

WESTON & SAMPSON ENGINEERS, INC.  
85 Devonshire Street, 3<sup>rd</sup> floor  
Boston, MA 02109  
tel: 617.412.4480

CONTRACT  
DOCUMENTS

February 2024

Holden

MASSACHUSETTS

Industrial Drive Athletic Fields and  
Dawson Recreation Improvements

18 Industrial Drive,  
Holden, MA 01520  
&  
200 Salisbury Street  
Holden, MA 01520

W&S PROJECT No.: ENG22-0852



Issued For:  
BIDDING



# TECHNICAL SPECIFICATIONS

## TABLE OF CONTENTS

### DIVISION 00 – FRONT END

|             |  |
|-------------|--|
| 00 01 10    | Table of Contents                                      |
| 00 06 13.13 | Performance Bond                                       |
| 00 11 13    | Advertisement for Bids                                 |
| 00 21 13    | Instructions to Bidders                                |
| 00 31 32    | Subsurface Data  |
| 00 31 43    | Permits  |
| 00 41 13    | Form of General Bid                                    |
| 00 43 43    | Prevailing Wage Rates                                  |
| 00 52 00    | Agreement  |
| 00 61 13.16 | Payment Bond   |
| 00 63 63    | Attachment D: Change Orders                            |
| 00 72 00    | ASCE General Conditions                                |
| 00 73 00    | Supplementary Conditions                               |
| 00 73 73.83 | Attachment F: American Iron and Steel Act Requirements |

### DIVISION 01 - GENERAL REQUIREMENTS

|             |                                  |
|-------------|----------------------------------|
| 01 11 00    | Control of Work and Materials    |
| 01 12 16    | Scope and Sequence of Work       |
| 01 14 00    | Special Provisions               |
| 01 14 19.16 | Dust Control                     |
| 01 22 00    | Measurement and Payment          |
| 01 22 00.13 | Price Adjustments                |
| 01 25 00    | Substitution Procedures          |
| 01 26 00    | Contract Modification Procedures |
| 01 29 00    | Payment Procedures               |
| 01 31 19.23 | Construction Meetings            |
| 01 32 16    | Construction Scheduling          |
| 01 33 23    | Submittals                       |
| 01 37 00    | Schedule of Values               |
| 01 40 00    | Quality Requirements             |
| 01 42 00    | References                       |
| 01 45 16.13 | Contractor Quality Control       |
| 01 45 23    | Structural Tests and Inspections |
| 01 45 29    | Sampling and Testing             |
| 01 52 13    | Temporary Facilities             |
| 01 55 26.13 | Signage (Traffic Controls)       |
| 01 56 26    | Temporary Chain Link Fence       |
| 01 56 39    | Tree Protection and Trimming     |
| 01 57 16    | Rodent Control                   |

01 57 19        Environmental Protection  
01 74 13        Cleaning Up  
01 78 00        Project Closeout  
01 78 39        Project As-Built Record Drawings  
01 92 13        Operation and Maintenance Manuals

DIVISION 02 - EXISTING CONDITIONS

02 32 13.13     Soil Borings  
02 41 13.29     Abandonment of Sewers and Drains  
02 41 13        Select Site Demolition  
02 41 19.16     Minor Electrical Demolition

DIVISION 03 - CONCRETE

03 05 00        Field Concrete  
03 11 00        Concrete Formwork  
03 21 00        Concrete Reinforcement  
03 30 00        Cast in Place Concrete

DIVISION 04 - MASONRY

04 40 00        Dry Placed Boulders

DIVISION 05 - METALS

05 12 33        Structural Steel  
05 50 00        Miscellaneous Metals  
05 52 13        Pipe and Tube Railings

DIVISION 11 - EQUIPMENT

11 68 13        Playground Equipment  
11 68 33        Athletic Field Equipment

DIVISION 13 – SPECIAL CONSTRUCTION

13 31 23        Pre-Engineered Fabric Shade Structure  
13 34 23        Pre-Engineered Support Building  
13 34 23        Pre-Engineered Pavilion

## DIVISION 26 - ELECTRICAL

|          |  |
|----------|--|
| 26 00 00 | Electrical Work – General Provisions                         |
| 26 05 19 | Low Voltage Electrical Power Conductors and Cables           |
| 26 05 26 | Grounding and Bonding for Electrical Systems                 |
| 26 05 29 | Hangers and Supports for Electrical Systems                  |
| 26 05 33 | Raceways and Boxes for Electrical Systems                    |
| 26 05 44 | Sleeves and Sleeve Seals for Electrical Raceways and Cabling |
| 26 05 53 | Identification for Electrical Systems                        |
| 26 24 16 | Panelboards  |
| 26 27 13 | Electricity Metering   |
| 26 27 26 | Wiring Devices   |
| 26 28 13 | Fuses  |
| 26 43 13 | Surge Protection for Low-Voltage Electrical Power Circuits   |
| 26 56 00 | Exterior Lighting  |
| 26 56 58 | Sports Lighting  |

## DIVISION 31 - EARTHWORK

|             |  |
|-------------|--|
| 31 00 00    | Earthwork                                |
| 31 12 00.13 | Selective Clearing, Invasive Species     |
| 31 05 19.13 | Filter Fabric                            |
| 31 13 13    | Tree Pruning and Tree and Stump Removals |
| 31 23 16.26 | Rock Excavation and Disposal             |
| 31 23 19    | Dewatering                               |
| 31 50 00    | Support of Excavation                    |

## DIVISION 32 - EXTERIOR IMPROVEMENTS

|             |                                     |
|-------------|-------------------------------------|
| 32 12 16.13 | Hot Mix Asphalt Pavement            |
| 32 13 13    | Concrete Pavement                   |
| 32 15 40.13 | Stabilized Stone Dust Pavement      |
| 32 16 00    | Curbing                             |
| 32 17 23    | Signage                             |
| 32 18 13    | Synthetic Grass Infill System       |
| 32 18 16    | Playground Protective Surfacing     |
| 32 31 00    | Fencing                             |
| 32 32 23    | Segmental Retaining Wall System     |
| 32 32 53    | Reinforced Soil Slopes              |
| 32 33 00    | Site Furnishings and Accessories    |
| 32 34 13    | Prefabricated Steel Boardwalk       |
| 32 71 00    | Wetlands Protection and Replication |

|          |                                     |
|----------|-------------------------------------|
| 32 91 00 | Loam and Planting Preparation       |
| 32 92 00 | Turf and Grasses                    |
| 32 93 00 | Trees, Shrubs, Groundcover Planting |

### DIVISION 33 - UTILITIES

|             |   |
|-------------|---|
| 33 05 26.13 | Tracer Tape                                   |
| 33 11 13.13 | Ductile Iron Pipe and Fitting for Water Mains |
| 33 11 13.16 | Service Connections Water Services            |
| 33 11 13.31 | Polyvinyl Chloride Pressure Pipe and Fittings |
| 33 11 13.34 | Connections to Existing Water Mains           |
| 33 11 13.43 | Insulation for Pipeline                       |
| 33 12 22    | Hydrants and Valves                           |
| 33 31 13.16 | Polyvinyl Chloride Gravity Pipe and Fittings  |
| 33 39 13    | Precast Manholes and Catch Basins             |
| 33 41 00    | Trench Drain System                           |
| 33 41 13.22 | Corrugated Polyethylene [HDPE] Drainage Pipe  |

### APPENDICES

|            |                     |
|------------|---------------------|
| Appendix A | Order of Conditions |
|------------|---------------------|

END OF TABLE OF CONTENTS

SECTION 00 61 13.13

PERFORMANCE BOND

Section 00 06 13.13

PERFORMANCE BOND

|   |  |
|---|--|
| <p><b>Contractor</b></p> <p>Name: <b>[Full formal name of Contractor]</b></p> <p>Address (<i>principal place of business</i>):<br/> <b>[Address of Contractor's principal place of business]</b></p>  | <p><b>Surety</b></p> <p>Name: <b>[Full formal name of Surety]</b></p> <p>Address (<i>principal place of business</i>):<br/> <b>[Address of Surety's principal place of business]</b></p>   |
| <p><b>Owner</b></p> <p>Name: <b>[Full formal name of Owner]</b></p> <p>Mailing address (<i>principal place of business</i>):<br/> <b>[Address of Owner's principal place of business]</b></p>   | <p><b>Contract</b></p> <p>Description (<i>name and location</i>):<br/> <b>[Owner's project/contract name, and location of the project]</b></p> <p>Contract Price: <b>[Amount from Contract]</b></p> <p>Effective Date of Contract: <b>[Date from Contract]</b></p> |
| <p><b>Bond</b></p> <p>Bond Amount: <b>[Amount]</b></p> <p>Date of Bond: <b>[Date]</b><br/> <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form:<br/> <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16</p> |  |
| <p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.</p>  |  |
| Contractor as Principal   | Surety   |
| <p>_____</p> <p><i>(Full formal name of Contractor)</i></p>   | <p>_____</p> <p><i>(Full formal name of Surety) (corporate seal)</i></p>   |
| <p>By: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>  | <p>By: _____</p> <p style="text-align: center;"><i>(Signature)(Attach Power of Attorney)</i></p>   |
| <p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>   | <p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>  |
| <p>Title: _____</p>   | <p>Title: _____</p>  |
| <p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>  | <p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>   |
| <p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>   | <p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>  |
| <p>Title: _____</p>   | <p>Title: _____</p>  |
| <p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>  |  |

The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

1. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
2. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:
  - 2.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;
  - 2.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
  - 2.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
3. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
4. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
  - 4.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
  - 4.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
  - 4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
  - 4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:



- 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
  - 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
- 5. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.
- 6. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
  - 6.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
  - 6.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
  - 6.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
- 7. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
- 8. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
- 9. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
- 10. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.
- 11. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.
- 12. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such

statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

13. Definitions

- 13.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
  - 13.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
  - 13.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
  - 13.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
  - 13.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
14. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
15. Modifications to this Bond are as follows:

END OF SECTION

SECTION 00 11 13

ADVERTISEMENT FOR BIDS

Sealed bids for construction of **Industrial Drive Athletic Fields and Dawson Improvements** Project located at 200 Salisbury St. and a new athletic complex located at 18 Industrial Dr. in Holden, MA. for the Town of **Holden, Massachusetts**, will be received at the **Town Hall, 1196** on **Wednesday, March 6, 2024 at 2:00 PM**, at which time and place said bids will be publicly opened and read aloud.

The scope of work includes construction of:

The proposed project will include renovations of the existing Dawson Recreation Area, located at 200 Salisbury St. and a new athletic complex located on Industrial Drive, 18 Industrial Dr. in Holden, MA. At the Dawson Recreation Area, site improvements will include regrading to allow for an ADA accessible path and vehicle access, new playground, a synthetic turf baseball/soccer field, improved trail network and a new boardwalk to allow connectivity to the Industrial Drive site.

The Industrial Drive portion of the proposed project will include the installation of a new access road, parking areas, manufacturer support building, two synthetic turf multi use fields, lighting, a workout area, and support utilities and amenities for the project.

**The work for Add Alternate No. 1** includes:

The performance of all work, labor, materials, and equipment necessary to construct and install the playground at Dawson Recreation Area as shown on the plans and as specified.

**The work for Add Alternate No. 2** includes:

The performance of all work, labor, materials, and equipment necessary to construct and install the synthetic turf baseball field at the Dawson Recreation Area as shown on the plans and as specified.

**The work for Add Alternate No. 3** includes:

The performance of all work, labor, materials, and equipment necessary to construct and install the boardwalk and associated trails connecting the Dawson Recreation Area to Industrial Drive as shown on the plans and as specified.

**The work for Add Alternate No. 4** includes:

The performance of all work, labor, materials, and equipment necessary to construct and install the access drive and accessible parking spaces at Dawson Recreation Area as shown on the plans and as specified.

**The work for Add Alternate No. 5** includes:

The performance of all work, labor, materials, and equipment necessary to construct and install the accessible path from the parking lot to the tennis courts at the Dawson Recreation Area as

shown on the plans and as specified.

**The work for Add Alternate No. 6** includes:

The performance of all work, labor, materials, and equipment necessary to construct and install the workout area at Industrial Drive as shown on the plans and as specified.

**The work for Add Alternate No. 7** includes:

The performance of all work, labor, materials, and equipment necessary to construct and install the manufactured pre-engineered support building as shown on the plans and as specified.

Substantial completion for the project under this contract shall be completed by **September 30 , 2025, with final completion by October 30, 2025.**

**The estimated cost of the project is \$8,500,000.00**

**PARAGRAPH “B” CHAPTER 30**

Bid Security in the form of a bid bond, cash, certified check, treasurer’s or cashier’s check payable to the Owner, is required in the amount of five percent of the bid, in accordance with Section 00200, INSTRUCTIONS TO BIDDERS.

The Instructions to Bidders, Form of General Bid, Agreement, Plans, Specifications, Performance and Payment Bond, and other Contract Documents may be examined at the following:

Accent Printing, Inc., 99 Chelmsford Road, North Billerica, Massachusetts

**Documents will be available on February 14, 2024.** Contract Documents may be viewed and downloaded as a Portable Document Format (PDF) file free of charge at [www.accentblueprints.com](http://www.accentblueprints.com). Copies may be obtained for a fee by completing an order online or by calling (978) 362-8038 for each set. Completed orders may be picked up at the office of Accent Printing located at 99 Chelmsford Road, North Billerica, MA 01862 (978)362-8038, from 9 a.m. to 4 p.m. Copies may also be shipped to prospective bidders for an additional charge to cover handling and mailing fees. All payments for printing and shipping are nonrefundable. For addition to the project plan holder’s list to guarantee receipt of addenda, it is recommended interested bidders obtain the Contract Documents directly from Accent. Interested bidders will be prompted to register an email address with Accent to access the documents.

