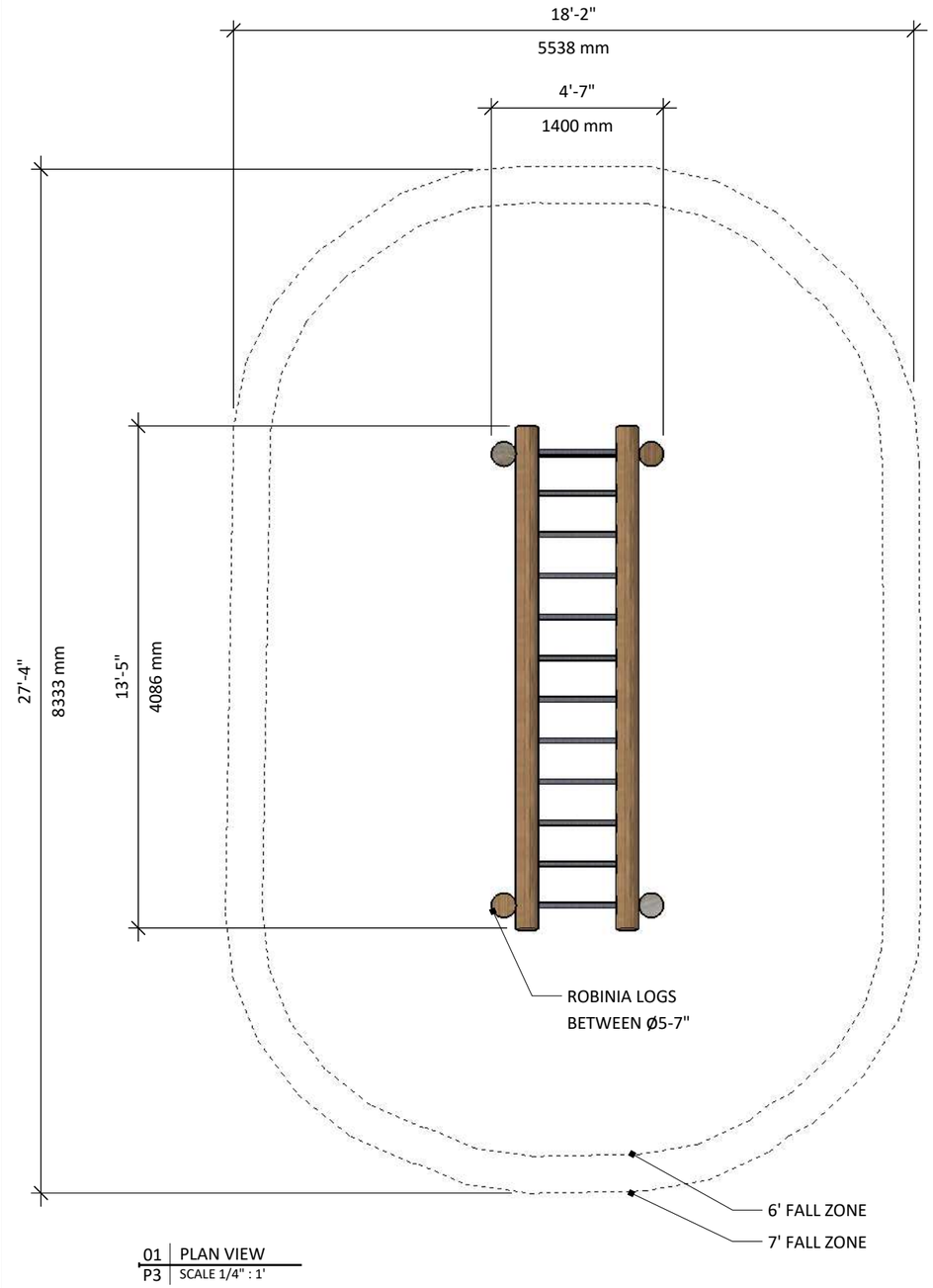
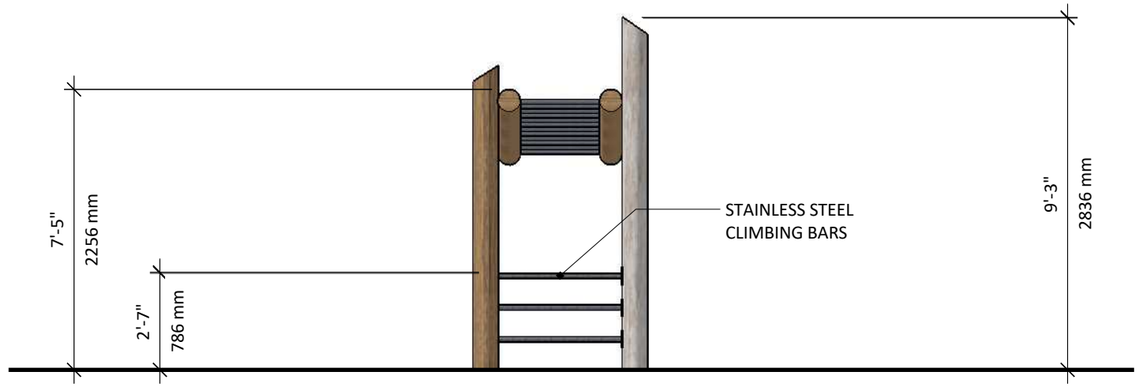
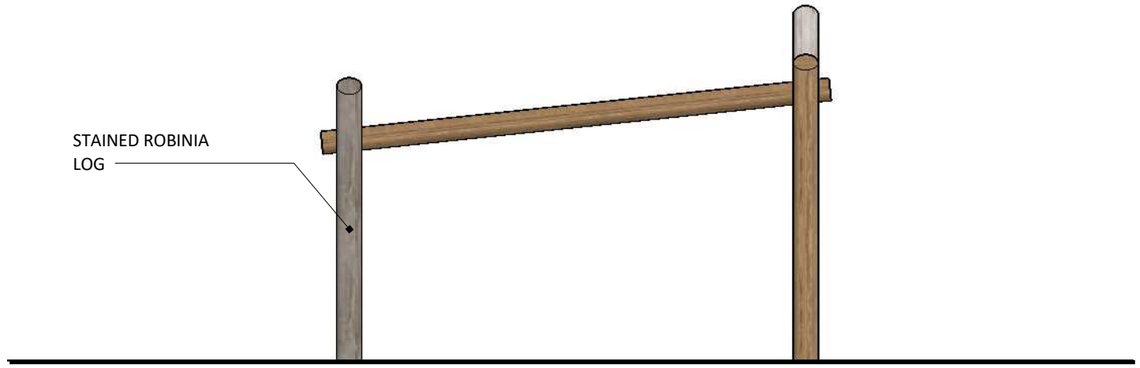


01 | PLAN VIEW
P3 | SCALE 1/4" : 1'



02 | SIDE ELEVATION
P4 | SCALE 1/4" : 1'



NOTE: FOOTING DETAILS TBD

03 | FRONT ELEVATION
P4 | SCALE 1/4" : 1'

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Hoyt Sullivan Park - Somerville, MA	MONKEY BARS - PLAN AND ELEVATION	**CURRENT VERSION**	**P** **03**
DRAWN BY: LW CHECKED BY:		v1.0	

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KOMPAN Product Info

SPICA 2 - GXY8015

GALAXY

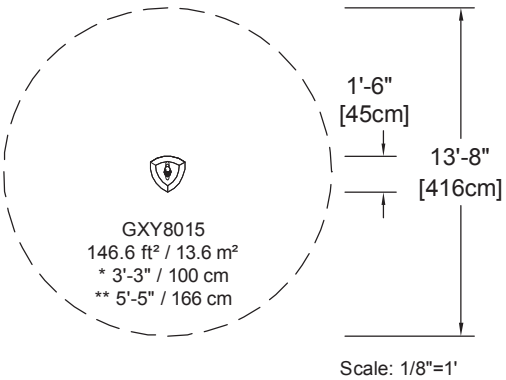
Best User Age: **5-12 years**

Footings: In-ground posts
Surface installation also available

Technical information available at kompan.com

ADA ANALYSIS

Elevated Activities: **0**	Accessible Elevated Activities	Accessible Ground Level Activities	Accessible Ground Level Play Types
Present	**0**	**1**	**1**
Required	**0**	**1**	**1**



Scale: 1/8"=1'

IPEMA CERTIFIED to ASTM F1487

IPEMA CERTIFIED to CAN/CSA-Z614

To verify product certification, visit www.ipema.org

* = Highest designated play surface.

** = Total height of product.

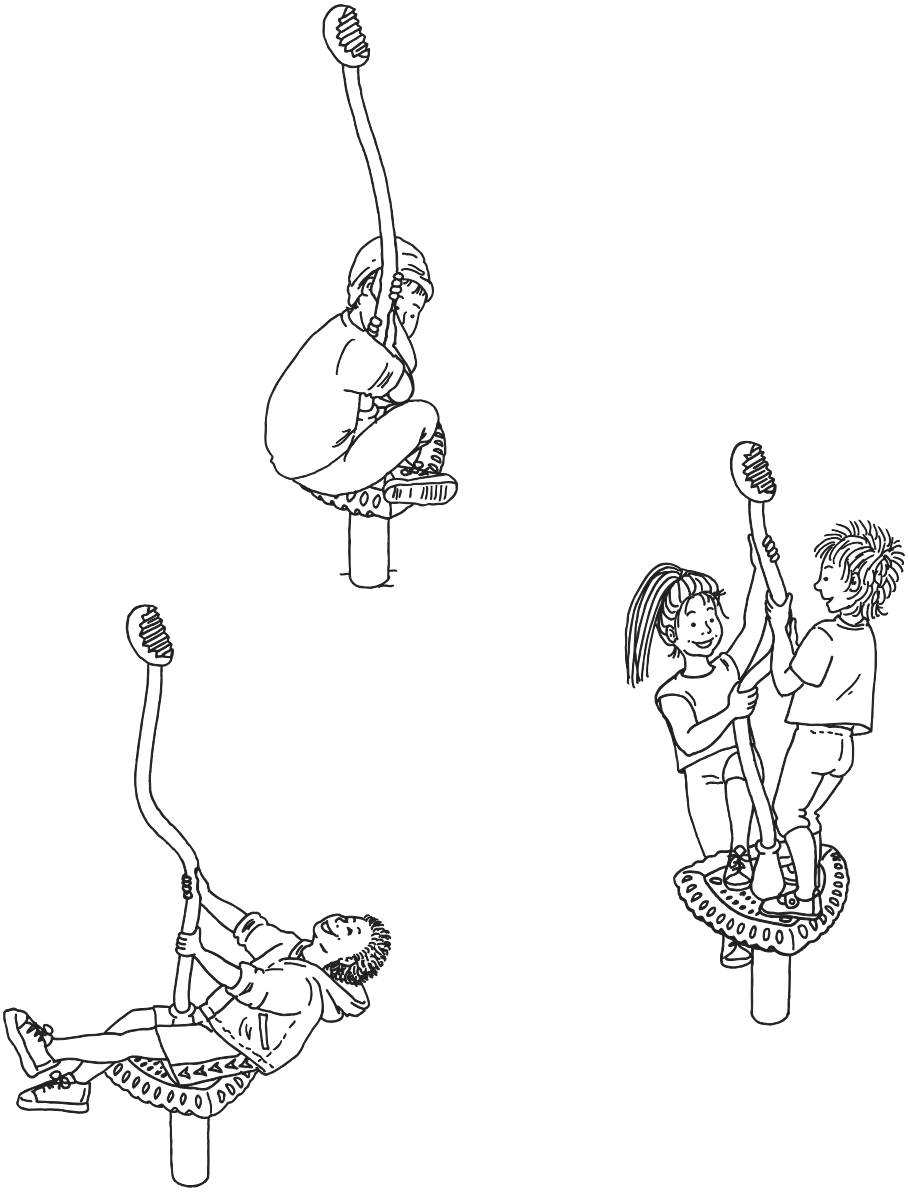
Highest designated play surface and space required are according to ASTM F1487.