The selected contractor shall furnish a performance bond and a payment bond in amount at least equal to one hundred percent (100%) of the contract price as stipulated in Section 00 72 00 GENERAL CONDITIONS of these specifications.

\*A **NON-MANDATORY** Prebid Conference will be held on **February 21, 2024 @ 10 am** at the Holden Department of Public Works at 18 Industrial Drive, Holden, MA. Any request for interpretation of plans and specifications may be submitted in writing at that time. Bidders will have an opportunity to view the site of the work following the Prebid Conference.

\* All Questions regarding the construction of the ***Industrial Drive Athletic Field and Dawson Recreation Improvements***, for the ***Town of Holden***, shall be received by mail or electronically no later than **3:00 PM** prevailing time, on ***Thursday, February 29<sup>th</sup>, 2024.*** All responses shall be

provided by **2:00 PM** prevailing time, on **Monday, March 4th, 2024**.

\*All bids for this project are subject to applicable bidding laws of Massachusetts, including General Laws Chapter 30, Section 39M as amended.

Prevailing Wage Rates as determined by the Director of the Executive Office of Labor and Workforce Development under the provisions of the Massachusetts General Laws Chapter 149, Section 26 to 27H, as amended, apply to this project. It is the responsibility of the Bidder, before bid opening, to request, if necessary, any additional information on Prevailing Wage Rates for those trades people who may be employed for the proposed work under this contract.

By submission of a bid, the Bidder agrees that this bid shall be good and may not be withdrawn for a period of 90 days, Saturdays, Sundays, and legal holidays excluded after the opening of bids.

The Town reserves the right to reject any and all bids, or to accept the bid deemed to be in the best interest of the Town of Holden. Bidders are reminded that the Town Officials other than those listed throughout the document neither individually or collectively are to be contacted, nor will they discuss any bids prior to the scheduled opening. Prior questions or concerns about the bid should be presented to individual listed in the Invitation to Bid document.

TOWN OF HOLDEN, MASSACHUSETTS

BY ITS

Mr. Peter Lukes, Town Manager \_\_\_\_\_

1196 Main Street, Holden, MA 01520

Weston & Sampson Engineers, Inc.  
Boston, Massachusetts

END OF SECTION

## SECTION 00 21 13

### INSTRUCTIONS TO BIDDERS

1. Receipt and Opening of Bids
2. Location and Work to be Done
3. Deposit on Documents
4. Preparation of Bid
5. Modification of Bids
6. Obligation of Bidder
7. Information not Guaranteed
8. Bid Security
9. Time for Completion
10. Addenda and Interpretations
11. Bid Opening Procedure
12. Comparison of Bids
13. Statutes Regulating Competitive Bidding
14. Right to Reject Bid
15. Ability and Experience of Bidder
16. Conditions of Work
17. Security for Faithful Performance
18. Power of Attorney
19. Laws and Regulations
20. Liquidated Damages for Failure to Enter into Contract
21. Indeterminate Items and Estimated Quantities
22. CONTRACTOR Records
23. Bidder Certification – OSHA Training
24. Prevailing Wage Rates
25. American Iron and Steel Requirements of P.L.113-76
26. American Sports Builders Association Certified
27. Synthetic Turf Council Certified
28. Synthetic Turf Manufacturer Certified Installer

1. Receipt and Opening of Bids

The Town of Holden herein called the OWNER, acting by and through its Town Manager will receive sealed Bids for the construction of Industrial Drive Athletic Fields and Dawson Recreation Improvements.

Such bids addressed to the Town Manager and endorsed Bid Form and Required Documents will be received at the Town Hall until 2:00 PM on March 6, 2024 at which time and place said bids will be publicly opened and read aloud.

If the building at which bids are to be received is closed for any reason on the date and time that bids are due, receipt of bids by the Owner will be postponed until the next business day at the time originally stated for receipt of bids.

Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified will not be considered. By submission of a bid, the bidder agrees that this bid shall be good and may not be withdrawn for the number of days, after the opening of bids, as stipulated in the FORM OF GENERAL BID.

2. Location and Work to be Done

The location, general characteristics, and principal details of the Work are indicated on a set of drawings titled Industrial Drive Athletic Fields and Dawson Recreation Improvements

Additional drawings showing details in accordance with which the Work is to be done may be furnished by addendum from time to time during the bidding period by the ENGINEER, and shall then become a part of the Contract Documents.

The CONTRACTOR shall furnish all superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to do all work required for the completion of each item of the Work and as herein specified.

The Work to be done and paid for under any item shall not be limited to the exact extent mentioned or described but shall include all incidental work necessary or customarily done for the completion of that item.

4. Preparation of Bid

Each bid must be submitted on the prescribed form in Section 00 41 13. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, its address, and endorsed with the name of the project as specified in Receipt and Opening of Bids, above.

If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in Receipt and Opening of Bids, above.

5. Modification of Bids

Any bidder may modify its bid by written communication at any time prior to the scheduled closing time for receipt of bids. Any telegraphic or electronic mail communication must be received by the OWNER prior to the bid closing time, and, provided further, for any telegraphic communication or electronic mail communication that modifies a bid the OWNER is satisfied that a written confirmation of the modification over the signature of the bidder was mailed prior to the closing time.

The modification communication shall not reveal the bid price but shall provide the addition or subtraction or other modification so that the final prices or terms will not be known by the OWNER until the sealed bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the facsimile transmission or electronic mail.

6. Obligation of Bidder

At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Contract Documents (including all addenda). The failure or omission of any bidder to examine any form, instrument, or document shall in no way relieve any bidder from any obligation in respect of its bid.

7. Information not Guaranteed

All information given in the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the OWNER. All such information is furnished only for the information and convenience of bidders and is not guaranteed.

It is agreed and understood that the OWNER does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated in the Contract Documents.

It is further agreed and understood that no bidder or CONTRACTOR shall use or be entitled to use any of the information made available to it or obtained in any examination made by it in any manner as a basis of or grounds for any claim or demand against the OWNER or the ENGINEER, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other conditions, natural phenomena, existing pipes or other structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

8. Bid Security

Each bid must be accompanied by a certified check, a bid bond, cash, a treasurer's or cashier's check, payable to the OWNER, in the amount stated in Section 00 11 13, ADVERTISEMENT FOR BIDS. Such deposits will be returned to all except the three lowest responsible and eligible bidders within five days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids, and the remaining deposits will be returned promptly after the OWNER and the accepted bidder have executed the Contract, or if no notice of intent to award has been presented to any bidder within 30 days, Saturdays, Sundays and legal holidays excluded, after the date of the opening of bids, upon demand of the bidder at any time thereafter.

9. Time for Completion



The successful general bidder must agree to commence work on or before a date to be specified in the written "Notice to Proceed" from the OWNER and to fully complete the project within the time limit stated in Section 00 41 13, FORM OF GENERAL BID.

10. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications or other prebid documents will be made to any bidder orally, and if provided orally, shall not be relied upon by bidders unless confirmed in a written addendum. All information given to bidders other than by means of the plans, specifications, or by addenda, as described below, is given informally and shall not be used as the basis of a claim against the OWNER or the ENGINEER.

Every request for such interpretation should be in writing (typed, not handwritten) addressed to Weston & Sampson Engineers, Inc., 55 Walkers Brook Drive, Reading, Massachusetts

01867 Attention: CSD, or sent via email to **kunkelb@wseinc.com** and to be given consideration must be received at least ten working days prior to the date fixed for the opening of bids.

Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, when issued, will be mailed by certified mail with return receipt requested to all prospective bidders who have not already received them at the respective addresses furnished by them for such purposes. Bidders picking up sets of bid documents will be given all addenda issued to date and will be required to sign for all documents, acknowledging receipt. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under its bid as submitted. All addenda so issued shall become part of the Contract Documents.

Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, when issued, may be viewed and downloaded as a Portable Document File (PDF) at [www.accentblueprints.com](http://www.accentblueprints.com). A notification of addenda will be emailed to all prospective bidders to email addresses furnished by them for such purposes. Bidders picking up sets of bid documents will be given all addenda issued to date and will be required to sign for all documents, acknowledging receipt. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under its bid as submitted, and each bidder must confirm for itself that it has received all addenda. All addenda so issued shall become part of the Contract Documents.

11. Bid Opening Procedure

The following list of requirements shall be met by each filed bid.

Bids shall be filed at the place and before the time specified in Receipt and Opening of Bids, above.

The bid and all accompanying documents where required shall be signed by the Bidder or its authorized representative before submission.

The total dollar amount of each bid will be read, and the three apparent lowest bids will be selected for further consideration. These three apparent low bids will be read aloud for the benefit of the other bidders and the bid opening procedure will be closed. All those present at the bid opening may examine all bids after the bid opening and after the reading of the three apparent low bids.

12. Comparison of Bids

Bids will be compared on the basis of the quantities and unit and lump sum prices stated in the bid forms.

In the event that there is a discrepancy in Section 00 41 13, FORM OF GENERAL BID between the lump sum or unit prices written in words and figures, the prices written in words will govern.

The OWNER agrees to examine and consider each FORM OF GENERAL BID submitted in accordance with the terms and conditions set forth herein and as set forth in Section 00 41 13, FORM OF GENERAL BID.

13. Statutes Regulating Competitive Bidding

Any bid, which does not comply with the provisions of Massachusetts General Laws Chapter 30, Section 39M as amended, need not be accepted and the OWNER may reject every such bid.

14. Right to Reject Bid

The OWNER may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids, should the OWNER deem it to be in the public interest to do so.

The OWNER may also reject bids which in its sole judgment are either incomplete, conditional, obscure or not responsive or which contain additions not called for, erasures not properly initialed, alterations, or similar irregularities, and may reject bids for any other reason permitted by law, or the OWNER may waive such omissions, conditions or irregularities.

15. Ability and Experience of Bidder

No award will be made to any bidder who cannot satisfy the OWNER that it has sufficient ability and experience in this class of work and sufficient capital and plant to enable it to prosecute and complete the work successfully within the time named. The OWNER's decision or judgment on these matters will be final, conclusive, and binding to the fullest extent permitted by law.

The OWNER may make such investigations as it deems necessary, and the bidder shall furnish to the OWNER, under oath if so required, all such information and data for this purpose as the OWNER may request.

16. Conditions of Work

Each bidder must inform itself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of its obligation to furnish all material and labor necessary to carry out the provisions of its contract. Insofar as possible the CONTRACTOR, in carrying out its work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

17. Security for Faithful Performance

Simultaneously with its delivery of the executed Contract, the CONTRACTOR shall furnish a surety bond or bonds as security for faithful performance of this Contract and for the payment of all persons performing labor and materials under this Contract as specified in Section 00700, GENERAL CONDITIONS included herein, each in the amount of 100 percent of its bid. The surety on such bond or bonds shall be a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the OWNER. The bonds shall remain in force for one year after final acceptance of the work by the OWNER, unless the OWNER, in writing, releases the CONTRACTOR from the obligation sooner.

18. Power of Attorney

Attorneys-in-fact who sign Contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

19. Laws and Regulations

Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this Contract and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where a conflict between Federal and State Laws and Regulations exists, the more stringent requirement shall apply.

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances or bylaws, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

Attention is directed to Section 00 73 73.13 STATE REGULATIONS and to other applicable sections of this specification. In the event of any conflict between provisions of law or regulation quoted or paraphrased in the Contract Documents, the actual provisions of law or regulation shall control.

20. Liquidated Damages for Failure to Enter into Contract

The successful bidder, upon its failure or refusal to execute and deliver the Contract, Bonds and Certificates of Insurance required within 10 days after receipt of notice of the acceptance of the bid, shall, except as otherwise provided by applicable law, forfeit to the OWNER, as liquidated damages for such failure or refusal, the security deposited with its bid, provided that the amount forfeited shall not exceed the difference between its bid price and the bid price of the next lowest responsible and eligible bidder. In case of death, disability, bonafide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the bidder, its bid deposit will be returned.

21. CONTRACTOR Records

The CONTRACTOR shall comply with the provisions of Massachusetts General Laws, Chapter 30, Section 39R, concerning CONTRACTOR records. This section has been reprinted in Section 00 73 73.13, STATE REGULATIONS.

22. Bidder Certification – OSHA Training

All employees who work on Massachusetts public works construction sites, on projects estimated to cost more than \$10,000, must have no less than ten (10) hours of OSHA-approved safety and health training.

The Massachusetts Attorney General is authorized to restrain award of construction contracts to any contractor who is in violation of this requirement and to restrain the performance of these contracts by non-complying contractors.

Noncompliance with this law will disqualify contractors from bidding on public contracts.

23. Prevailing Wage Rates

Prevailing Wage Rates as determined by the Director of the Executive Office of Labor and Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H, as amended, apply to this project. It is the responsibility of the bidder, before bid opening, to request if necessary, any additional information on Prevailing Wage Rates for those trades people who may be employed for the proposed work under this contract.

The Contractor is responsible for requesting up to date wage rates from the Owner prior to the one-year anniversary of the notice to proceed of this contract. The Owner shall obtain updated wage rates from the Director and provide them to the Contractor upon said request.

24. Guarantee

The Contractor shall guarantee that the Work and Services to be performed under the Contract, and all workmanship, materials and equipment performed, furnished, used or

installed in the construction of the same shall be free from defects and flaws, and shall be performed and furnished in strict accordance with the Drawings, Specifications, and other contract documents, that the strength of all parts of all manufactured equipment shall be adequate and as specified and that the performance test requirements of the contract shall be fulfilled. This guarantee shall be for a period of one year from and after the date of completion and acceptance of the Work as stated in the final estimate. If part of the Work is accepted in accordance with that subsection of this AGREEMENT titled "Partial Acceptance", the guarantee for that part of the Work shall be for a period of one year from the date fixed for such acceptance.

If at any time within the said period of guarantee any part of the Work requires repairing, correction or replacement, the Owner may notify the Contractor in writing to make the required repairs, correction or replacements. If the Contractor neglects to commence making such repairs, corrections or replacements to the satisfaction of the Owner within seven (7) days from the date of receipt of such notice, or having commenced fails to prosecute such Work with diligence, the Owner may employ other persons to make said repairs, correction or replacements, and charge the costs, including compensation for additional professional services, to the Contractor.

**29. Efficiency Guarantee Bond**

Whenever it is written that an equipment manufacturer must have a specified period of experience with its product, equipment which does not meet the specified experience period can be considered if the equipment supplier or manufacturer is willing to provide an "Efficiency Guarantee Bond" or cash deposit for the duration of the specified time period which will guarantee replacement of that equipment in the event of failure.

**31. American Iron and Steel Requirements of P.L. 113-76**

This project is subject to the American Iron and Steel Requirements of P.L. 113-76, the Consolidated Appropriations Act of 2014.

END OF SECTION

## SECTION 00 31 32

### SUBSURFACE DATA

#### PART I - GENERAL

##### 1.01 SCOPE:

- A. A subsurface exploration program consisting of soil borings, test pits, and geotechnical laboratory testing has been performed, with reasonable care. The following geotechnical report prepared by Weston & Sampson is appended hereto and is for informational purposes as described below:

“Preliminary Geotechnical Engineering Report, Dawson Recreational Area Improvements, Holden, Massachusetts” dated January 18, 202.

- B. Laboratory analytical data for the site soil and groundwater samples are summarized in the data tables attached to this Section. Associated laboratory analytical reports summarized in the attached data tables are available upon request. The project area includes the Massachusetts Department of Environmental Protection (MassDEP) Release Tracking Number (RTN) 3-0425. An Activity and Use Limitation (AUL) shown on the drawings is present on portions of the work area and the Contractor shall be familiar with the AUL deed restrictions and requirements. Selected AUL pages are attached to this Section.
- C. The Contractor shall review environmental reports to familiarize themselves with the property conditions including but not limited to the RTN listed above at the following MassDEP website: <https://eeaonline.eea.state.ma.us/portal#!/search/wastesite>. The Contractor shall note excavation and management of impacted materials will be conducted under an Engineer-prepared Release Abatement Measure (RAM) Plan in accordance with the requirements of the Massachusetts Contingency Plan (MCP). The RAM Plan will include the requirements of the Contract Documents.
- D. The attached subsurface data is provided for informational purposes only. The Contractor shall not rely on the interpretations, opinions, conclusions, or recommendations included in the report, only the factual data relative to the specific times, locations, and depths/elevations. Specific project requirements are referenced only in the drawings and specifications.
- E. If Contractors deem the subsurface information insufficient, they may, after obtaining Owner’s permission, carry out additional subsurface explorations, at no expense to the Owner.
- F. Subsurface information provided in the Contract Documents is limited by the methods used for obtaining and expressing such data and is subject to various interpretations. The terms used to describe soils, rock, groundwater, and such other conditions are subject to local usage and individual interpretation.

- G. Borings and test pits have been completed substantially at the locations indicated on the drawings and advanced to the depths shown on the logs. Soil information presented in the boring logs, as to classification, gradation, properties, density and consistency, is based on visual observation of recovered samples. Reported groundwater levels are those measured in the field at the particular location and at the time measurements were made, and do not necessarily represent permanent or seasonal groundwater elevations. Groundwater elevations may be affected by temperature, rainfall, tidal fluctuation, and other factors that may not have been present at the time the measurements were made. The Contractors should be aware that groundwater level fluctuations may affect methods of construction.
- H. Subsurface exploration, soil and rock data are for the general information of the Contractors. The Contractors are obligated to examine the site, review boring and test pit logs, all available information and records of explorations, investigations and other pertinent data for the site, and then based upon their own interpretations and investigations decide the character of material to be encountered and excavated, the suitability of the materials to be used for backfilling and such other purposes, the groundwater conditions, difficulties or obstacles likely to be encountered, and other conditions affecting the work. The subsurface data is accurate only at the particular locations and times the subsurface explorations were made. No other warranty either expressed or implied by the Owner, Engineer or their agents is made as to the accuracy of the subsurface information and data shown on the drawings or presented in the Contract Documents.

## PART 2 – PRODUCTS

Not used.

## PART 3 – EXECUTION

Not used.

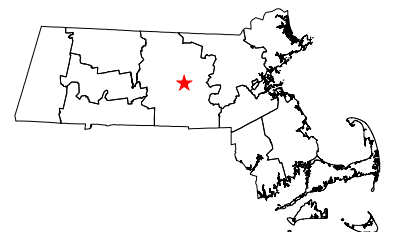
END OF SECTION

Figures

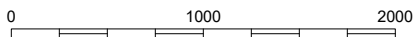




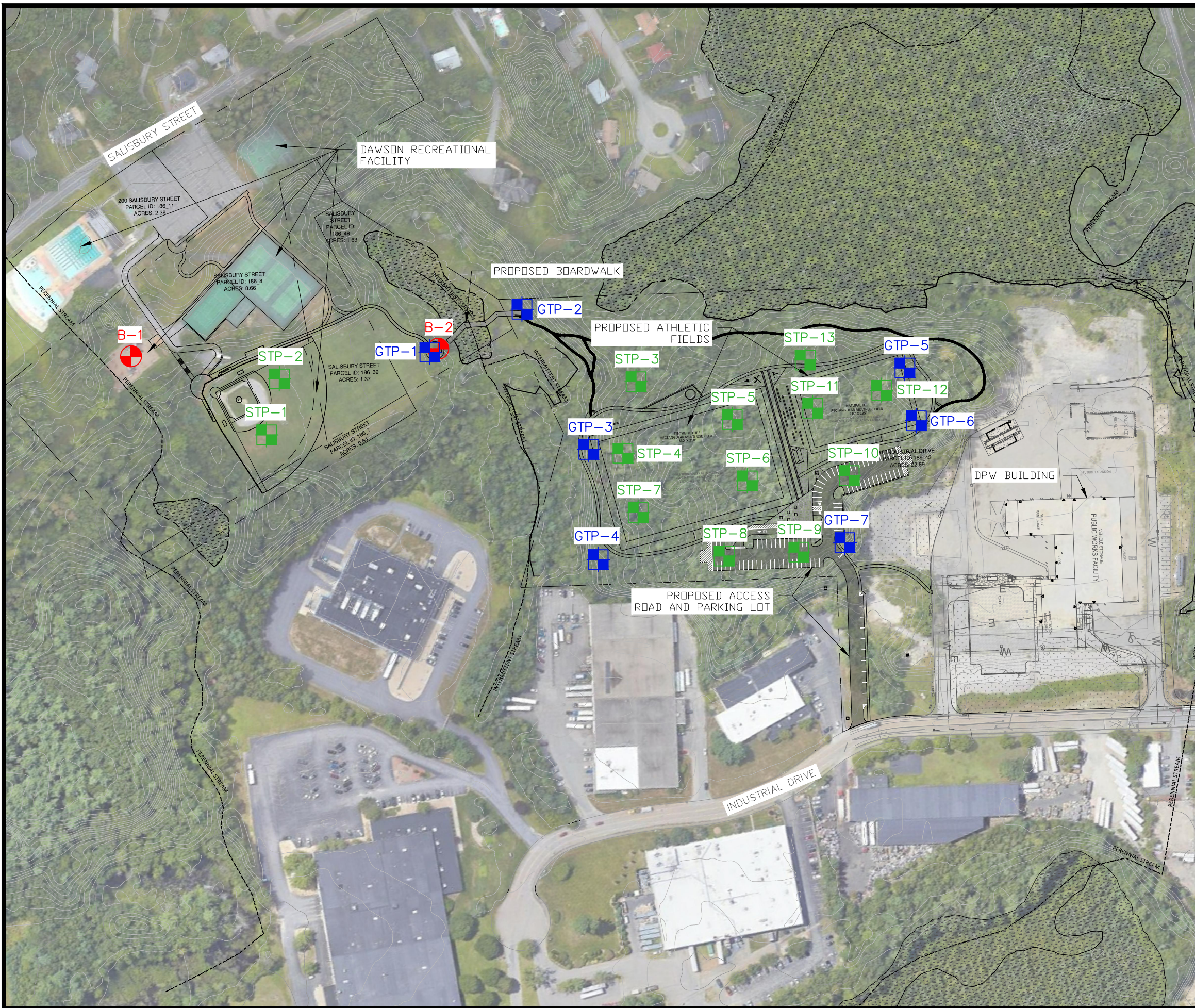
**FIGURE 1  
 LOCUS MAP  
 DAWSON RECREATIONAL AREA IMPROVEMENTS  
 200 SALISBURY STREET  
 TOWN OF HOLDEN, MA  
 WORCESTER COUNTY**



SCALE IN FEET



\\WSE03.LOCAL\WSE\PROJECTS\MA\HOLDEN\_MA\INDUSTRIAL\_DRIVE\_&\_DAWSON\_RECREATION\_AREA\_IMPROVEMENTS\GEOTECH\3.1\_CADD\FIGURE\_2\_SITE\_PLAN.DWG






Weston & Sampson Engineers, Inc.  
 55 Walkers Brook Drive, Suite 100  
 Reading, MA 01867  
 978.532.1900 800.SAMPSON  
 www.westonandsampson.com

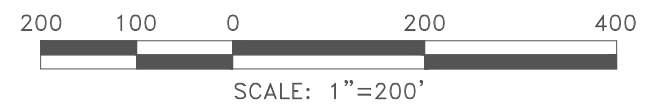
**NOTES**

1. EXPLORATION LOCATIONS SHOWN ARE APPROXIMATE AND BASED ON FIELD MEASUREMENTS RELATIVE TO EXISTING SITE FEATURES.
2. BORINGS WERE COMPLETED BY G&M SUBSURFACE OF NORTH DIGHTON, MASSACHUSETTS AND OBSERVED BY WESTON & SAMPSON ENGINEERS ON NOVEMBER 16 AND 17, 2022.
3. TEST PITS WERE COMPLETED BY THE DEPARTMENT OF PUBLIC WORKS OF HOLDEN MASSACHUSETTS AND OBSERVED BY WESTON & SAMPSON ENGINEERS ON OCTOBER 25 AND 28 AND NOVEMBER 1, 4, AND 21, 2022.

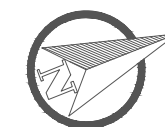
**LEGEND**

-  B-1 DESIGNATION AND APPROXIMATE LOCATION OF BORING
-  GTP-1 DESIGNATION AND APPROXIMATE LOCATION OF GEOTECHNICAL TEST PIT
-  STP-1 DESIGNATION AND APPROXIMATE LOCATION OF STORMWATER TEST PIT

**GRAPHIC SCALE**



**ORIENTATION**



**TITLE**

SITE PLAN

**PROJECT**

DAWSON RECREATIONAL  
 AREA IMPROVEMENTS  
 200 SALISBURY STREET  
 HOLDEN, MA

**FIGURE**

|          |            |
|----------|------------|
| DATE     | 12/2022    |
| DRWN BY  | SLW        |
| CHKD BY  | HDF        |
| PRJ. NO. | ENG22-0852 |
| REV. NO. | -          |