Equipment must be installed over resilient surfacing appropriate to the safety guidelines in your area.

Product development is an ongoing process. We reserve the right to make modifications on all our products. This product may not be mirrored, scaled or altered in any way. Safety zones must be retained for proper placement of equipment. If any changes are required, please contact your KOMPAN representative at 1.800.426.9788.

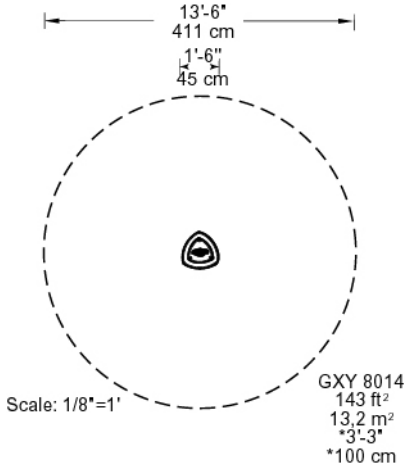
KOMPAN
Playful Living

GXY801421-3417
GXY801521-3417
GXY801621-3417
GXY801421-3717
GXY801521-3717
GXY801621-3717



V801421XX17 20100315 MarSky

Safety zone in accordance with ASTM 1487
Sicherheitsabstand gemäß ASTM 1487
Espace d'évolution selon ASTM 1487
Zona de seguridad según ASTM 1487
Distanze di sicurezza in conformità con lo standard ASTM 1487
Veiligheidsgebied in overeenstemming met ASTM 1487
Säkerhetsområde enl ASTM 1487
Sikkerhedsareal iht. ASTM 1487
Зона безопасности в соответствии с ASTM 1487
ASTM 1487-normin mukainen turva-alue



* Free height of fall
Freie Fallhöhe
Hauteur de chute libre
Altura de caída libre
Altezza di caduta libera
Vrije valhoogte
Fri fallhöjd
Fri faldhøjde
Высота свободного падения
Vapaa putoamiskorkeus

Please note: The safety zone shown on this drawing is in accordance with ASTM 1487. There may be some locations where a larger safety zone is required. If in doubt, please contact your play consultant.

Achtung: Der angegebene Sicherheitsabstand entspricht ASTM 1487. Bestimmte Länder schreiben größere Sicherheitsabstände vor. Bitte wenden Sie sich in Zweifelsfällen an Ihren Berater.

Attention : l'espace d'évolution montré est conforme à ASTM 1487. Dans certains pays, un espace d'évolution plus grand peut être exigé. Prière de contacter notre conseiller en cas de doute.

Observe: La zona de seguridad demostrada en este dibujo cumple con ASTM 1487. En algunos sitios puede ser necesaria una zona de seguridad más grande. En caso de tener alguna duda, por favor póngase en contacto con nuestro consultor.

Attenzione: la distanza di sicurezza specificata è conforme ai requisiti ASTM 1487. In alcuni paesi, le norme locali possono richiedere distanze di sicurezza maggiori. In caso di dubbi, contattare il nostro consulente.

N.B.: het getoonde veiligheidsgebied is in overeenstemming met ASTM 1487. In sommige landen kan een groter veiligheidsgebied vereist zijn. In geval van twijfel onze adviseur raadplegen.

Obs: Det markerade säkerhetsområdet följer ASTM 1487. I vissa länder kan det finnas krav på större säkerhetsområde. Kontakta vänligen vår konsulent om du är osäker.

Obs.: Det viste sikkerhedsareal er i overensstemmelse med ASTM 1487. I nogle lande kan der være krav om større sikkerhedsareal. Kontakt venligst vores konsulent ved tvivlsspørgsmål.

Внимание: Зона безопасности указана в соответствии с ASTM 1487. Возможны случаи, когда требуется увеличение зоны безопасности. В затруднительных случаях обращайтесь к Вашему консультанту.

Huom: Tämän piirustuksen turva-alue on ASTM 1487-normin mukainen. Joissain sijoituspaikoissa saatetaan edellyttää suurempaa turva-aluetta. Jos olet epävarma, otathan yhteyttä KOMPANiin.

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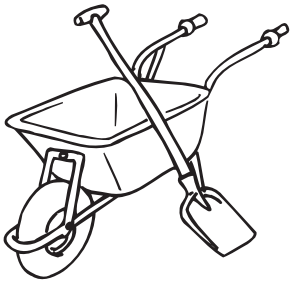
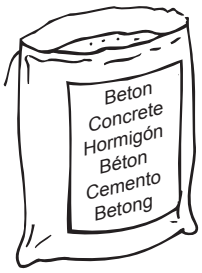
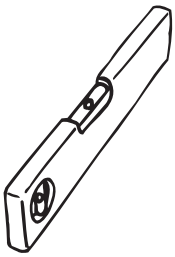
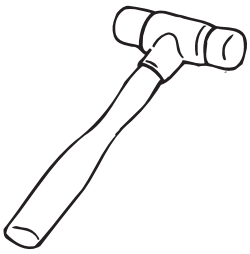
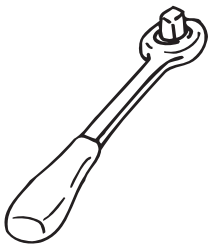
Tools required for installation
Für die Montage benötigte Werkzeuge
Matériel nécessaire pour l'installation
Herramientas necesarias para la instalación
Utensili necessari per l'installazione
Benodigde gereedschappen voor de montage
Nödvändiga verktyg för montering
Nødvendigt værktøj til montage
Инструменты необходимые для установки
Asennuksessa tarvittavat työkalut

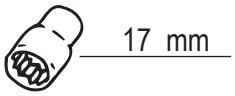






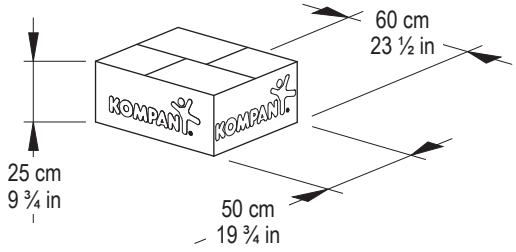




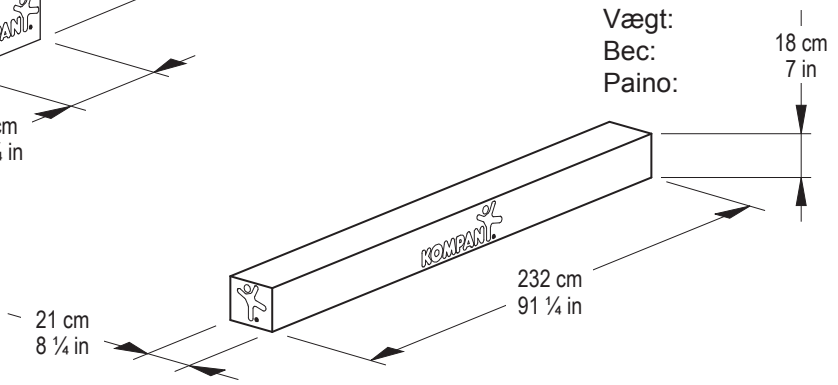


Spica consists of the following packages:
Spica besteht aus folgenden Paketen:
Spica comprend les paquets suivants :
Spica consiste de los siguientes paquetes:
Spica è costituito dai seguenti imballaggi:
Spica bestaat uit de volgende verpakkingen:
Spica består av följande paket:
Spica består af følgende pakker:
Упаковка «Колосок» состоит из:
Spica koostuu näistä pakkauksista:

Weight: 13 kg
Gewicht:
Poids :
Peso:
Peso:
Gewicht:
Vikt:
Vægt:
Bec:
Paino:



Weight: 32 kg
Gewicht:
Poids :
Peso:
Peso:
Gewicht:
Vikt:
Vægt:
Bec:
Paino:

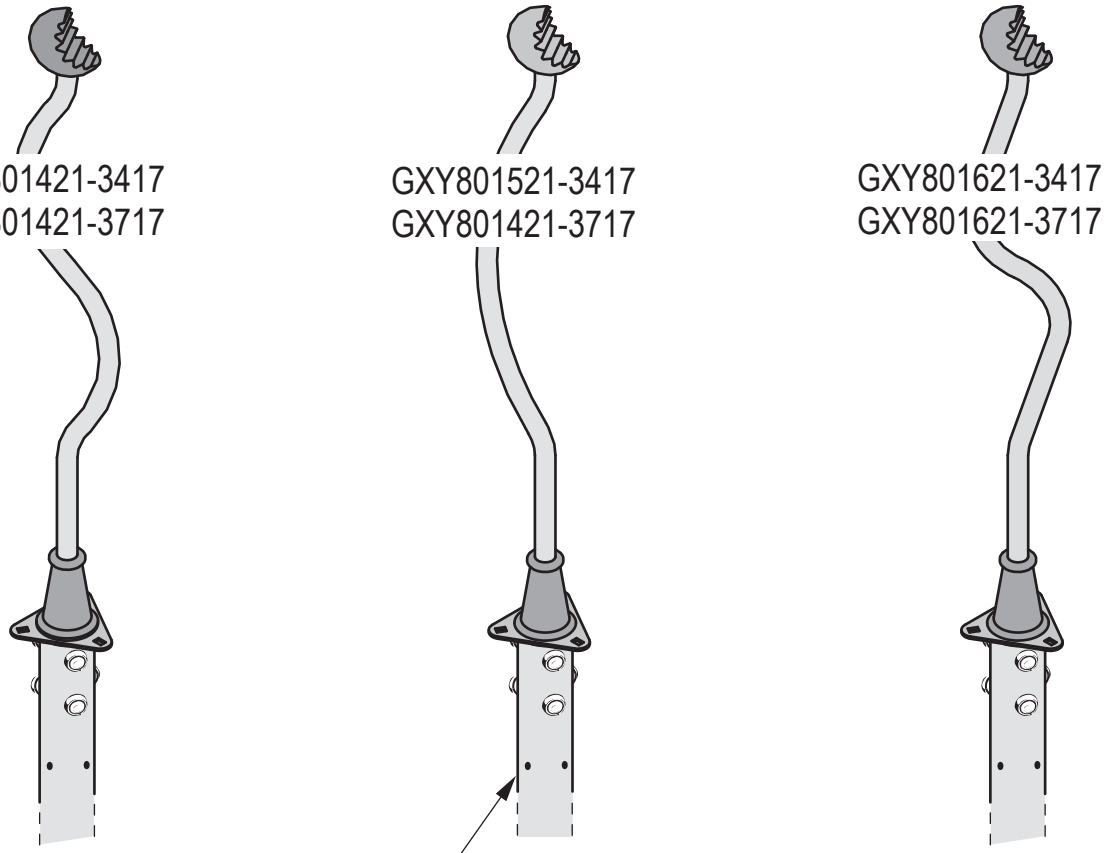


V801421XX17 20100315 MarSky

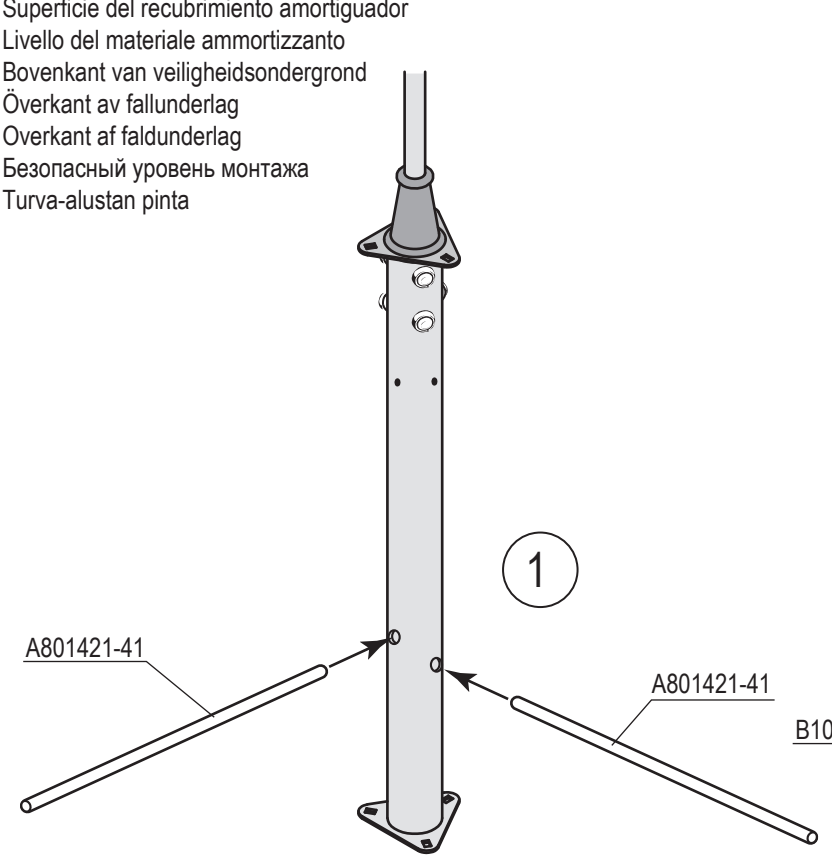
GXY801421-3417
GXY801421-3717

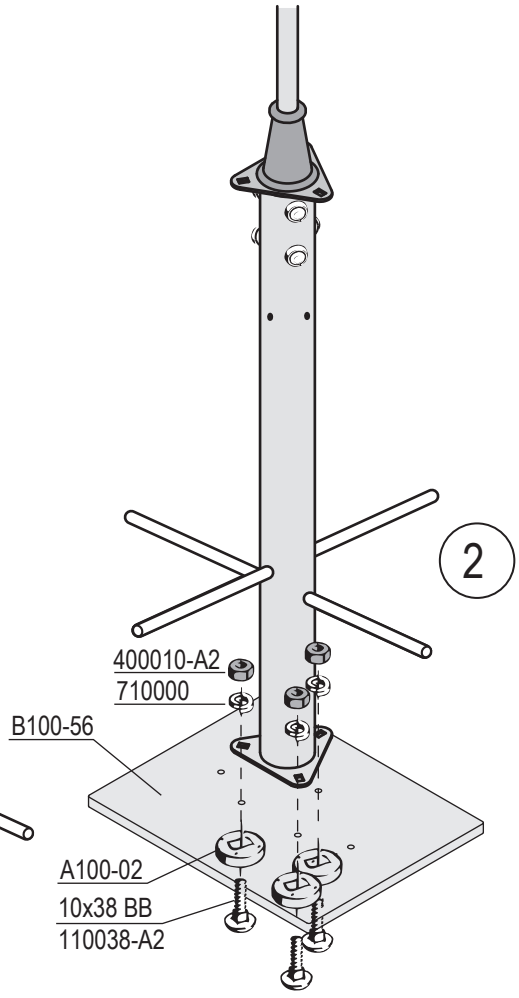
GXY801521-3417
GXY801421-3717

GXY801621-3417
GXY801621-3717



Top of safety surface
Oberkante Fallschutzmaterial
Surface du revêtement amortissant
Superficie del recubrimiento amortiguador
Livello del materiale ammortizzanto
Bovenkant van veiligheidsondergrond
Överkant av fallunderlag
Overkant af faldunderlag
Безопасный уровень монтажа
Turva-alustan pinta





	400010-A2	110038 BB 10x38	710000	A100-02
blue blau bleu azul blu blauw blå blå Голубой Sininen	x3	x3	x3	x3

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Important! The concrete must be sufficiently hardened before the play item may be used.
Total volume of concrete: Min. 7.42 cu. ft.

Wichtig! Vor der Inbetriebnahme des Spielgeräts muß der Beton ausreichend abgebunden haben.
Betonverbrauch insgesamt: mind. 0,21 m³

Important ! Le béton doit avoir suffisamment durci avant de mettre en service l'équipement de jeux.
Consommation totale de béton : au minimum 0,21 m³

¡Importante! El hormigón debe estar suficientemente endurecido antes de comenzar a utilizar el equipo de juego. Consumo total de hormigón: Min. 0,21 m³

Importante! Prima di utilizzare le attrezzature da gioco, il cemento deve essere sufficientemente solidificato. Volume totale di cemento: min. 0,21 m³

Belangrijk! Het beton moet voldoende gehard zijn voordat het speeltoestel in gebruik wordt genomen.
Totale benodigde hoeveelheid beton: min. 0,21 m³

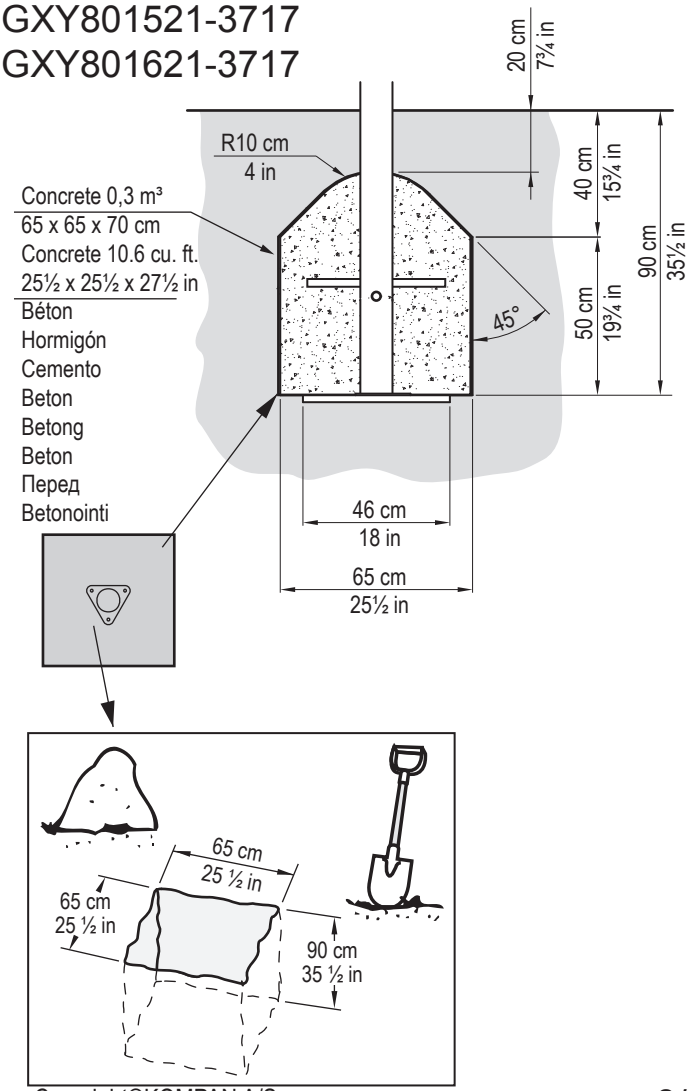
Viktigt! Betongen måste ha härdat tillräckligt innan lekredskapet börjar användas.
Total betongåtgång: min. 0,21 m³

Vigtigt! Betonen skal være tilstrækkelig hærdet, før legeredskabet tages i brug.
Totalt betonforbrug: Min. 0,21 m³

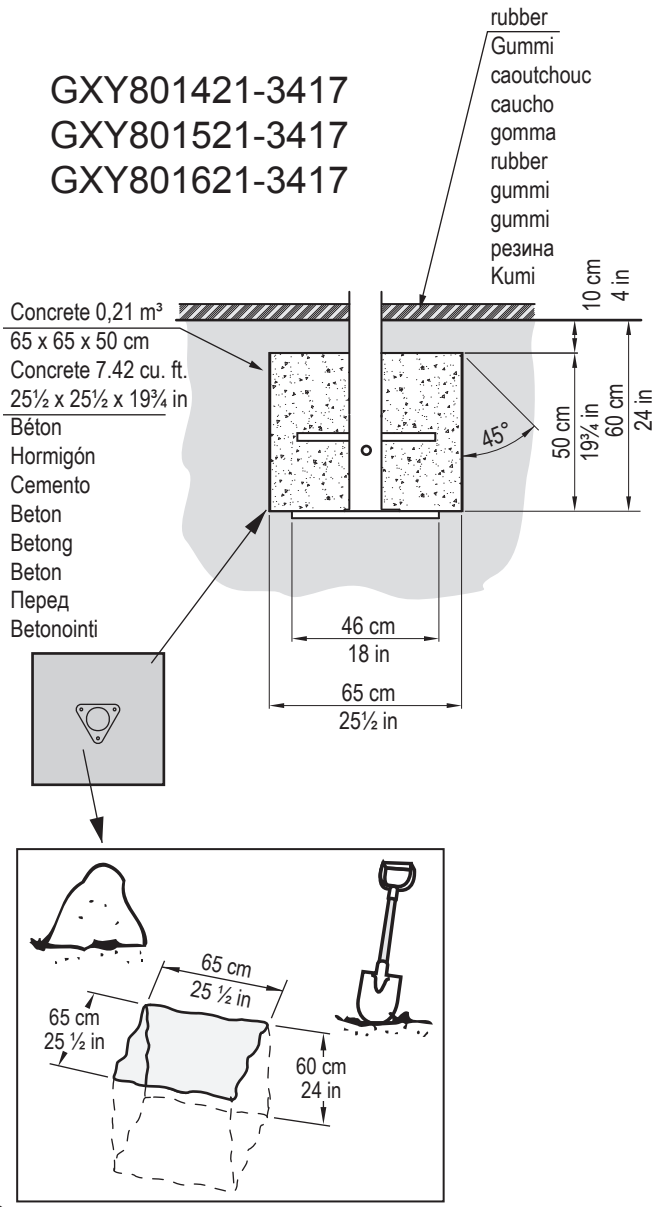
Важно! Перед использованием сооружений убедитесь, что бетон затвердел.
Сумарный объем бетона: мин. 6 л.

HUOM! Betonivalun on oltava tarpeeksi kuiva, ennen kuin leikkivälinettä saa käyttää.
Betonoinnin minimikokonaismäärä; min. 0,21 m³

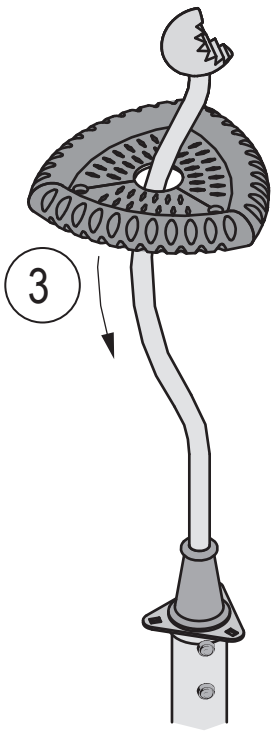
GXY801421-3717
GXY801521-3717
GXY801621-3717

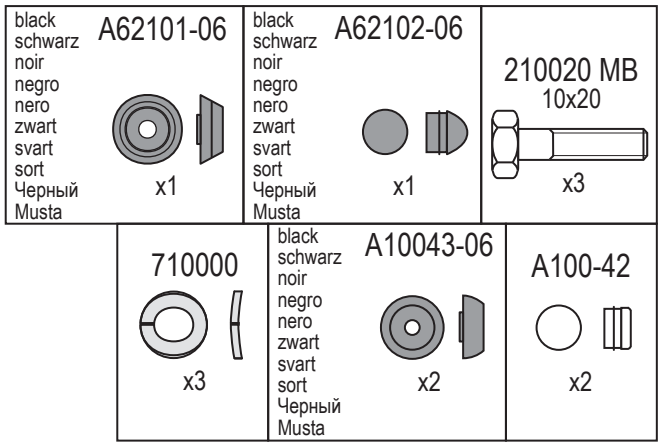


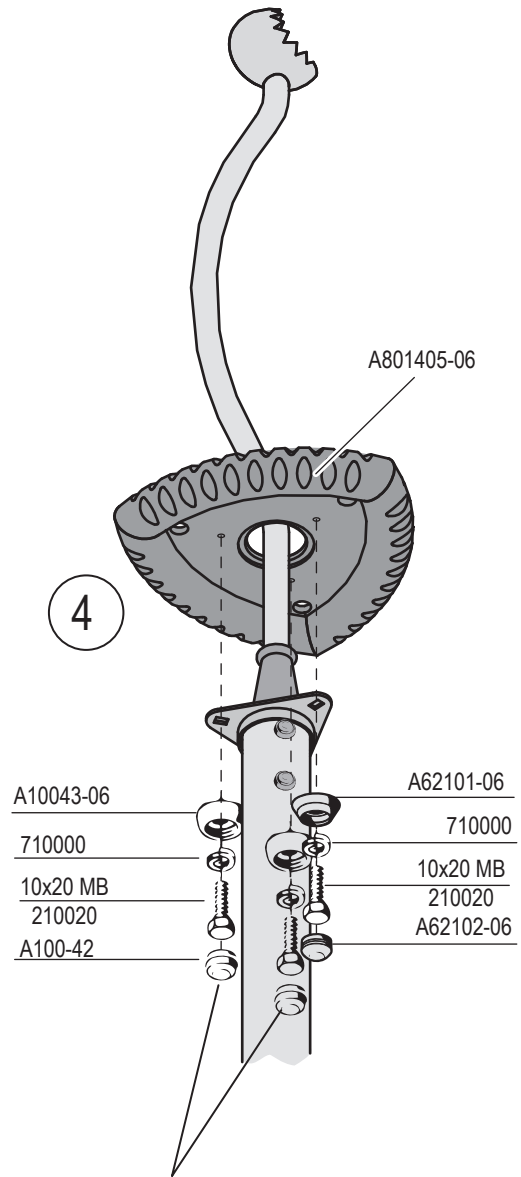
GXY801421-3417
GXY801521-3417
GXY801621-3417

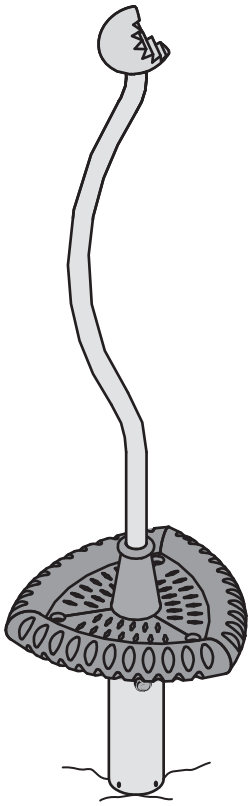


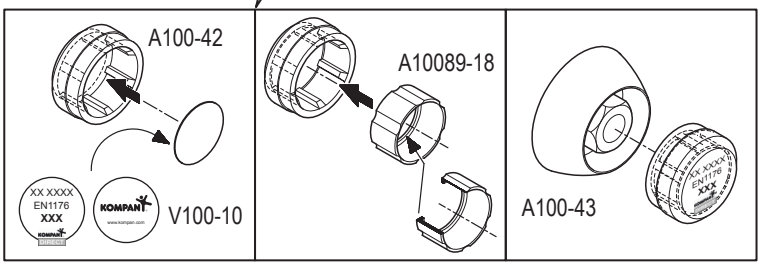
V801421XX17 20100315 MarSky







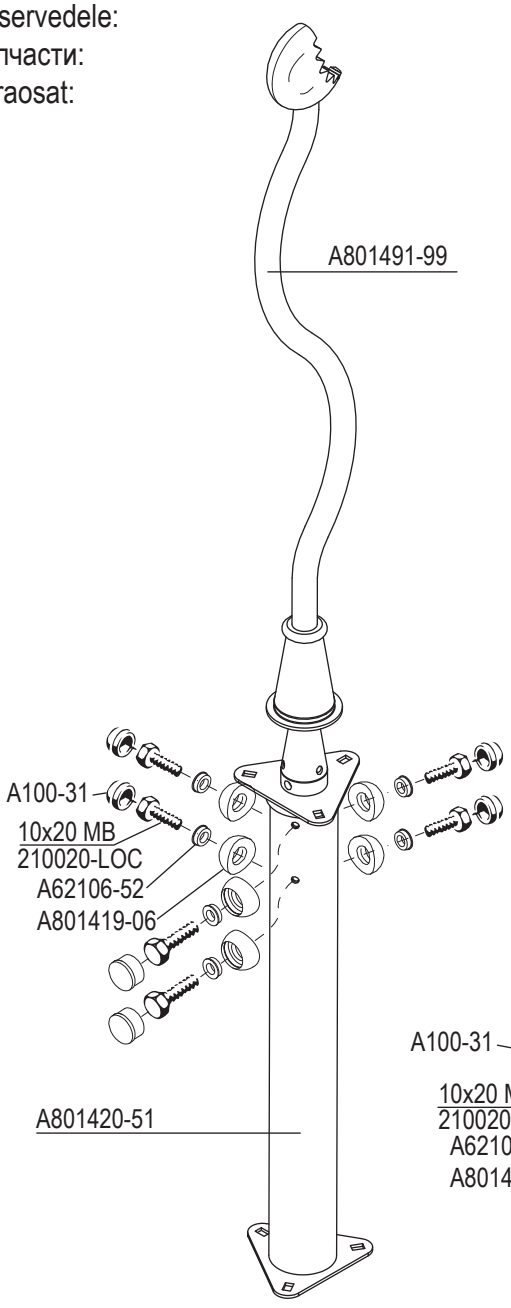




V801421XX17 20100315 MarSky

Spare parts:
Ersatzteile:
Pièces de rechange:
Piezas de recambio:
Parti di ricambio:
Reservedelen:
Reservdelar:
Reservedele:
Запчасти:
Varaosat:

X801400-91



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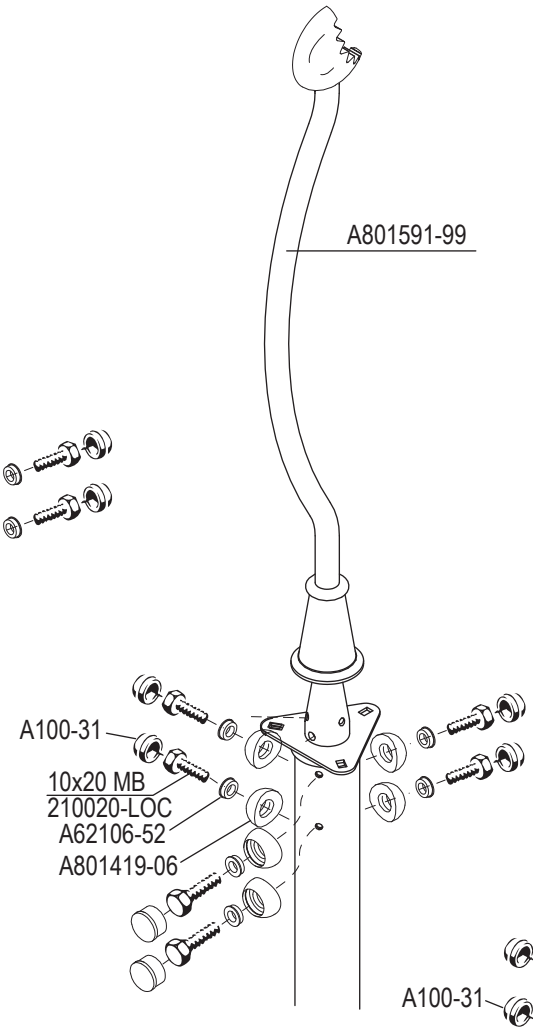

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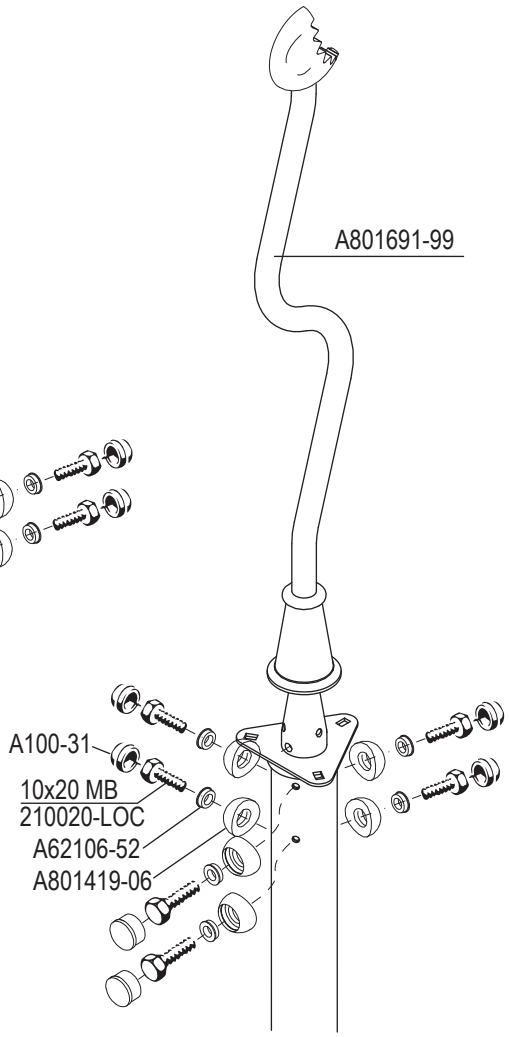