**FIGURE 2**

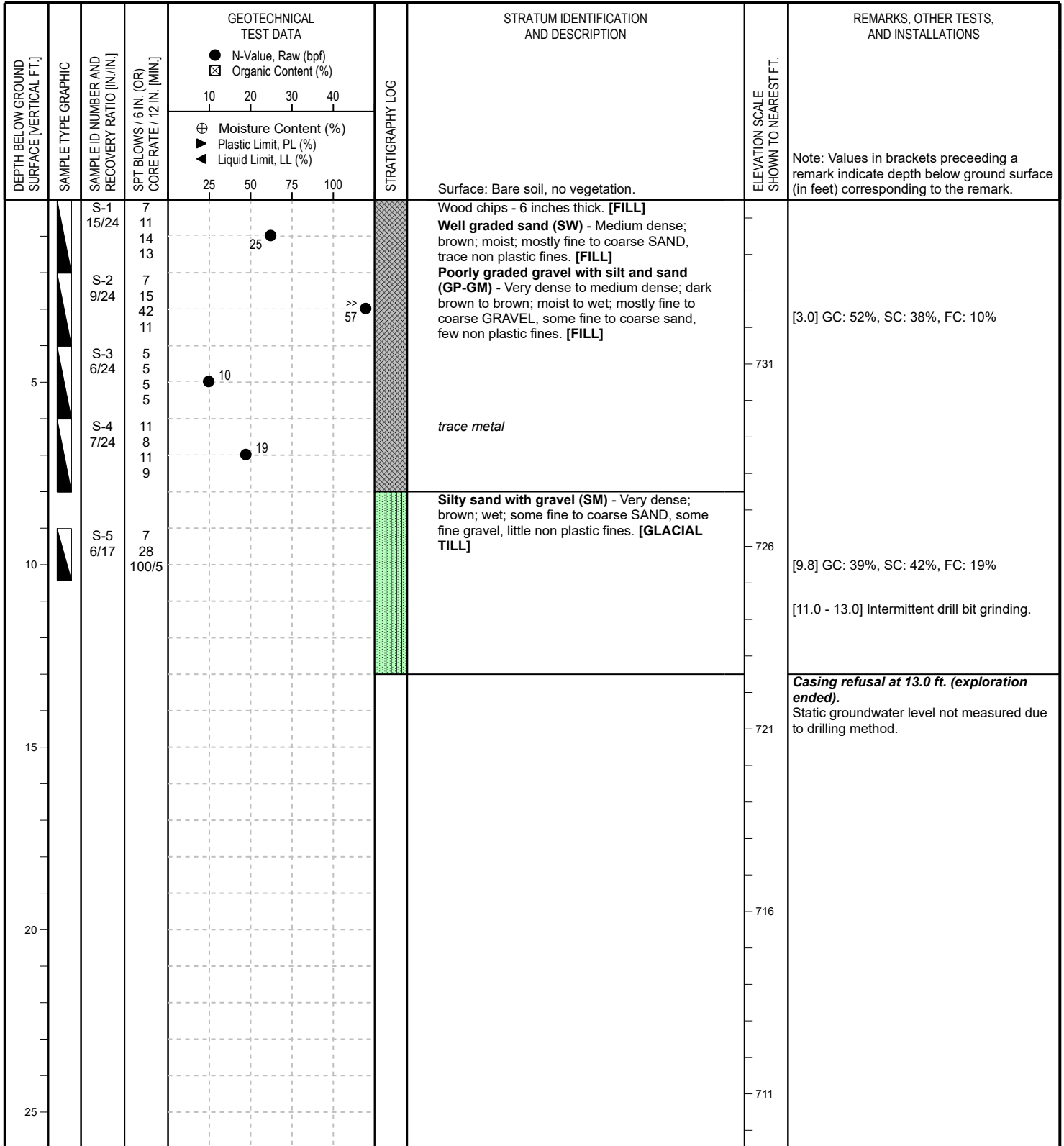
Attachment A

Boring Logs

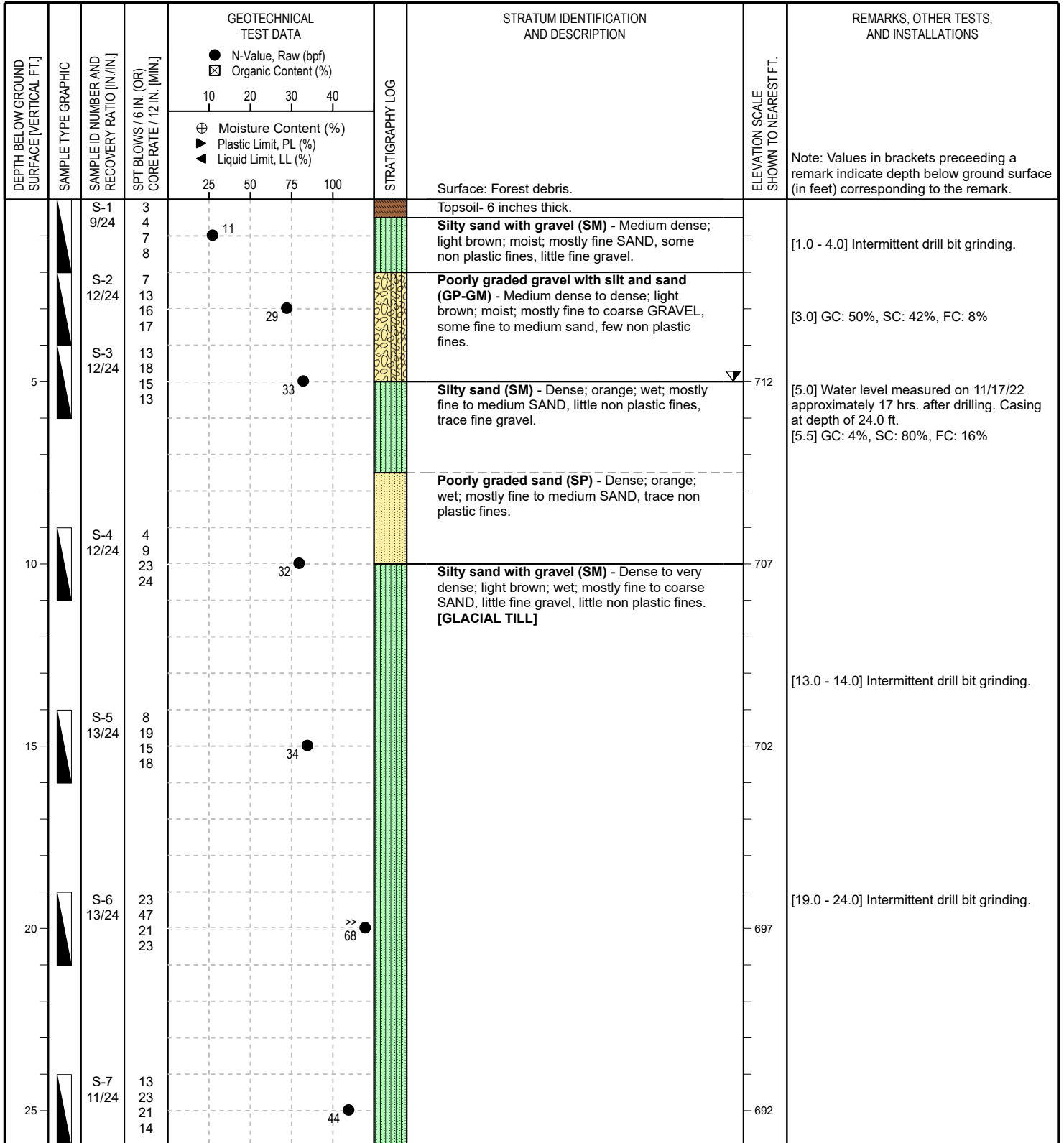
|  |  |  |
|--|--|--|
| CONTRACTOR: <b>G&amp;M Subsurface</b>          | BORING LOCATION: <b>See Attached Figure</b>              | DATE START: <b>November 16, 2022</b>       |
| FOREMAN: <b>Scott Canning</b>                  | ADVANCE METHOD: <b>Rotary Wash Drilling</b>              | DATE FINISH: <b>November 16, 2022</b>      |
| LOGGED BY: <b>Aaron Chabot</b>                 | AUGER DIAMETER: <b>N/A</b>                               | GROUND EL: <b>735.5 ± (NAVD88)</b>         |
| CHECKED BY: <b>TJ Blair, PE</b>                | SUPPORT CASING: <b>Driven Flush-Joint Casing (3" ID)</b> | FINAL DEPTH: <b>1.5 ft. (Refusal)</b>      |
| EQUIPMENT: <b>Geoprobe 7822DT, ATV Mounted</b> | CORING METHOD: <b>N/A</b>                                | GRID COORDS: <b>N/A</b>                    |
| SPT HAMMER: <b>Automatic (140-lb.)</b>         | BACKFILL MATERIAL: <b>Drill Cuttings</b>                 | GRID SYSTEM: <b>NAD83 State Plane (MA)</b> |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.] | SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.] | GEOTECHNICAL TEST DATA |                       |                        |                         | STRATIGRAPHY LOG  | STRATUM IDENTIFICATION AND DESCRIPTION | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|---|--|------------------------|-----------------------|------------------------|-------------------------|---|--|--------------------------------------|--|
|   |                     |   |  | ● N-Value, Raw (bpf)   | ☒ Organic Content (%) | ⊕ Moisture Content (%) | ▼ Plastic Limit, PL (%) |   |  |                                      |  |
|   |                     | S-1<br>13/18                                  | 25<br>18<br>7                                    |                        |                       |                        |                         |   |  |                                      |  |
|   |                     |   |  |                        |                       |                        |                         | Surface: Bare soil, no vegetation.  |  |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |   |  |                        |                       |                        |                         | Wood chips - 6 inches thick. [FILL]   |  |                                      |  |
|   |                     |   |  |                        |                       |                        |                         | Well graded sand (SW) - Medium dense; brown; moist; mostly fine to coarse SAND, trace non plastic fines. [FILL]                                     |  |                                      |  |
|   |                     |   |  |                        |                       |                        |                         | Silty sand with gravel (SM) - Medium dense; gray; moist; mostly fine to coarse SAND, little fine to coarse gravel, little non plastic fines. [FILL] |  |                                      | Sampler refusal at 1.5 ft. (exploration ended).  |
| 5   |                     |   |  |                        |                       |                        |                         |   | 731                                    |                                      |  |
| 10  |                     |   |  |                        |                       |                        |                         |   | 726                                    |                                      |  |
| 15  |                     |   |  |                        |                       |                        |                         |   | 721                                    |                                      |  |
| 20  |                     |   |  |                        |                       |                        |                         |   | 716                                    |                                      |  |
| 25  |                     |   |  |                        |                       |                        |                         |   | 711                                    |                                      |  |

|  |  |  |
|--|--|--|
| CONTRACTOR: <b>G&amp;M Subsurface</b>          | BORING LOCATION: <b>See Attached Figure</b>              | DATE START: <b>November 16, 2022</b>       |
| FOREMAN: <b>Scott Canning</b>                  | ADVANCE METHOD: <b>Rotary Wash Drilling</b>              | DATE FINISH: <b>November 16, 2022</b>      |
| LOGGED BY: <b>Aaron Chabot</b>                 | AUGER DIAMETER: <b>N/A</b>                               | GROUND EL: <b>735.5 ± (NAVD88)</b>         |
| CHECKED BY: <b>TJ Blair, PE</b>                | SUPPORT CASING: <b>Driven Flush-Joint Casing (3" ID)</b> | FINAL DEPTH: <b>13.0 ft. (Refusal)</b>     |
| EQUIPMENT: <b>Geoprobe 7822DT, ATV Mounted</b> | CORING METHOD: <b>N/A</b>                                | GRID COORDS: <b>N/A</b>                    |
| SPT HAMMER: <b>Automatic (140-lb.)</b>         | BACKFILL MATERIAL: <b>Drill Cuttings</b>                 | GRID SYSTEM: <b>NAD83 State Plane (MA)</b> |



|  |  |  |
|--|--|--|
| CONTRACTOR: <b>G&amp;M Subsurface</b>          | BORING LOCATION: <b>See Attached Figure</b>              | DATE START: <b>November 17, 2022</b>       |
| FOREMAN: <b>Scott Canning</b>                  | ADVANCE METHOD: <b>Rotary Wash Drilling</b>              | DATE FINISH: <b>November 17, 2022</b>      |
| LOGGED BY: <b>Aaron Chabot</b>                 | AUGER DIAMETER: <b>N/A</b>                               | GROUND EL: <b>717.0 ± (NAVD88)</b>         |
| CHECKED BY: <b>TJ Blair, PE</b>                | SUPPORT CASING: <b>Driven Flush-Joint Casing (3" ID)</b> | FINAL DEPTH: <b>31.0 ft.</b>               |
| EQUIPMENT: <b>Geoprobe 7822DT, ATV Mounted</b> | CORING METHOD: <b>N/A</b>                                | GRID COORDS: <b>N/A</b>                    |
| SPT HAMMER: <b>Automatic (140-lb.)</b>         | BACKFILL MATERIAL: <b>Drill Cuttings</b>                 | GRID SYSTEM: <b>NAD83 State Plane (MA)</b> |



Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.] | SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.] | GEOTECHNICAL TEST DATA |                       |                        |                         | STRATIGRAPHY LOG   | STRATUM IDENTIFICATION AND DESCRIPTION | ELEVATION SCALE SHOWN TO NEAREST FT.   | REMARKS, OTHER TESTS, AND INSTALLATIONS |
|---|---------------------|---|--|------------------------|-----------------------|------------------------|-------------------------|--|--|--|---|
|   |                     |   |  | ● N-Value, Raw (bpf)   | ☒ Organic Content (%) | ⊕ Moisture Content (%) | ▶ Plastic Limit, PL (%) |  |  |  |   |
| 30  |                     | S-8<br>7/24                                   | 47<br>20<br>21<br>18                             | 10                     | 20                    | 30                     | 40                      | <p><b>Silty sand with gravel (SM)</b> - Dense to very dense; light brown; wet; mostly fine to coarse SAND, little fine gravel, little non plastic fines. <b>[GLACIAL TILL]</b></p> | 687                                    | <p>Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark.</p> <p>Exploration ended at 31.0 ft.</p> |   |
| 35  |                     |   |  |                        |                       |                        |                         |  | 682                                    |  |   |
| 40  |                     |   |  |                        |                       |                        |                         |  | 677                                    |  |   |
| 45  |                     |   |  |                        |                       |                        |                         |  | 672                                    |  |   |
| 50  |                     |   |  |                        |                       |                        |                         |  | 667                                    |  |   |
| 55  |                     |   |  |                        |                       |                        |                         |  | 662                                    |  |   |

# GUIDE TO SUBSURFACE EXPLORATION LOGS



# INDEX SHEET 1 GENERAL INFORMATION

## GENERAL NOTES AND USE OF LOGS

- 1.) Explorations were made by ordinary and conventional methods and with care adequate for Weston & Sampson's study and/or design purposes. The exploration logs are part of a specific report prepared by Weston & Sampson for the referenced project and client, and are an integral part of that report. Information and interpretations are subject to the explanations and limitations stated in the report. Weston & Sampson is not responsible for any interpretations, assumptions, projections, or interpolations made by others.
- 2.) Exploration logs represent general conditions observed at the point of exploration on the date(s) stated. Boundary lines separating soil and rock layers (strata) represent approximate boundaries only and are shown as solid lines where observed and dashed lines where inferred based on drilling action. Actual transitions may be gradual and changes may occur over time.
- 3.) Soil and rock descriptions are based on visual-manual examination of recovered samples, direct observation in test pits (when permissible), and laboratory testing (when conducted).
- 4.) Water level observations were made at the times and under the conditions stated. Fluctuations should be expected to vary with seasons and other factors. Use of fluids during drilling may affect water level observations. The absence of water level observations does not necessarily mean the exploration was dry or that subsurface water will not be encountered during construction.
- 5.) Standard split spoon samplers may not recover particles with any dimension larger than 1-3/8 inches. Reported gravel conditions or poor sample recovery may not reflect actual in-situ conditions.
- 6.) Sections of this guide provide a general overview of Weston & Sampson's practices and procedures for *identifying* and *describing* soil and rock. These procedures are predominantly based on ASTM D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)*, the International Society of Rock Mechanics (ISRM) standards, and the *Engineering Geology Field Manual* published by the Bureau of Reclamation. Not all aspects of this guide relating to description and identification procedures of soil and rock may be applicable in all circumstances.

## SAMPLER GRAPHICS

- Split Spoon (Standard)  
2" OD, 1-3/8" ID
- Split Spoon (Oversize)  
3" OD, 2-3/8" ID
- Shelby or Piston Tube  
3" OD, 2-7/8" ID
- Double-Tube Rock Core Barrel  
2" Core Diameter
- Direct Push with Acetate Liner  
Various Liner Sizes
- Auger Sample  
(from cuttings or hand auger)
- Grab Sample  
(manual, from discrete point)
- Composite Sample  
(multiple grab samples)

## WELL GRAPHICS

- Cement concrete seal around casing or riser pipe
- Bentonite seal around casing or riser pipe
- Cement grout seal around casing or riser pipe
- Soil backfill around riser pipe or beneath screen
- Gravel backfill around screen or riser pipe
- Sand backfill around screen or riser pipe (filter sand)
- Solid-wall riser; Sch. 40 PVC, 1" ID unless noted otherwise
- Slotted screen; Sch. 40 PVC, 1" ID with machined slots

## CAVING / SEEPAGE TERMS

The following caving and/or seepage terms may appear on a test pit log.

| Caving Term   | Criteria                 |
|---------------|--------------------------|
| Minor.....    | less than 1 cubic ft.    |
| Moderate..... | 1 to 3 cubic ft.         |
| Severe.....   | greater than 3 cubic ft. |

| Seepage Term  | Criteria           |
|---------------|--------------------|
| Slow.....     | less than 1 gpm    |
| Moderate..... | 1 to 3 gpm         |
| Fast.....     | greater than 3 gpm |

## KEY TO WATER LEVELS

- Observed in exploration during advancement.
- Measured in exploration at completion, prior to backfilling or well installation.
- Measured in exploration after the stated stabilization period, prior to backfilling, or in well installation if noted.

## DEFINITIONS OF COMMON TERMS

**Sample Recovery Ratio** - The length of material recovered in a drive or push type sampler over the length of sampler penetration, in inches (e.g. 18/24).

**Standard Penetration Test (SPT)** - An in-situ test where a standard split-spoon sampler is driven a distance of 12 or 18 inches (after an initial 6-inch seating interval) using a 140-lb. hammer falling 30 inches for each blow.

**SPT Blows** - The number of hammer blows required to drive a split-spoon sampler each consecutive 6-inch interval during a *Standard Penetration Test*. If no discernable advancement of a split spoon sampler is made after 50 consecutive hammer blows, 50/X indicates *sampler refusal* and is the number of blows required to drive the sampler X inches.

**SPT N-Value (N)** - The uncorrected blow count representation of a soil's penetration resistance over a 12-inch interval after an initial 6-in. seating interval, reported in blows per foot (bpf). The N-value is correlated to soil engineering properties.

**Auger Refusal** - No discernable advancement of the auger over a period of 5 minutes with full rig down pressure applied.

**Casing Refusal (Driven)** - Casing penetration of less than 6 inches after a minimum 50 blows of a drop hammer weighing 300 lbs. or a minimum 100 blows of a drop hammer weighing 140 lbs.

**PID Measurement** - A measurement (electronic reading) taken in the field using a photoionization detector (PID) to detect the presence of volatile organic compounds in a soil sample. Values are reported as benzene equivalent units in parts per million (ppm) unless noted otherwise.

**Rock Quality Designation (RQD)** - A qualitative index measure of the degree of jointing and fracture of a rock core taken from a borehole. The RQD is defined as the sum length of solid core pieces 4 inches or longer divided by the run (cored) length, expressed as a percentage. Higher RQD values may indicate fewer joints and fractures in the rock mass.

**Fill (Made Ground)** - A deposit of soil and/or artificial waste materials that has been placed or altered by human processes.

## LABORATORY TESTS AND FIELD MEASUREMENTS

|         |                  |          |                              |
|---------|------------------|----------|------------------------------|
| MC..... | Moisture Content | IC.....  | 1D Incremental Consolidation |
| OC..... | Organic Content  | VS.....  | Laboratory Vane Shear        |
| PL..... | Plastic Limit    | US.....  | Unconfined Compression       |
| LL..... | Liquid Limit     | TC.....  | Triaxial Compression         |
| GC..... | Gravel Content   | PP.....  | Pocket (Hand) Penetrometer   |
| SC..... | Sand Content     | TV.....  | Torvane (Hand Vane)          |
| FC..... | Fines Content    | PID..... | Photoionization Detector     |
| DS..... | Direct Shear     | FID..... | Flame Ionization Detector    |

## BORING ADVANCEMENT METHODS

**Hollow-Stem Auger Drilling** - Utilizes continuous flight auger sections with hollow stems to advance the borehole. Drill rods and a plug are inserted into the auger stem to prevent the entrance of soil cuttings into the augers.

**Rotary Wash Drilling** - Utilizes downward pressure and rotary action applied to a non-coring bit while washing the cuttings to the surface using a circulating fluid injected down the drill rods. The borehole is supported with either steel casing or the drilling fluid. Where a casing is used, the borehole is advanced sequentially by driving the casing to the desired depth and then cleaning out the casing. The process of driving and cleaning the casing is commonly referred to as the 'drive-and-wash' technique.

**Continuous Sampling** - Includes a variety of methods and procedures during which the borehole is advanced via continuous recovery of soil samples. *Direct Push* sampling is a common method that uses static downward pressure combined with percussive energy to drive a steel mandrel into the ground at continuous intervals while recovering soil samples in disposable acetate liners.

**Rock Coring** - Utilizes downward pressure and rotary action applied to a core barrel equipped with a diamond-set or tungsten carbide coring bit. During conventional coring, the entire barrel is retrieved from the hole upon completion of a core run. Wireline coring allows for removal of the inner barrel assembly containing the actual core while the drill rods and outer barrel remain in the hole. Various types and sizes of core barrels and bits are used.



# GUIDE TO SUBSURFACE EXPLORATION LOGS



# INDEX SHEET 2 SOIL DESCRIPTION

## SOIL CONSTITUENTS

Naturally occurring soils consist of one or more of the following matrix constituents defined in terms of particle size.

| Constituent          | U.S. Sieve Size      | Observed Size (in.) |
|----------------------|----------------------|---------------------|
| Gravel (Coarse)      | 3/4 in. - 3 in.      | 3/4 - 3             |
| Gravel (Fine)        | No. 4 - 3/4 in.      | 1/5 - 3/4           |
| Sand (Coarse)        | No. 10 - No. 40      | 1/16 - 1/5          |
| Sand (Medium)        | No. 40 - No. 10      | 1/64 - 1/16         |
| Sand (Fine)          | No. 200 - No. 40     | 1/300 - 1/64        |
| Fines (Silt or Clay) | Smaller than No. 200 | Less than 1/300     |

## SOIL IDENTIFICATION

Soil identification refers to the grouping of soils with similar physical characteristics into a category defined by a **group name** and corresponding **group symbol** based on estimation of the matrix soil constituents to the nearest 5% and simple manual tests. Proportions of cobbles, boulders, and other non-matrix soil materials are not considered during this procedure but are included in the overall soil description if observed or thought to be present. Refer to the following descriptions and tables adapted from ASTM D2488.

**Coarse-Grained Soil** - Coarse-grained soils contain fewer than 50% fines and are identified based on the following table.

| Primary Constituent | Fines Percent | Type of Fines and Gradation           | Group Symbol | Group Name <sup>(1)</sup>            |
|---------------------|---------------|---------------------------------------|--------------|--------------------------------------|
| GRAVEL              | ≤ 5%          | well graded                           | GW           | Well graded gravel                   |
|                     |               | poorly graded                         | GP           | Poorly graded gravel                 |
|                     | 10%           | clayey well graded fines              | GW-GC        | Well graded gravel with clay fines   |
|                     |               | poorly graded silty well graded fines | GP-GM        | Poorly graded gravel with clay fines |
| SAND                | 15% to 45%    | clay fines                            | GC           | Clayey gravel                        |
|                     |               | silt fines                            | GM           | Silty gravel                         |
|                     | ≤ 5%          | well graded                           | SW           | Well graded sand                     |
|                     |               | poorly graded                         | SP           | Poorly graded sand                   |
|                     | ≥ 10%         | clayey well graded fines              | SW-SC        | Well graded sand with clay fines     |
|                     |               | poorly graded silty well graded fines | SP-SM        | Poorly graded sand with clay fines   |
| clay fines          |               | SC                                    | Clayey sand  |                                      |
| silt fines          |               | SM                                    | Silty sand   |                                      |

<sup>(1)</sup> If soil is a gravel and contains 15% or more sand, add "with sand" to the group name. If soil is a sand and contains 15% of more gravel, add "with gravel" to the group name.

**Inorganic Fine-Grained Soil** - Fine-grained soils contain 50% or more fines and are identified based on the following table.

| Plasticity Criteria | Dry Strength      | Coarse Fraction S = Sand, G = Gravel | Group Symbol | Group Name <sup>(1)</sup> |
|---------------------|-------------------|--------------------------------------|--------------|---------------------------|
| Medium              | Medium to high    | < 15% S + G                          | CL           | Lean clay                 |
|                     |                   | ≥ 30% % S ≥ % G                      | CL           | Sandy lean clay           |
|                     |                   | S + G % S < % G                      | CL           | Gravelly lean clay        |
| Non-plastic         | None to low       | < 15% S + G                          | ML           | Silt                      |
|                     |                   | ≥ 30% % S ≥ % G                      | ML           | Sandy silt                |
|                     |                   | S + G % S < % G                      | ML           | Gravelly silt             |
| High                | High to very high | < 15% S + G                          | CH           | Fat clay                  |
|                     |                   | ≥ 30% % S ≥ % G                      | CH           | Sandy fat clay            |
|                     |                   | S + G % S < % G                      | CH           | Gravelly fat clay         |
| Low to Medium       | Low to medium     | < 15% S + G                          | MH           | Elastic silt              |
|                     |                   | ≥ 30% % S ≥ % G                      | MH           | Sandy elastic silt        |
|                     |                   | S + G % S < % G                      | MH           | Gravelly elastic silt     |

<sup>(1)</sup> If soil contains 15% to 25% sand or gravel, add "with sand" or "with gravel" to the group name.

**Organic Fine-Grained Soil** - Fine-grained soils that contain enough organic particles to influence the soil properties are identified as Organic Soil and assigned the group symbol **OL** or **OH**.

**Highly Organic Soil (Peat)** - Soils composed primarily of plant remains in various stages of decomposition are identified as Peat and given the group symbol **PT**. Peat usually has an organic odor, a dark brown to black color, and a texture ranging from fibrous (original plant structure intact or mostly intact) to amorphous (plant structure decomposed to fine particles).

## SOIL DESCRIPTION

Soils are described in the following general sequence. Deviations may occur in some instances.

### Identification Components

(1) Group Name and Group Symbol

### Description Components

- (2) Consistency (Fine-Grained) or Apparent Density (Coarse-Grained)
- (3) Color (*note, the term "to" may be used to indicate a gradational change*)
- (4) Soil Moisture
- (5) Matrix Soil Constituents (Gravel, Sand, Fines)
  - ↳ Proportion (*by weight*), particle size, plasticity of fines, angularity, etc.
- (6) Non-Matrix Soil Materials and Proportions (*by volume*)
- (7) Other Descriptive Information (Unusual Odor, Structure, Texture, etc.)
- (8) [Geologic Formation Name or Soil Survey Unit]

## SPT N-VALUE CORRELATIONS

| Consistency  | SPT N-Value | Apparent Density | SPT N-Value |
|--------------|-------------|------------------|-------------|
| Very soft    | 0 - 2       | Very loose       | 0 - 5       |
| Soft         | 2 - 4       | Loose            | 5 - 10      |
| Medium stiff | 4 - 8       | Medium dense     | 10 - 30     |
| Stiff        | 8 - 15      | Dense            | 30 - 50     |
| Very stiff   | 15 - 30     | Very dense       | > 50        |
| Hard         | > 30        |                  |             |

## SOIL MOISTURE

**Dry**..... Apparent absence of moisture; dry to the touch.  
**Moist**..... Damp but no visible water.  
**Wet**..... Visible free water; saturated.

## PROPORTIONS / PERCENTAGES

Proportions of gravel, sand, and fines (excluding cobbles, boulders, and other constituents) are stated in the following terms indicating a range of percentages **by weight** (to nearest 5%) of the minus 3-in. soil fraction and add up to 100%.

Proportions of cobbles, boulders, and other non-matrix soil materials including artificial debris, roots, plant fibers, etc. are stated in the following terms indicating a range of percentages **by volume** (to the nearest 5%) of the total soil.

|                     |              |                         |              |
|---------------------|--------------|-------------------------|--------------|
| <b>Mostly</b> ..... | 50% - 100%   | <b>Numerous</b> .....   | 40% - 50%    |
| <b>Some</b> .....   | 30% - 45%    | <b>Common</b> .....     | 25% - 35%    |
| <b>Little</b> ..... | 15% - 25%    | <b>Occasional</b> ..... | 10% - 20%    |
| <b>Few</b> .....    | 5% - 10%     | <b>Trace</b> .....      | Less than 5% |
| <b>Trace</b> .....  | Less than 5% |                         |              |

## PLASTICITY (FINES ONLY)

**Non-plastic**..... Dry specimen ball falls apart easily. Cannot be rolled into thread at any moisture content.  
**Low**..... Dry specimen ball easily crushed with fingers. Can be rolled into 1/8-in. thread with some difficulty.  
**Medium**..... Difficult to crush dry specimen ball with fingers. Easily rolled into 1/8-in. thread.  
**High**..... Cannot crush dry specimen ball with fingers. Easily rolled and re-rolled into 1/8-in. thread.

## COBBLES AND BOULDERS

**Cobbles** - Particles of rock that will pass a 12-in. square opening and be retained on a 3-in. sieve.  
**Boulders** - Particles of rock that will not pass a 12-in. square opening.