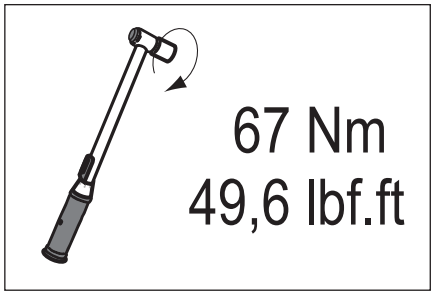

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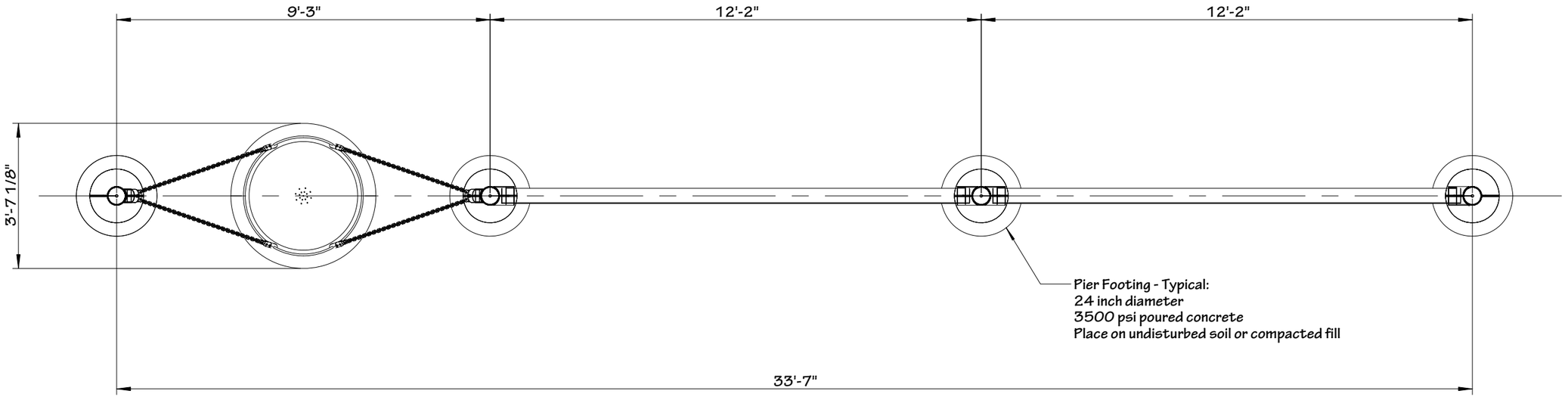
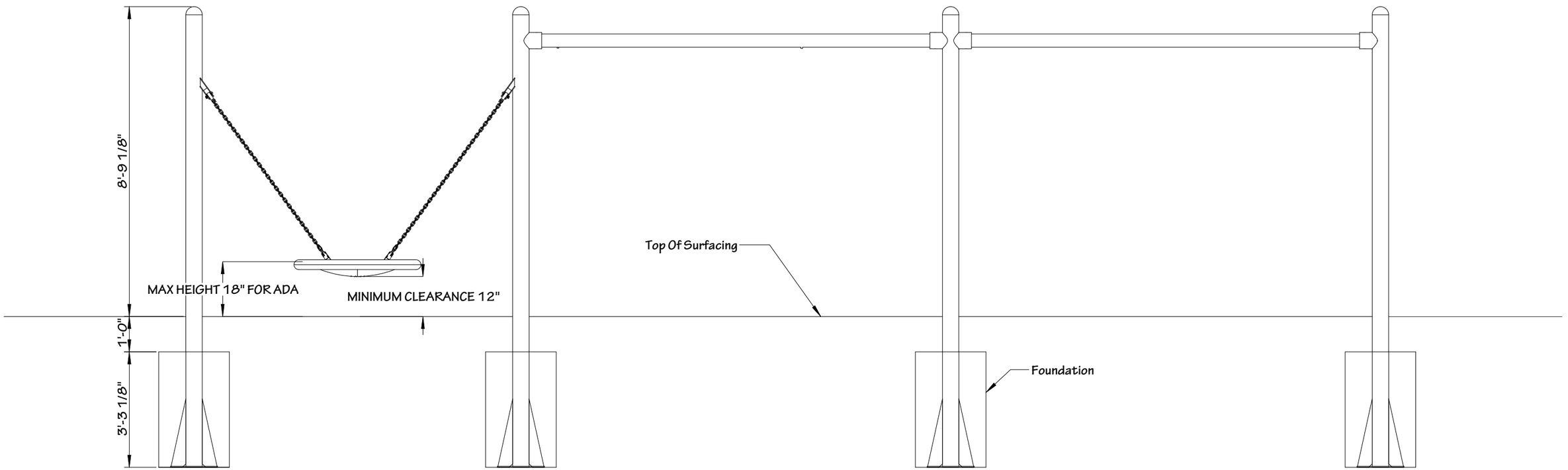
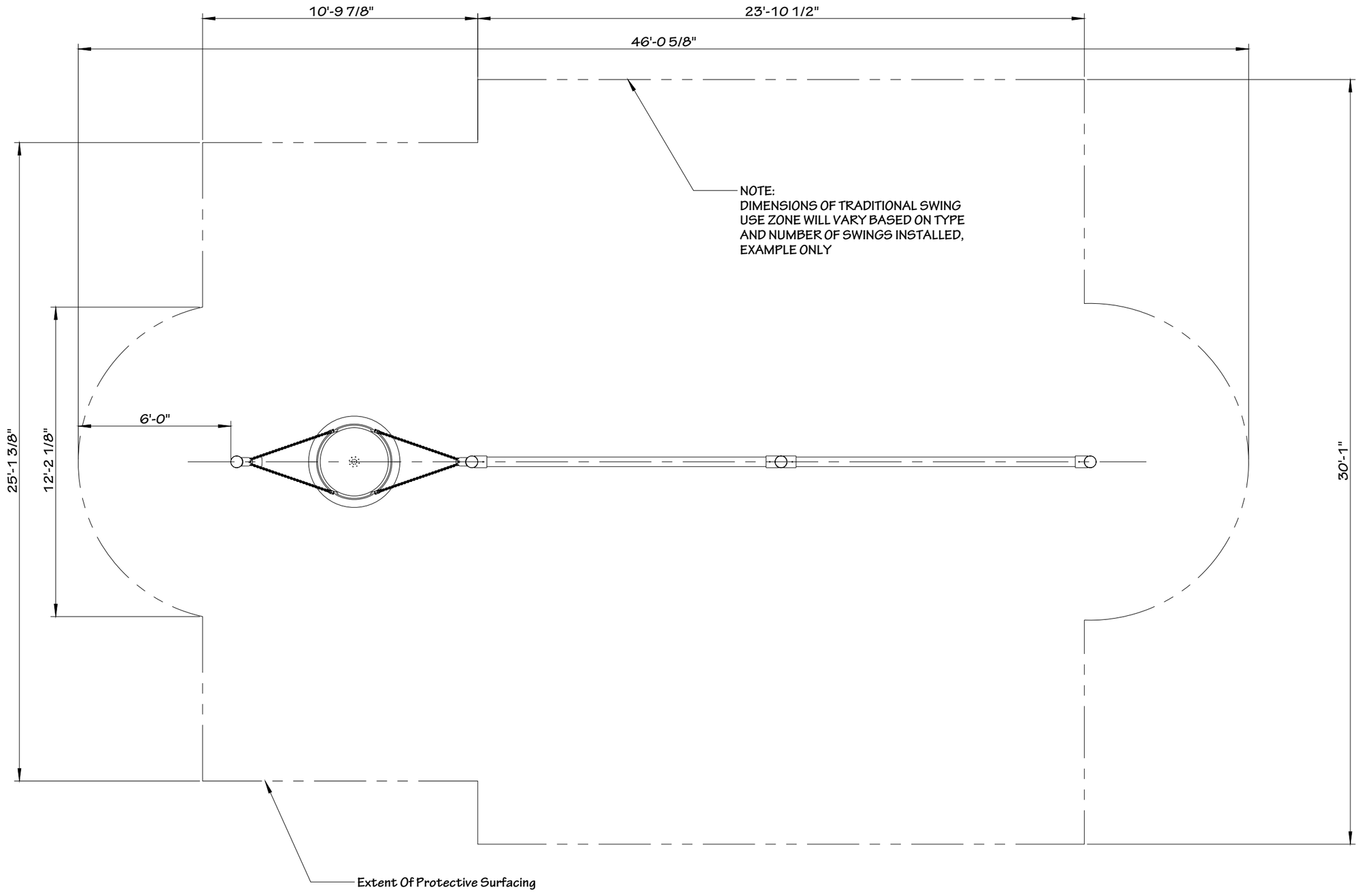


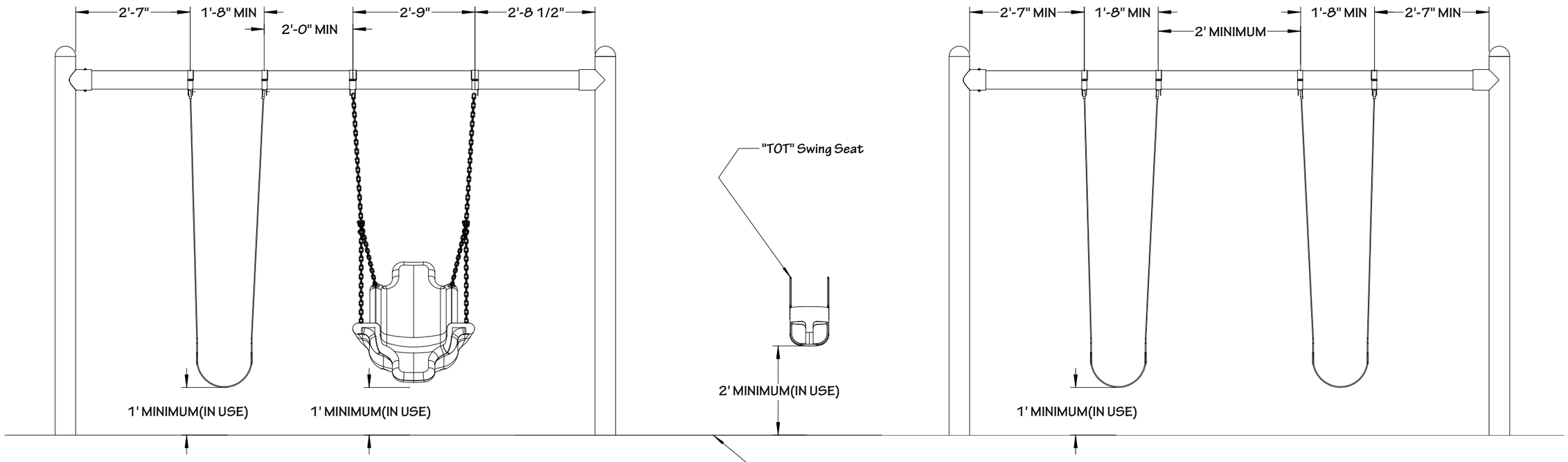


PRODUCT: DX-3175-A3			DYNAMO PLAYGROUNDS
DRAWING TITLE: Layout Imperial		SCALE: NOT TO SCALE	www.dynamoplaygrounds.com
ADDED BY: jcarruthers	APPROVED BY: rmartin	DATE: 6/3/2016	STATUS: RELEASE



PRODUCT: DX-3175-A3			DYNAMO PLAYGROUNDS
DRAWING TITLE: ASTM	SCALE: NOT TO SCALE		www.dynamoplaygrounds.com
DESIGNED/ADDED BY: jcarruthers	APPROVED BY: rmartin	DATE: 6/3/2016	STATUS: RELEASE

NOTE: CHAINS MAY NEED TO BE CUT TO ACHIEVE REQUIRED SEAT HEIGHT



BELT SWING WITH ACCESSIBLE SEAT

TWO BELT OR TOT SWINGS

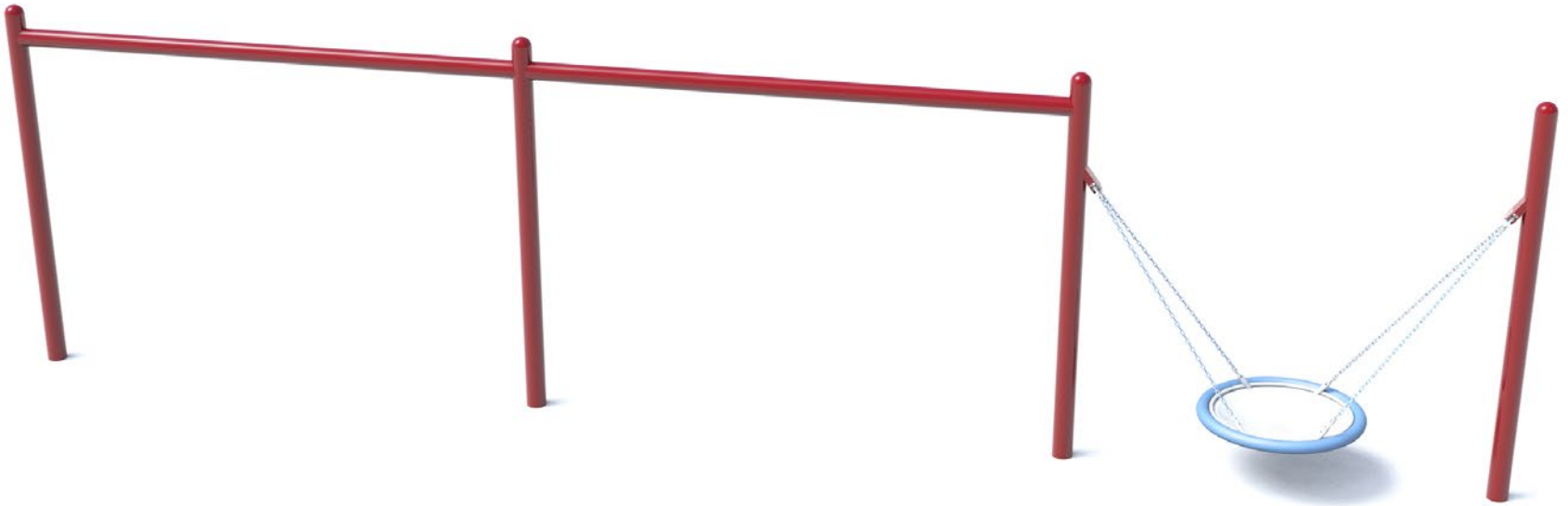
PRODUCT: Traditional Swing Placement			DYNAMO PLAYGROUNDS www.dynamoplaygrounds.com
DRAWING TITLE: ASTM	SCALE: NOT TO SCALE		
DESIGNED/ADDED BY: jcarruthers	APPROVED BY: rmartin	DATE: 5/25/2016	STATUS: RELEASE

BIGGO SPIA COMBO

INSTALLATION MANUAL

DX-3175-A3

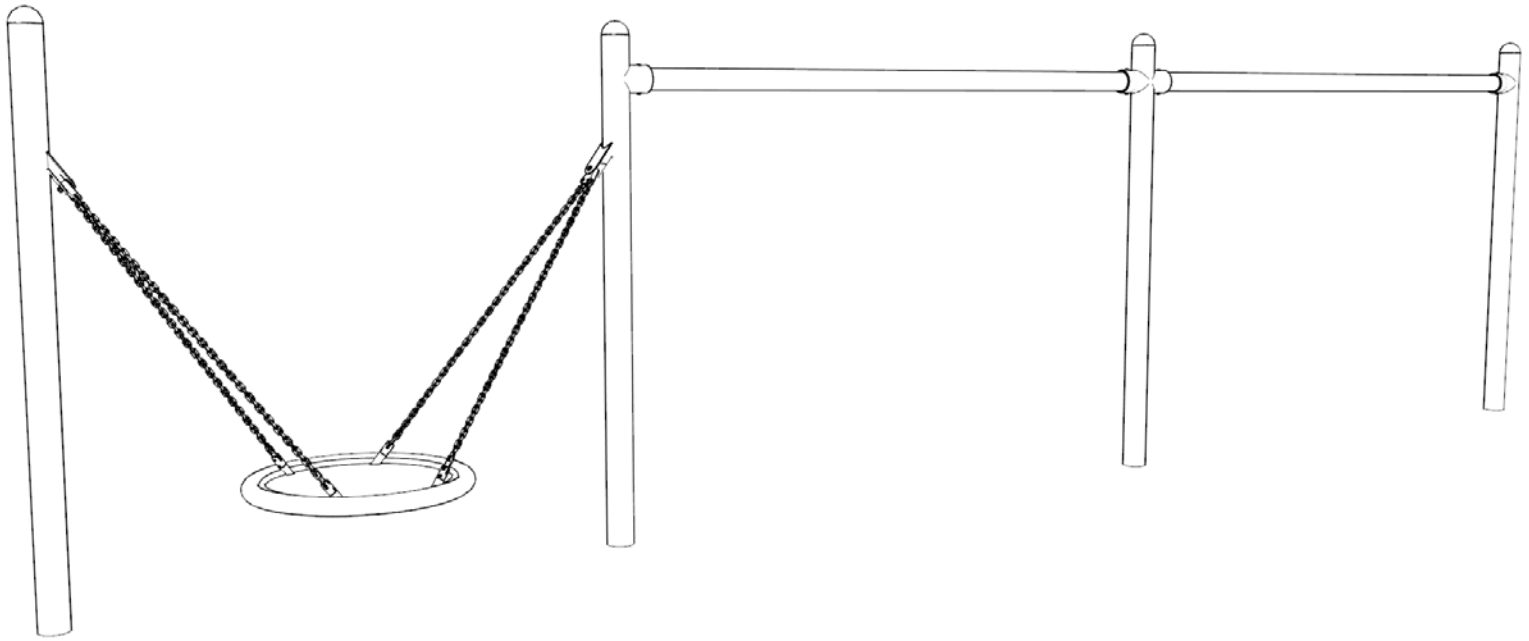
DYNAMO INDUSTRIES
www.dynamoplaygrounds.com
Toll free: (800) 790-0034 (Canada & US)
Local: (613) 446-0030
Fax: (613) 446-0034



BIGGO SPIA COMBO

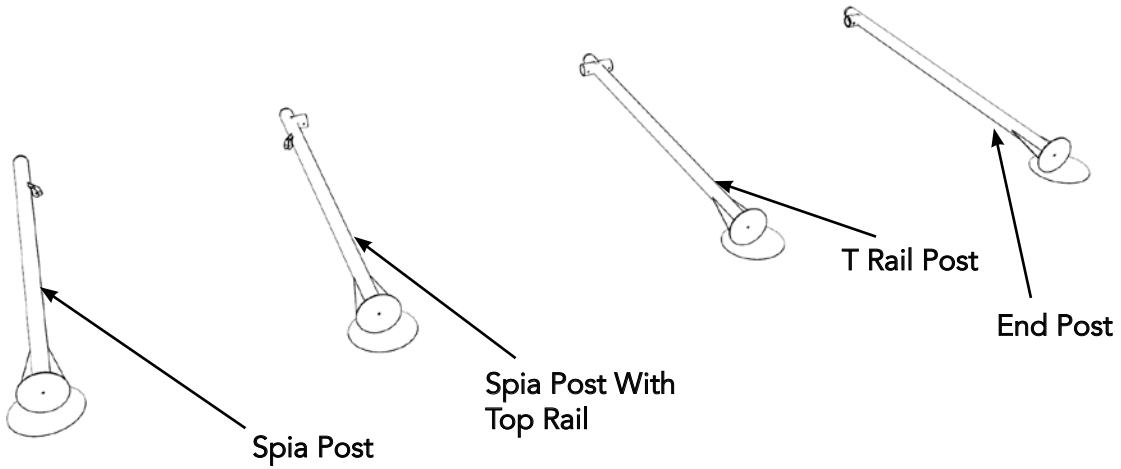
INSTALLATION & MAINTENANCE INSTRUCTIONS

DX-3175-A3

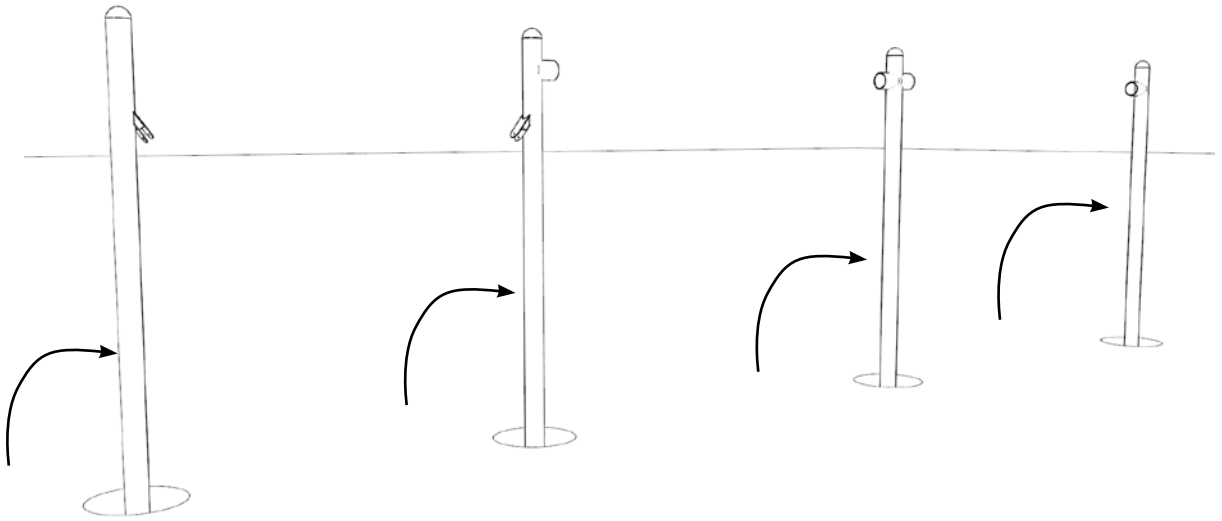


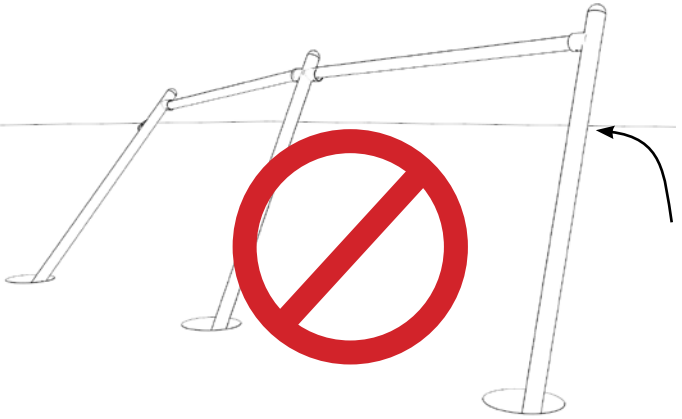
DYNAMO DX TECHNOLOGY

Ages:	2 to 12 years
Capacity:	8 children
Size:	W: 34′ 1″ / 10.4m
	H: 8′ 9″ / 2.67m
Use zone:	See Layout Drawing