*Note: Where the percentage (by volume) of cobbles and/or boulders cannot be accurately or reliably estimated, the terms "with cobbles", "with boulders", or "with cobbles and boulders" may be used to indicate observed or inferred presence.*

# GUIDE TO SUBSURFACE EXPLORATION LOGS



# INDEX SHEET 3 ROCK DESCRIPTION

## ROCK DEFINITION

Where reported on an exploration log, *rock* is defined as any naturally formed aggregate of mineral matter occurring in large masses or fragments. This definition of rock should not be taken as a replacement for any definitions relating to rock and/or rock excavation defined in construction documents. Intensely weathered or decomposed rock that is friable and can be reduced to gravel size particles or smaller by normal hand pressure is identified and described as soil. Poorly indurated formational materials which display both rock-like and soil-like properties are identified and described as rock followed by the soil description. In such cases, the term "poorly indurated" or "weakly cemented" is added to the rock name (e.g. weakly cemented sandstone).

## ROCK IDENTIFICATION

Rock is identified by a combination of *rock type* (igneous, metamorphic, or sedimentary) followed by the *rock name* (e.g. granite, schist, sandstone).

## ROCK DESCRIPTION

Rock descriptions are presented in the following general sequence. The detail of description is dictated by the complexity and objectives of the project.

### Identification Components

- (1) Rock Type and Name

### Description Components

- (2) Rock Grain Size (*for clastic sedimentary rock*)
- (3) Crystal Size (*for igneous and metamorphic rock*)
- (4) Bedding Spacing (*for sedimentary rock*)
- (5) Color
- (6) Hardness and Weathering Descriptors
- (7) Fracture Density
- (8) [Geologic Formation Name]

## ROCK QUALITY DESIGNATION

$$RQD (\%) = \frac{\sum \text{Length of intact core pieces} \geq 4 \text{ inches}}{\text{Total length of core run (inches)}} \times 100$$

The RQD should correlate with the fracture density in most cases. Higher RQD values generally indicate fewer joints and fractures.

## GRAIN / CRYSTAL SIZE

### Grain Size for Clastic Sedimentary Rock

The names of clastic sedimentary rocks are generally based on their predominant clast or grain size (e.g. fine sandstone, medium sandstone, coarse gravel conglomerate, cobble conglomerate, siltstone, claystone).

### Crystal Size for Igneous and Metamorphic Rock

| Grain Size Description           | Average Crystal Size (in.)   |
|----------------------------------|------------------------------|
| Very coarse grained (pegmatitic) | Greater than or equal to 3/8 |
| Coarse-grained                   | Between 3/16 and 3/8         |
| Medium-grained                   | Between 1/32 and 3/16        |
| Fine-grained                     | Between 1/250 and 1/32       |
| Aphanitic                        | Less than or equal to 1/250  |

## BEDDING SPACING

| Bedding Description | Thickness / Spacing |
|---------------------|---------------------|
| Massive             | Less than 10 ft.    |
| Very thickly bedded | 3 ft. to 10 ft.     |
| Thickly bedded      | 1 ft. to 3 ft.      |
| Moderately bedded   | 4 in. to 1 ft.      |
| Thinly bedded       | 1 in. to 4 in.      |
| Very thinly bedded  | 1/4 in. to 1 in.    |
| Laminated           | Less than 1/4 in.   |

Note: Bedding is generally only applicable to sedimentary or bedded volcanic rocks.

## HARDNESS

| Hardness        | Criteria   |
|-----------------|--|
| Extremely hard  | Cannot be scratched with a pocketknife or sharp pick. Can only be chipped with repeated heavy hammer blows.  |
| Very hard       | Cannot be scratched with a pocketknife or sharp pick with difficulty. Breaks with repeated heavy hammer blows.   |
| Hard            | Can be scratched with a pocketknife or sharp pick with difficulty. Breaks with heavy hammer blows.   |
| Moderately hard | Can be scratched with a pocketknife or sharp pick with light or moderate pressure. Breaks with moderate hammer blows.                                  |
| Moderately soft | Can be grooved 1/16 in. deep with a pocketknife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure. |
| Soft            | Can be grooved or gouged easily with a pocketknife or sharp pick. Breaks with light to moderate manual pressure.                                       |
| Very soft       | Can be readily indented, grooved, or gouged with fingernail, or carved with a pocketknife. Breaks with light manual pressure.                          |

## WEATHERING (INTACT ROCK)

| Weathering Description | Discoloration and/or Oxidation   | General Characteristics  |
|------------------------|--|--|
| Fresh                  | Body of rock and fracture surfaces are not discolored or oxidized.   | Rock texture unchanged. Hammer rings when crystalline rocks are struck.  |
| Slightly weathered     | Discoloration or oxidation limited to surface of, or short distance from, fractures. Most surfaces exhibit minor to complete discoloration.                      | Rock texture preserved. Hammer rings when crystalline rocks are struck. Body of rock not weakened.   |
| Moderately weathered   | Discoloration or oxidation extends usually throughout. Fe-Mg minerals appear rusty. All fracture surfaces are discolored or oxidized.                            | Rock texture generally preserved. Hammer does not ring when rock is struck. Body of rock slightly weakened.  |
| Intensely weathered    | Discoloration or oxidation throughout. Feldspar and Fe-Mg minerals altered to clay to some extent. All fracture surfaces are discolored or oxidized and friable. | Rock texture altered by chemical disintegration. Can usually be broken with moderate to heavy manual pressure or by light hammer blow. Body of rock is significantly weakened. |
| Decomposed             | Discoloration or oxidation throughout but resistant minerals such as quartz may be unaltered. All feldspar and Fe-Mg minerals are completely altered to clay.    | Resembles a soil; partial or complete remnant rock structure may be preserved. Can be granulated by hand. Resistant minerals may present as stringers or dikes.                |

## FRACTURE DENSITY

| Description              | Observed Fracture Density               |
|--------------------------|---|
| Unfractured              | No fractures                            |
| Very slightly fractured  | Core lengths greater than 3 ft.         |
| Slightly fractured       | Core lengths mostly from 1 ft. to 3 ft. |
| Moderately fractured     | Core lengths mostly from 4 in. to 1 ft. |
| Intensely fractured      | Core lengths mostly from 1 in. to 4 in. |
| Very intensely fractured | Mostly chips and fragments              |

Note: Fracture density is based on the fracture spacing in recovered core, measured along the core axis (excluding mechanical breaks).

Attachment B

Test Pit Logs

WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Edge of Athletic Field</b>          | DATE START: <b>November 21, 2022</b>         |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>November 21, 2022</b>        |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>Moderate Seepage at 7.5 ft.</b>       | GROUND EL: <b>717.9 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS: <b>Moderate Caving Below 6.5 ft.</b>      | FINAL DEPTH: <b>9.5 ft.</b>                  |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948222 ± / E:562236 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|--|--------------------------------------|--|
|   |                     |                  | Surface: Grass field.  |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Sandy silt (ML)</b> - Dark brown; moist; mostly non plastic FINES, some fine to medium sand, few fine to coarse gravel; <b>[Topsoil]</b> .  |                                      |  |
|   |                     |                  | <b>Silty sand with gravel (SM)</b> - Brown; moist; some fine to coarse SAND, some fine to coarse gravel, little non plastic fines; trace cobbles.  |                                      |  |
| 5   |                     |                  | <b>Well graded sand with silt and gravel (SW-SM)</b> - Brown; moist to wet; mostly fine to coarse SAND, some fine to coarse gravel, few non plastic fines; occasional cobbles, trace boulders. | 713                                  | [4.5] Estimated seasonal high groundwater @ 54 inches. Dark red, 5YR4/6, oxidized soils observed.                      |
|   |                     |                  |  |                                      | [7.5] Weeping from pit face observed.<br>[8.0] Standing water observed.  |
| 10  |                     |                  |  | 708                                  | <b>Caving at 9.5 ft. (exploration ended).</b>  |
| 15  |                     |                  |  | 703                                  |  |



|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>November 4, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>November 4, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>Moderate Seepage at 8.0 ft.</b>       | GROUND EL: <b>718.9 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>10.5 ft.</b>                 |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948464 ± / E:562235 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|--|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.  |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; some organic debris (roots); <b>[Topsoil]</b> .                                |                                      |  |
|   |                     |                  | <b>Sandy silt (ML)</b> - Brown; moist; mostly non plastic FINES, some fine to medium sand, few gravel; few organic debris (roots); <b>[Subsoil]</b> .                                      |                                      |  |
| 5   |                     |                  | <b>Well graded sand with gravel (SW)</b> - Brown; moist to wet; mostly fine to coarse SAND, little fine to coarse gravel, trace non plastic fines; occasional cobbles, trace boulders.     | 714                                  | [5.0] Estimated seasonal high groundwater @ 60 inches. Dark red, 5YR 4/6, oxidized soils observed.                     |
| 10  |                     |                  | <b>Well graded gravel with silt and sand (GW-GM)</b> - Olive; wet; mostly fine to coarse GRAVEL, some fine to coarse sand, few non plastic fines; occasional cobbles, occasional boulders. | 709                                  | [8.0] Weeping from pit face observed.<br>[9.5] Standing water observed.  |
| 15  |                     |                  |  | 704                                  | <b>Exploration ended at 10.5 ft.</b>   |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>November 4, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>November 4, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>Fast Seepage at 3.0 ft.</b>           | GROUND EL: <b>714.5 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS: <b>Moderate Caving Below 9.0 ft.</b>      | FINAL DEPTH: <b>11.0 ft.</b>                 |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948470 ± / E:562500 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|--|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.  |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark.   |
|   |                     |                  | <p><b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b>.</p> <p><b>Well graded sand with silt and gravel (SW-SM)</b> - Olive and dark brown; moist to wet; mostly fine to coarse SAND, little fine to coarse gravel, few non plastic fines.</p> |                                      |  |
| 5   |                     |                  | <p><b>Well graded gravel with silt and sand (GW-GM)</b> - Olive; moist; mostly fine to coarse GRAVEL, some fine to coarse sand, few non plastic fines; occasional cobbles, occasional boulders.</p>  | 710                                  | <p>[2.7] Estimated seasonal high groundwater @ 32 inches. Dark red, 5YR4/6, oxidized soils observed..</p> <p>[3.0] Weeping from pit face observed.</p> <p>[3.5] Standing water observed.</p> |
| 10  |                     |                  |  | 705                                  |  |
| 15  |                     |                  |  | 700                                  | Exploration ended at 11.0 ft.  |



|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>November 1, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>November 1, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>731.8 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>11.0 ft.</b>                 |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948466 ± / E:562712 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|--|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.  |                                      |  |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; some organic debris (roots); <b>[Topsoil]</b> .                                |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Silt with sand (ML)</b> - Brown; moist; mostly non plastic FINES, little fine sand, trace gravel; trace cobbles, trace organics (roots); <b>[Subsoil]</b> .                             |                                      |  |
|   |                     |                  | <b>Silty sand (SM)</b> - Brown; moist; mostly fine SAND, some non plastic fines, few fine to coarse gravel; trace cobbles.   |                                      |  |
|   |                     |                  | <b>Well graded sand with gravel (SW)</b> - Light brown; moist; mostly fine to coarse SAND, little fine to coarse gravel, trace non plastic fines; occasional boulders, occasional cobbles. |                                      |  |
| 5   |                     |                  |  | 727                                  |  |
| 10  |                     |                  |  | 722                                  |  |
| 15  |                     |                  |  | 717                                  | Exploration ended at 11.0 ft.  |



|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>October 25, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>October 25, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>766.2 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>9.0 ft. (Refusal)</b>        |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2949146 ± / E:562530 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS: <b>Refusal at 9 ft due to boulders</b>    | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION  | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|---|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.   |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; some organic debris (roots); <b>[Topsoil]</b> .                       |                                      |  |
|   |                     |                  | <b>Silt (ML)</b> - Dark brown to brown; moist; mostly non plastic FINES, few fine sand; occasional cobbles, occasional boulders, trace organic debris (roots); <b>[Subsoil]</b> . |                                      |  |
|   |                     |                  | <b>Silty sand with gravel (SM)</b> - Brown; moist; some fine to coarse SAND, some fine to coarse gravel, some non plastic fines; occasional cobbles, occasional boulders.         |                                      |  |
| 5   |                     |                  | <b>Silty gravel with sand (GM)</b> - Gray; dry; some fine to coarse GRAVEL, some non plastic fines, little fine to coarse sand; occasional cobbles, occasional boulders.          | 762                                  | [3.5 - 9.0] Excavation very difficult.   |
| 10  |                     |                  |   | 757                                  | <b>Excavation refusal at 9.0 ft. (exploration ended).</b>  |
| 15  |                     |                  |   | 752                                  |  |





|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>October 25, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>October 25, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>763.6 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>10.0 ft.</b>                 |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2949129 ± / E:562665 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION  | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|---|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.   |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; some organic debris (roots); <b>[Topsoil]</b> .<br><b>Silt (ML)</b> - Brown; moist; mostly non plastic FINES, few fine sand; occasional boulders, occasional cobbles. |                                      |  |
|   |                     |                  | <b>Well graded sand with silt and gravel (SW-SM)</b> - Gray; moist; mostly fine to coarse SAND, some fine to coarse gravel, few non plastic fines; common boulders, occasional cobbles.   |                                      |  |
| 5   |                     |                  | <b>Gravelly silt (ML)</b> - Gray; moist; mostly non plastic FINES, some fine to coarse gravel, few fine to coarse sand; common cobbles, occasional boulders.  | 759                                  |  |
| 10  |                     |                  |   | 754                                  | Exploration ended at 10.0 ft.  |
| 15  |                     |                  |   | 749                                  |  |