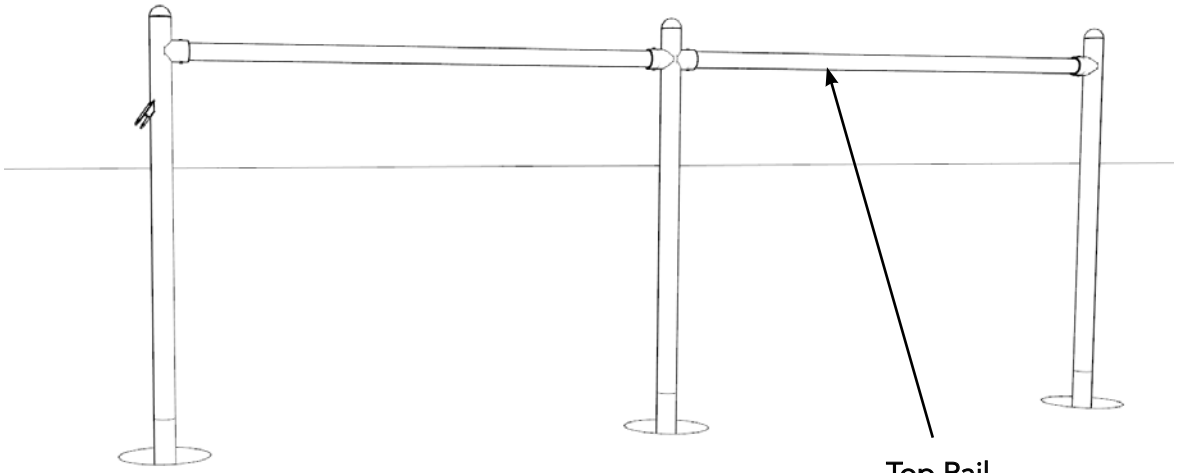


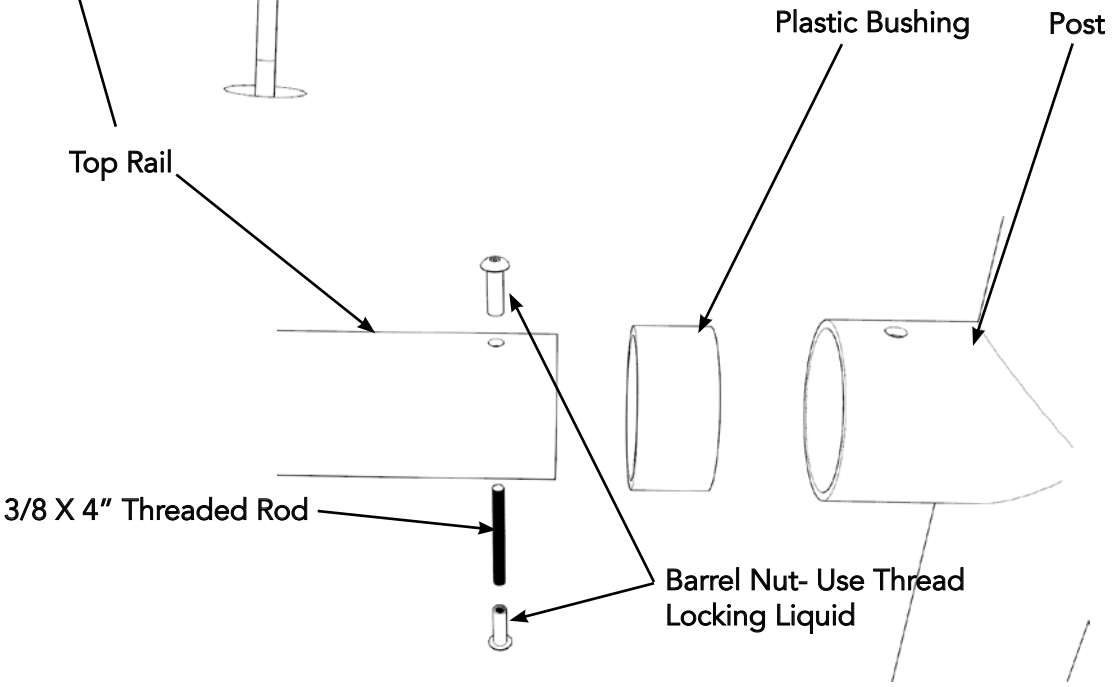
1. Excavate the foundation holes following the dimensions on the attached Layout Drawing.
2. Lay out the Posts with feet overhanging the foundation holes.
3. Stand up the Posts in the center of each excavated hole. Do NOT attempt to assemble all the top rails first and raise as a single unit.





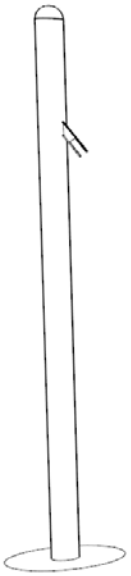
4. Assemble the Top Rails to the posts using a Plastic Bushing, 3/8 X 4" Threaded Rod, and 2x 3/8 X 1-1/2" Barrel Nuts per connection.

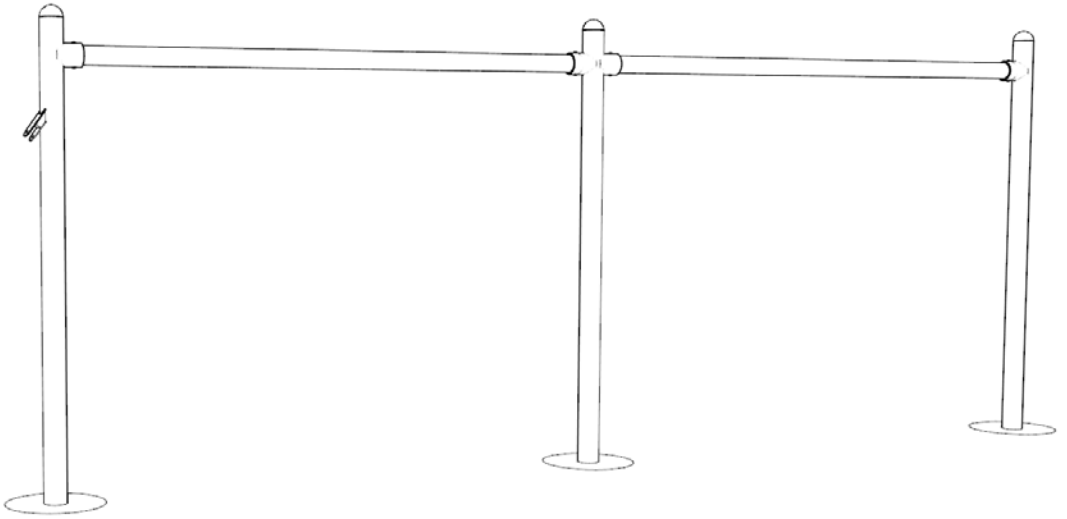




5. Make sure the swing hinge brackets on the Spia posts are precisely aligned in the orientation shown at Right.
6. Level and align the posts to match the specifications on the included Layout Drawings.
7. Once the posts are level in the holes and at the proper depth, fill the hole with concrete to sub grade. Concrete is to be wet concrete with minimum 25 MPa/3500psi.

Make sure the concrete has fully cured before installing seats. Do not install seats the same day!





Resilient Surfacing NOTE:
This product is designed with a 12”/300mm depth from finished grade to the top of the foundation, optimized for sand or engineered wood fiber. In the case of materials that do not require that much depth, the height above finished grade MUST nonetheless be maintained.

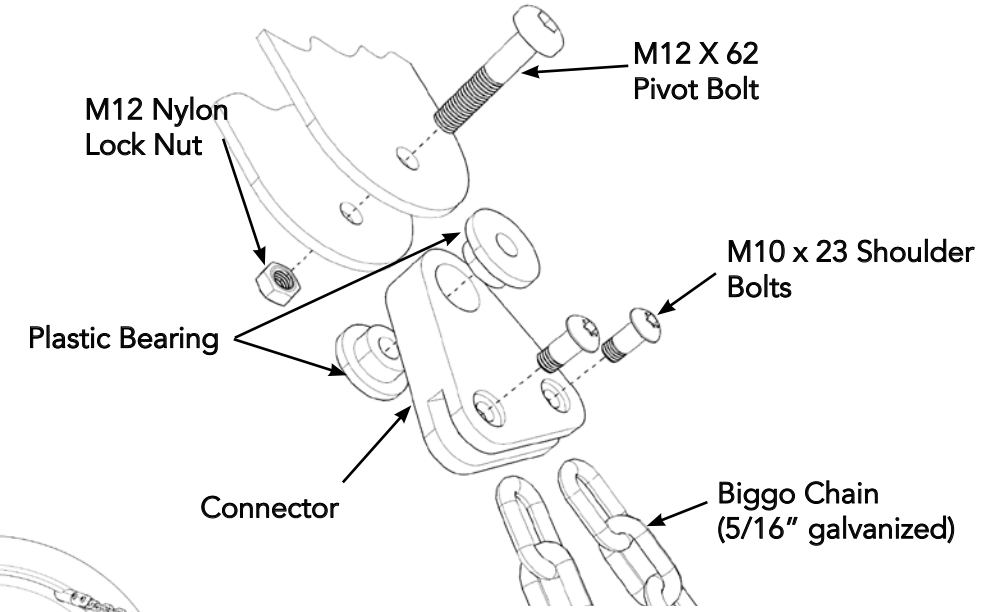
Only proceed once the concrete has cured.

NOTE: Chain may need to be shortened to meet local standards, see attached Layout Drawing for requirements.