|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>October 25, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>October 25, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>742.5 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>10.0 ft.</b>                 |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948921 ± / E:562854 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION  | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|---|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.   |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; few organic debris (roots); <b>[Topsoil]</b> .                        |                                      |  |
|   |                     |                  | <b>Silt with sand (ML)</b> - Brown; moist; mostly non plastic FINES, few fine to coarse sand, trace gravel; occasional cobbles.   |                                      |  |
|   |                     |                  | <b>Well graded sand with gravel (SW)</b> - Light brown; moist; mostly fine to coarse SAND, some fine to coarse gravel, trace non plastic fines; occasional cobbles.               |                                      |  |
| 5   |                     |                  | <b>Silty sand with gravel (SM)</b> - Light brown; dry; mostly fine to medium SAND, some non plastic fines, little fine to coarse gravel; occasional cobbles, occasional boulders. | 738                                  | [5.0 - 8.0] Boulder 3x4 ft observed.   |
| 10  |                     |                  |   | 733                                  |  |
| 15  |                     |                  |   | 728                                  | Exploration ended at 10.0 ft.  |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Athletic Field</b>                  | DATE START: <b>November 21, 2022</b>         |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>November 21, 2022</b>        |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>Moderate Seepage at 10.2 ft.</b>      | GROUND EL: <b>723.3 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>10.5 ft.</b>                 |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2947871 ± / E:562333 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION  | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|---|--------------------------------------|--|
|   |                     |                  | Surface: Grass field.   |                                      |  |
|   |                     |                  | <b>Sandy silt (ML)</b> - Dark brown; moist; mostly non plastic FINES, some fine to medium sand, few fine to coarse gravel; trace organic debris (roots); <b>[Topsoil]</b> . |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark.<br><br>[6.3] Estimated seasonal high groundwater @ 75 inches. Dark red, 5YR 3/6, oxidized soils observed. |
|   |                     |                  | <b>Silty sand with gravel (SM)</b> - Dark brown; moist; mostly fine to coarse SAND, some fine to coarse gravel, little non plastic fines; trace cobbles.                    |                                      |  |
| 5   |                     |                  | <b>Well graded sand with gravel (SW)</b> - Brown; moist to wet; mostly fine to coarse SAND, some fine to coarse gravel, trace non plastic fines; occasional cobbles.        | 719                                  |  |
| 10  |                     |                  |   | 714                                  | [10.5] Standing water observed.<br><b>Exploration ended at 10.5 ft.</b>  |
| 15  |                     |                  |   | 709                                  |  |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Athletic Field</b>                  | DATE START: <b>November 21, 2022</b>         |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>November 21, 2022</b>        |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>Moderate Seepage at 8.3 ft.</b>       | GROUND EL: <b>722.3 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>8.5 ft.</b>                  |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2947924 ± / E:562191 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION  | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|---|--------------------------------------|--|
|   |                     |                  | Surface: Grass field.   |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Sandy silt (ML)</b> - Dark brown; moist; mostly non plastic FINES, some fine to medium sand, few fine to coarse gravel; trace organic debris (roots); <b>[Topsoil]</b> . |                                      |  |
|   |                     |                  | <b>Silty sand with gravel (SM)</b> - Dark brown; moist; some fine to medium sand, some non plastic fines, some fine to coarse gravel; trace cobbles.                        |                                      |  |
| 5   |                     |                  | <b>Well graded sand with gravel (SW)</b> - Light brown; moist to wet; mostly fine to coarse SAND, little fine to coarse gravel, trace non plastic fines; trace cobbles.     | 718                                  | [7.0] Estimated seasonal high groundwater. Dark red, 5YR 4/6, oxidized soils observed.                                 |
| 10  |                     |                  |   | 713                                  | [8.5] Standing water observed. <b>Exploration ended at 8.5 ft.</b>   |
| 15  |                     |                  |   | 708                                  |  |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>November 21, 2022</b>         |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>November 21, 2022</b>        |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>734.2 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>9.0 ft. (Refusal)</b>        |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948617 ± / E:562428 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|--|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.  |                                      |  |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b> .                            |                                      |  |
|   |                     |                  | <b>Silt with sand (ML)</b> - Brown; moist; mostly non plastic FINES, few fine sand, trace gravel; trace organic debris (roots); <b>[Subsoil]</b> .                                       |                                      |  |
|   |                     |                  | <b>Silty sand (SM)</b> - Brown; moist; mostly fine SAND, some non plastic fines, few gravel; trace cobbles.  |                                      |  |
| 5   |                     |                  | <b>Well graded gravel with silt and sand (GW-GM)</b> - Brown; moist; mostly fine to coarse GRAVEL, some fine to coarse sand, few non plastic fines; common cobbles, occasional boulders. | 730                                  |  |
| 10  |                     |                  |  | 725                                  | [9.0] Boulders observed. <b>Excavation refusal at 9.0 ft. (exploration ended).</b> |
| 15  |                     |                  |  | 720                                  |  |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>November 1, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>November 1, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>737.3 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS: <b>Moderate Caving Below 8.0 ft.</b>      | FINAL DEPTH: <b>10.0 ft.</b>                 |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948552 ± / E:562561 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION  | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|---|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.   |                                      |  |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b> .       |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Silt with sand (ML)</b> - Brown; moist; mostly non plastic FINES, few fine sand, trace gravel; trace organic debris (roots); <b>[Subsoil]</b> .                  |                                      |  |
|   |                     |                  | <b>Silty sand (SM)</b> - Brown; moist; mostly fine SAND, some non plastic fines, few gravel; trace cobbles.   |                                      |  |
|   |                     |                  | <b>Well graded sand with gravel (SW)</b> - Light brown; moist; mostly fine to coarse SAND, some fine to coarse gravel, trace non plastic fines; occasional cobbles. |                                      |  |
| 5   |                     |                  |   | 733                                  |  |
| 10  |                     |                  |   | 728                                  |  |
| 15  |                     |                  |   | 723                                  |  |
|   |                     |                  |   |                                      | <b>Caving at 10.0 ft. (exploration ended).</b>   |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>October 28, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>October 28, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>757.4 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>8.5 ft. (Refusal)</b>        |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948805 ± / E:562551 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|--|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.  |                                      |  |
|   |                     |                  | <p><b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b>.</p> <p><b>Silt with sand (ML)</b> - Dark brown; moist; mostly non plastic FINES, trace fine sand; trace organic debris (roots); <b>[Subsoil]</b>.</p> <p><b>Silt with sand (ML)</b> - Brown; moist; mostly non plastic FINES, little fine sand; common cobbles, common boulders.</p> <p><b>Well graded gravel with silt and sand (GW-GM)</b> - Brown; moist; mostly fine to coarse GRAVEL, some fine to coarse sand, few non plastic fines; common boulders, common cobbles.</p> | 753                                  | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
| 5   |                     |                  |  |                                      |  |
| 10  |                     |                  |  |                                      | <b>Excavation refusal at 8.5 ft. (exploration ended).</b>  |
| 15  |                     |                  |  | 743                                  |  |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>October 28, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>October 28, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>753.9 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>8.0 ft. (Refusal)</b>        |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948769 ± / E:562676 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS: <b>Refusal at 8 ft due to boulders</b>    | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|--|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.  |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b> .    |                                      |  |
|   |                     |                  | <b>Silt (ML)</b> - Dark brown to brown; moist to moist; mostly non plastic FINES, few fine sand; trace cobbles, trace organic debris (roots); <b>[Subsoil]</b> . |                                      |  |
| 5   |                     |                  | <b>Well graded gravel with sand (GW)</b> - Brown; moist; mostly fine to coarse GRAVEL, little fine to coarse sand, trace non plastic fines; occasional cobbles.  | 749                                  |  |
| 10  |                     |                  |  | 744                                  | <b>Excavation refusal at 8.0 ft. (exploration ended).</b>  |
| 15  |                     |                  |  | 739                                  |  |





WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>November 1, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>November 1, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>743.4 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>11.0 ft. (Refusal)</b>       |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948563 ± / E:562679 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS: <b>Refusal at 11 ft due to boulders</b>   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|--|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.  |                                      |  |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b> .                            |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Silt with sand (ML)</b> - Dark brown to brown; moist; mostly non plastic FINES, few fine sand, trace gravel; trace cobbles, trace organic debris (roots); <b>[Subsoil]</b> .          |                                      |  |
|   |                     |                  | <b>Silty sand (SM)</b> - Brown; moist; mostly fine SAND, some non plastic fines, few gravel; trace cobbles.  |                                      |  |
|   |                     |                  | <b>Well graded gravel with sand (GW)</b> - Light brown; moist; mostly fine to coarse GRAVEL, some fine to coarse sand, trace non plastic fines; occasional cobbles, occasional boulders. |                                      |  |
| 5   |                     |                  |  | 739                                  |  |
| 10  |                     |                  |  | 734                                  |  |
| 15  |                     |                  |  | 729                                  | <b>Excavation refusal at 11.0 ft. (exploration ended).</b>   |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>November 1, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>November 1, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>751.4 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>11.0 ft. (Refusal)</b>       |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948689 ± / E:562783 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS: <b>Refusal at 11 ft due to boulders</b>   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS             |
|---|---------------------|------------------|--|--------------------------------------|---|
|   |                     |                  | Surface: Forest debris.  |                                      |   |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b> .                                      |                                      |   |
|   |                     |                  | <b>Silt with sand (ML)</b> - Brown; moist; mostly non plastic FINES, few fine sand, trace gravel; trace cobbles, trace organic debris (roots); <b>[Subsoil]</b> .                                  |                                      |   |
|   |                     |                  | <b>Silty sand (SM)</b> - Brown; moist; mostly fine SAND, some non plastic fines, few gravel; trace cobbles.  |                                      |   |
|   |                     |                  | <b>Well graded gravel with silt and sand (GW-GM)</b> - Light brown; moist; mostly fine to coarse GRAVEL, some fine to coarse sand, few non plastic fines; occasional boulders, occasional cobbles. |                                      |   |
| 5   |                     |                  |  | 747                                  |   |
| 10  |                     |                  |  | 742                                  |   |
| 15  |                     |                  |  | 737                                  | Excavation refusal at 11.0 ft. (exploration ended). |

WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>November 1, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>November 1, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>752.7 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>7.0 ft. (Refusal)</b>        |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948827 ± / E:562836 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS: <b>Refusal at 7 ft due to boulders</b>    | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS                   |
|---|---------------------|------------------|--|--------------------------------------|---|
|   |                     |                  | Surface: Forest debris.  |                                      |   |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b> .                      |                                      |   |
|   |                     |                  | <b>Sandy silt (ML)</b> - Dark brown; moist; mostly non plastic FINES, some fine to medium sand; trace cobbles.   |                                      |   |
|   |                     |                  | <b>Silty sand with gravel (SM)</b> - Brown; moist; mostly fine to medium SAND, some non plastic fines, little fine to coarse gravel; trace cobbles.                                |                                      |   |
|   |                     |                  | <b>Well graded sand with gravel (SW)</b> - Brown; moist; mostly fine to coarse SAND, some fine to coarse gravel, trace non plastic fines; occasional cobbles, occasional boulders. |                                      |   |
| 5   |                     |                  |  | 748                                  |   |
| 10  |                     |                  |  | 743                                  | <b>Excavation refusal at 7.0 ft. (exploration ended).</b> |
| 15  |                     |                  |  | 738                                  |   |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>October 25, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>October 25, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>757.9 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>10.0 ft. (Refusal)</b>       |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948989 ± / E:562720 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS:   | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION  | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS                    |
|---|---------------------|------------------|---|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.   |                                      |  |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b> .                         |                                      |  |
|   |                     |                  | <b>Gravelly silt (ML)</b> - Brown; moist; mostly non plastic FINES, little fine to coarse gravel, few fine to medium sand; common boulders, occasional cobbles.                       |                                      |  |
|   |                     |                  | <b>Well graded sand with gravel (SW)</b> - Olive; moist; mostly fine to coarse SAND, some fine to coarse gravel, trace non plastic fines; occasional boulders, occasional cobbles.    |                                      |  |
| 5   |                     |                  |   | 753                                  |  |
|   |                     |                  | <b>Sandy silt with gravel (ML)</b> - Light olive; moist; mostly non plastic FINES, little fine to medium sand, little fine to coarse gravel; occasional boulders, occasional cobbles. |                                      |  |
|   |                     |                  |   |                                      | [5.5 - 10.0] Very difficult digging.                       |
| 10  |                     |                  |   | 748                                  | <b>Excavation refusal at 10.0 ft. (exploration ended).</b> |
|   |                     |                  |   |                                      |  |
| 15  |                     |                  |   | 743                                  |  |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>October 28, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>October 28, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>756.8 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>7.0 ft. (Refusal)</b>        |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948945 ± / E:562565 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS: <b>Refusal at 7 ft due to boulders</b>    | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS                   |
|---|---------------------|------------------|--|--------------------------------------|---|
|   |                     |                  | Surface: Forest debris.  |                                      |   |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b> .                                  |                                      |   |
|   |                     |                  | <b>Sandy silt with gravel (ML)</b> - Olive to brown; moist; mostly non plastic FINES, little fine sand, little gravel; occasional cobbles, trace boulders.                                     |                                      |   |
| 5   |                     |                  | <b>Well graded sand with silt and gravel (SW-SM)</b> - Brown; moist; mostly medium to coarse SAND, some fine to coarse gravel, few non plastic fines; occasional cobbles, occasional boulders. | 752                                  |   |
| 10  |                     |                  |  | 747                                  | <b>Excavation refusal at 7.0 ft. (exploration ended).</b> |
| 15  |                     |                  |  | 742                                  |   |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>October 25, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>October 25, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>760.1 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>8.5 ft. (Refusal)</b>        |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2949087 ± / E:562605 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS: <b>Refusal at 8.5 ft due to boulders</b>  | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION   | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|--|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.  |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b> .                    |                                      |  |
|   |                     |                  | <b>Silt (ML)</b> - Dark brown to brown; moist; mostly non plastic FINES, few fine sand; few organic debris (roots); <b>[Subsoil]</b> .   |                                      |  |
|   |                     |                  | <b>Well graded sand with gravel (SW)</b> - Olive; moist; mostly fine to coarse SAND, some fine to coarse gravel, trace non plastic fines; occasional boulders.                   | 756                                  | [3.0 - 8.5] Very difficult digging.  |
| 5   |                     |                  | <b>Gravelly silt with sand (ML)</b> - Olive; moist; mostly non plastic FINES, little fine to coarse gravel, little fine to medium sand; occasional boulders, occasional cobbles. |                                      |  |
| 10  |                     |                  |  | 751                                  | <b>Excavation refusal at 8.5 ft. (exploration ended).</b>  |
| 15  |                     |                  |  | 746                                  |  |