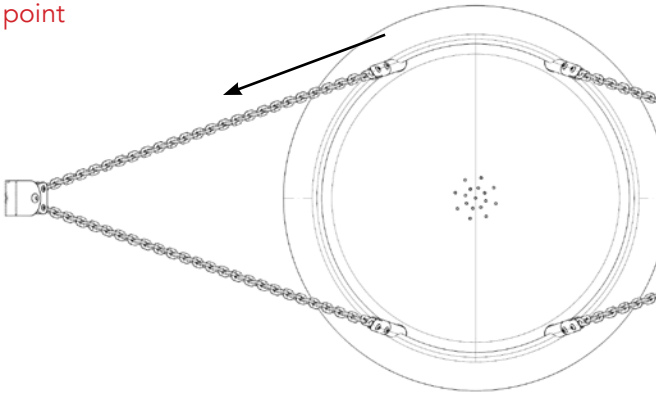
1. Insert the Plastic Bearing in the connector.
2. Attach the Chain to the Connector using M10 X 25 shoulder bolts.
3. Secure the connector to the post bracket with the Chain Attachment with the M12 X 62 pivot bolt and its corresponding washer and M12 nylon lock nut.

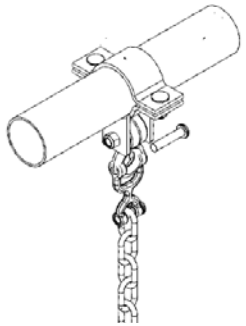
NOTE: Do not over-torque lock nut on pivot bolt - flanges should remain parallel.

4. Secure the chain connectors to the seat with M10 X 35 shoulder bolts.
5. Attach the chain to the chain connectors using M10 X 35 shoulder bolts.

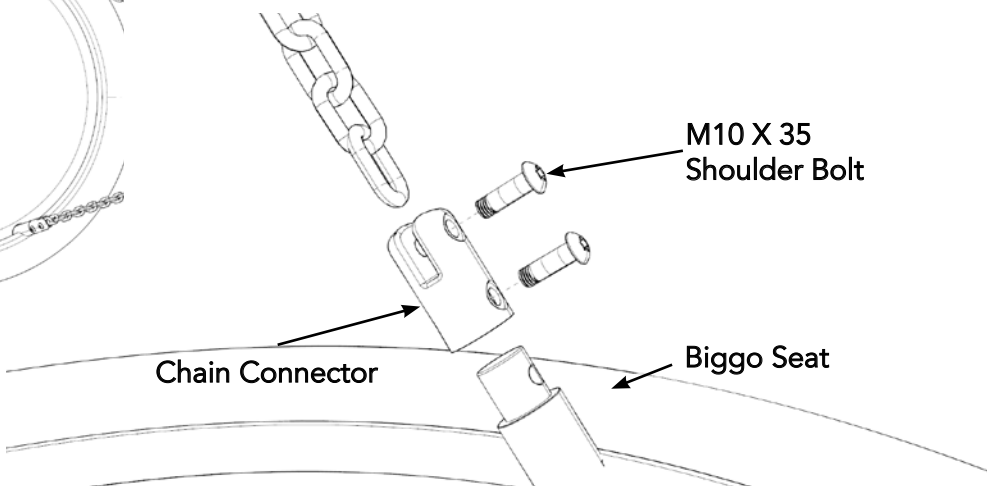


Note: The seat has been installed in the correct orientation when the connectors are angled towards the pivot point





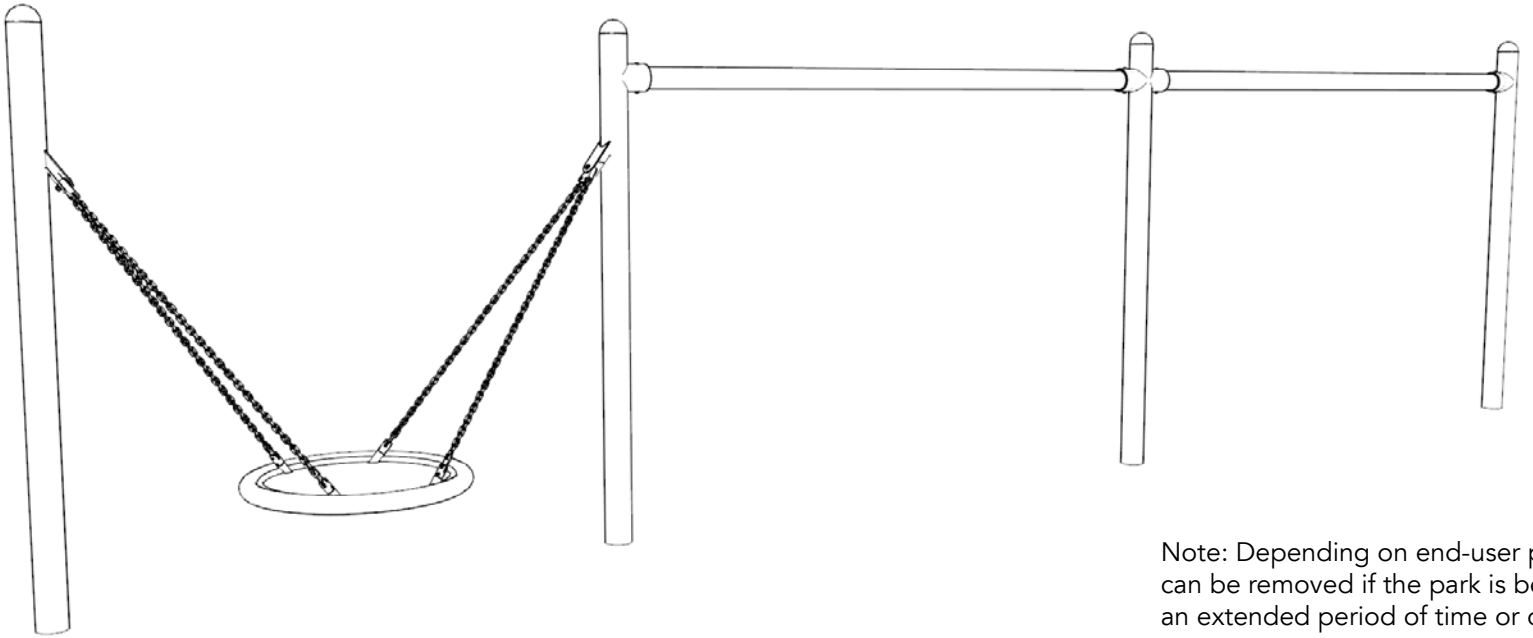
NOTE: On Traditional swing seats, ensure that bolts on swing clamps are facing downwards and installed to be compliant with safety standards. See attached Traditional Swing Placement Drawing



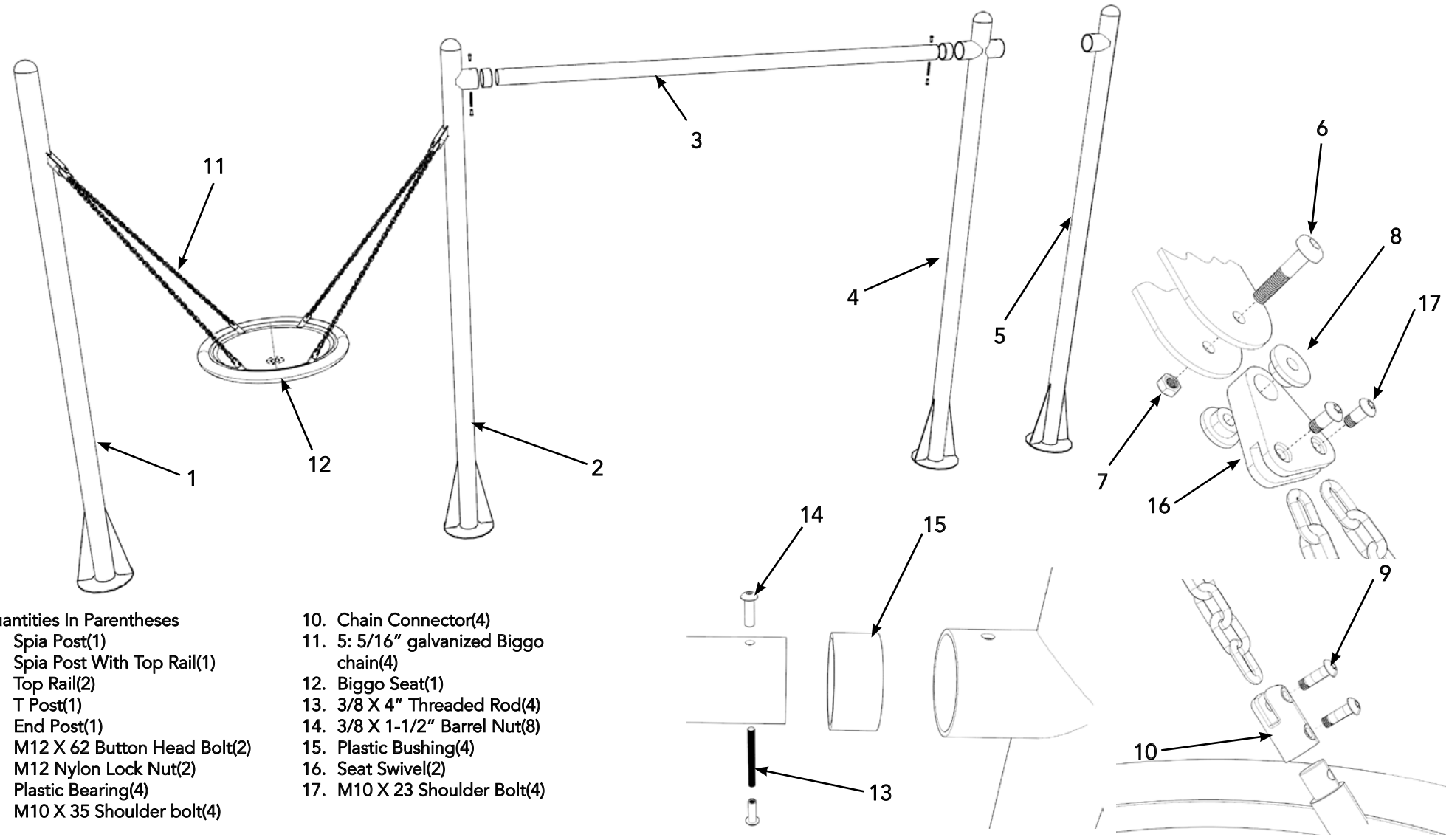
The Biggo Spia is designed to be a low-maintenance item. However, there are a few points that should be checked regularly:

Weekly/Monthly -Check connections at top of ropes and where ropes attach to seats for signs of excessive wear or vandalism -Check that seat drainage holes are not blocked and water is not pooling in the seat bowls.

Yearly -Check entire structure for loose/missing bolts, excessive connection wear or vandalism.



Note: Depending on end-user preferences, the seat can be removed if the park is being shut down for an extended period of time or over winter.



Quantities In Parentheses

1. Spia Post(1)
2. Spia Post With Top Rail(1)
3. Top Rail(2)
4. T Post(1)
5. End Post(1)
6. M12 X 62 Button Head Bolt(2)
7. M12 Nylon Lock Nut(2)
8. Plastic Bearing(4)
9. M10 X 35 Shoulder bolt(4)
10. Chain Connector(4)
11. 5: 5/16" galvanized Biggo chain(4)
12. Biggo Seat(1)
13. 3/8 X 4" Threaded Rod(4)
14. 3/8 X 1-1/2" Barrel Nut(8)
15. Plastic Bushing(4)
16. Seat Swivel(2)
17. M10 X 23 Shoulder Bolt(4)