WSE Project: ENG22-0852

200 Salisbury Street, Holden, MA

Page 1 of 1

|   |   |  |
|---|---|--|
| CONTRACTOR: <b>Excavated by Town DPW</b>            | TEST PIT LOCATION: <b>Wooded Area</b>                     | DATE START: <b>October 28, 2022</b>          |
| OPERATOR: <b>Jason Putnam</b>                       | PLAN DIMENSIONS: <b>Length: 10.0 ft. , Width: 7.0 ft.</b> | DATE FINISH: <b>October 28, 2022</b>         |
| LOGGED BY: <b>Nathaniel Parker</b>                  | SEEPAGE REMARKS: <b>No Seepage Observed</b>               | GROUND EL: <b>753.0 ± (NAVD88)</b>           |
| CHECKED BY: <b>Hector Flores</b>                    | CAVING REMARKS:   | FINAL DEPTH: <b>8.0 ft. (Refusal)</b>        |
| EQUIPMENT: <b>Hydraulic Excavator, Compact</b>      | BACKFILL MATERIAL: <b>Excavated Soil</b>                  | GRID COORDS: <b>N:2948948 ± / E:562485 ±</b> |
| BUCKET TYPE: <b>Toothed, 24-in. (6.4 cubic-ft.)</b> | OTHER COMMENTS: <b>Refusal at 8 ft due to boulders</b>    | GRID SYSTEM: <b>NAD83 State Plane (MA)</b>   |

| DEPTH BELOW GROUND SURFACE [VERTICAL FT.] | SAMPLE TYPE GRAPHIC | STRATIGRAPHY LOG | STRATUM IDENTIFICATION AND DESCRIPTION  | ELEVATION SCALE SHOWN TO NEAREST FT. | REMARKS, OTHER TESTS, AND INSTALLATIONS  |
|---|---------------------|------------------|---|--------------------------------------|--|
|   |                     |                  | Surface: Forest debris.   |                                      | Note: Values in brackets preceding a remark indicate depth below ground surface (in feet) corresponding to the remark. |
|   |                     |                  | <b>Organic soil with sand (OL)</b> - Dark brown; moist; mostly organic non plastic FINES, little fine sand; little organic debris (roots); <b>[Topsoil]</b> .             |                                      |  |
|   |                     |                  | <b>Silt with sand (ML)</b> - Brown; moist; mostly non plastic FINES, little fine sand, few gravel; occasional cobbles, trace organic debris (roots); <b>[Subsoil]</b> .   |                                      |  |
| 5   |                     |                  | <b>Well graded gravel with sand (GW)</b> - Brown; moist; mostly fine to coarse GRAVEL, some fine to coarse sand, trace non plastic fines; common cobbles, trace boulders. | 748                                  |  |
| 10  |                     |                  |   | 743                                  | <b>Excavation refusal at 8.0 ft. (exploration ended).</b>  |
| 15  |                     |                  |   | 738                                  |  |



# GUIDE TO SUBSURFACE EXPLORATION LOGS



# INDEX SHEET 1 GENERAL INFORMATION

## GENERAL NOTES AND USE OF LOGS

- 1.) Explorations were made by ordinary and conventional methods and with care adequate for Weston & Sampson's study and/or design purposes. The exploration logs are part of a specific report prepared by Weston & Sampson for the referenced project and client, and are an integral part of that report. Information and interpretations are subject to the explanations and limitations stated in the report. Weston & Sampson is not responsible for any interpretations, assumptions, projections, or interpolations made by others.
- 2.) Exploration logs represent general conditions observed at the point of exploration on the date(s) stated. Boundary lines separating soil and rock layers (strata) represent approximate boundaries only and are shown as solid lines where observed and dashed lines where inferred based on drilling action. Actual transitions may be gradual and changes may occur over time.
- 3.) Soil and rock descriptions are based on visual-manual examination of recovered samples, direct observation in test pits (when permissible), and laboratory testing (when conducted).
- 4.) Water level observations were made at the times and under the conditions stated. Fluctuations should be expected to vary with seasons and other factors. Use of fluids during drilling may affect water level observations. The absence of water level observations does not necessarily mean the exploration was dry or that subsurface water will not be encountered during construction.
- 5.) Standard split spoon samplers may not recover particles with any dimension larger than 1-3/8 inches. Reported gravel conditions or poor sample recovery may not reflect actual in-situ conditions.
- 6.) Sections of this guide provide a general overview of Weston & Sampson's practices and procedures for *identifying* and *describing* soil and rock. These procedures are predominantly based on ASTM D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)*, the International Society of Rock Mechanics (ISRM) standards, and the *Engineering Geology Field Manual* published by the Bureau of Reclamation. Not all aspects of this guide relating to description and identification procedures of soil and rock may be applicable in all circumstances.

## SAMPLER GRAPHICS

- Split Spoon (Standard)  
2" OD, 1-3/8" ID
- Split Spoon (Oversize)  
3" OD, 2-3/8" ID
- Shelby or Piston Tube  
3" OD, 2-7/8" ID
- Double-Tube Rock Core Barrel  
2" Core Diameter
- Direct Push with Acetate Liner  
Various Liner Sizes
- Auger Sample  
(from cuttings or hand auger)
- Grab Sample  
(manual, from discrete point)
- Composite Sample  
(multiple grab samples)

## WELL GRAPHICS

- Cement concrete seal around casing or riser pipe
- Bentonite seal around casing or riser pipe
- Cement grout seal around casing or riser pipe
- Soil backfill around riser pipe or beneath screen
- Gravel backfill around screen or riser pipe
- Sand backfill around screen or riser pipe (filter sand)
- Solid-wall riser; Sch. 40 PVC, 1" ID unless noted otherwise
- Slotted screen; Sch. 40 PVC, 1" ID with machined slots

## CAVING / SEEPAGE TERMS

The following caving and/or seepage terms may appear on a test pit log.

| Caving Term   | Criteria                 |
|---------------|--------------------------|
| Minor.....    | less than 1 cubic ft.    |
| Moderate..... | 1 to 3 cubic ft.         |
| Severe.....   | greater than 3 cubic ft. |
| Seepage Term  | Criteria                 |
| Slow.....     | less than 1 gpm          |
| Moderate..... | 1 to 3 gpm               |
| Fast.....     | greater than 3 gpm       |

## KEY TO WATER LEVELS

- Observed in exploration during advancement.
- Measured in exploration at completion, prior to backfilling or well installation.
- Measured in exploration after the stated stabilization period, prior to backfilling, or in well installation if noted.

## DEFINITIONS OF COMMON TERMS

**Sample Recovery Ratio** - The length of material recovered in a drive or push type sampler over the length of sampler penetration, in inches (e.g. 18/24).

**Standard Penetration Test (SPT)** - An in-situ test where a standard split-spoon sampler is driven a distance of 12 or 18 inches (after an initial 6-inch seating interval) using a 140-lb. hammer falling 30 inches for each blow.

**SPT Blows** - The number of hammer blows required to drive a split-spoon sampler each consecutive 6-inch interval during a *Standard Penetration Test*. If no discernable advancement of a split spoon sampler is made after 50 consecutive hammer blows, 50/X indicates *sampler refusal* and is the number of blows required to drive the sampler X inches.

**SPT N-Value (N)** - The uncorrected blow count representation of a soil's penetration resistance over a 12-inch interval after an initial 6-in. seating interval, reported in blows per foot (bpf). The N-value is correlated to soil engineering properties.

**Auger Refusal** - No discernable advancement of the auger over a period of 5 minutes with full rig down pressure applied.

**Casing Refusal (Driven)** - Casing penetration of less than 6 inches after a minimum 50 blows of a drop hammer weighing 300 lbs. or a minimum 100 blows of a drop hammer weighing 140 lbs.

**PID Measurement** - A measurement (electronic reading) taken in the field using a photoionization detector (PID) to detect the presence of volatile organic compounds in a soil sample. Values are reported as benzene equivalent units in parts per million (ppm) unless noted otherwise.

**Rock Quality Designation (RQD)** - A qualitative index measure of the degree of jointing and fracture of a rock core taken from a borehole. The RQD is defined as the sum length of solid core pieces 4 inches or longer divided by the run (cored) length, expressed as a percentage. Higher RQD values may indicate fewer joints and fractures in the rock mass.

**Fill (Made Ground)** - A deposit of soil and/or artificial waste materials that has been placed or altered by human processes.

## LABORATORY TESTS AND FIELD MEASUREMENTS

|         |                  |          |                              |
|---------|------------------|----------|------------------------------|
| MC..... | Moisture Content | IC.....  | 1D Incremental Consolidation |
| OC..... | Organic Content  | VS.....  | Laboratory Vane Shear        |
| PL..... | Plastic Limit    | US.....  | Unconfined Compression       |
| LL..... | Liquid Limit     | TC.....  | Triaxial Compression         |
| GC..... | Gravel Content   | PP.....  | Pocket (Hand) Penetrometer   |
| SC..... | Sand Content     | TV.....  | Torvane (Hand Vane)          |
| FC..... | Fines Content    | PID..... | Photoionization Detector     |
| DS..... | Direct Shear     | FID..... | Flame Ionization Detector    |

## BORING ADVANCEMENT METHODS

**Hollow-Stem Auger Drilling** - Utilizes continuous flight auger sections with hollow stems to advance the borehole. Drill rods and a plug are inserted into the auger stem to prevent the entrance of soil cuttings into the augers.

**Rotary Wash Drilling** - Utilizes downward pressure and rotary action applied to a non-coring bit while washing the cuttings to the surface using a circulating fluid injected down the drill rods. The borehole is supported with either steel casing or the drilling fluid. Where a casing is used, the borehole is advanced sequentially by driving the casing to the desired depth and then cleaning out the casing. The process of driving and cleaning the casing is commonly referred to as the 'drive-and-wash' technique.

**Continuous Sampling** - Includes a variety of methods and procedures during which the borehole is advanced via continuous recovery of soil samples. *Direct Push* sampling is a common method that uses static downward pressure combined with percussive energy to drive a steel mandrel into the ground at continuous intervals while recovering soil samples in disposable acetate liners.

**Rock Coring** - Utilizes downward pressure and rotary action applied to a core barrel equipped with a diamond-set or tungsten carbide coring bit. During conventional coring, the entire barrel is retrieved from the hole upon completion of a core run. Wireline coring allows for removal of the inner barrel assembly containing the actual core while the the drill rods and outer barrel remain in the hole. Various types and sizes of core barrels and bits are used.



# GUIDE TO SUBSURFACE EXPLORATION LOGS



# INDEX SHEET 2 SOIL DESCRIPTION

## SOIL CONSTITUENTS

Naturally occurring soils consist of one or more of the following matrix constituents defined in terms of particle size.

| Constituent          | U.S. Sieve Size      | Observed Size (in.) |
|----------------------|----------------------|---------------------|
| Gravel (Coarse)      | 3/4 in. - 3 in.      | 3/4 - 3             |
| Gravel (Fine)        | No. 4 - 3/4 in.      | 1/5 - 3/4           |
| Sand (Coarse)        | No. 10 - No. 40      | 1/16 - 1/5          |
| Sand (Medium)        | No. 40 - No. 10      | 1/64 - 1/16         |
| Sand (Fine)          | No. 200 - No. 40     | 1/300 - 1/64        |
| Fines (Silt or Clay) | Smaller than No. 200 | Less than 1/300     |

## SOIL IDENTIFICATION

Soil identification refers to the grouping of soils with similar physical characteristics into a category defined by a **group name** and corresponding **group symbol** based on estimation of the matrix soil constituents to the nearest 5% and simple manual tests. Proportions of cobbles, boulders, and other non-matrix soil materials are not considered during this procedure but are included in the overall soil description if observed or thought to be present. Refer to the following descriptions and tables adapted from ASTM D2488.

**Coarse-Grained Soil** - Coarse-grained soils contain fewer than 50% fines and are identified based on the following table.

| Primary Constituent | Fines Percent | Type of Fines and Gradation           | Group Symbol | Group Name <sup>(1)</sup>            |
|---------------------|---------------|---------------------------------------|--------------|--------------------------------------|
| GRAVEL              | ≤ 5%          | well graded                           | GW           | Well graded gravel                   |
|                     |               | poorly graded                         | GP           | Poorly graded gravel                 |
|                     | 10%           | clayey well graded fines              | GW-GC        | Well graded gravel with clay fines   |
|                     |               | poorly graded silty well graded fines | GP-GC        | Poorly graded gravel with clay fines |
| SAND                | 15% to 45%    | clay fines                            | GC           | Clayey gravel                        |
|                     |               | silt fines                            | GM           | Silty gravel                         |
|                     | ≤ 5%          | well graded                           | SW           | Well graded sand                     |
|                     |               | poorly graded                         | SP           | Poorly graded sand                   |
| % sand ≥ % gravel   | 10%           | clayey well graded fines              | SW-SC        | Well graded sand with clay fines     |
|                     |               | poorly graded silty well graded fines | SP-SC        | Poorly graded sand with clay fines   |
|                     | 15% to 45%    | clay fines                            | SW-SM        | Well graded sand with silt           |
|                     |               | silt fines                            | SP-SM        | Poorly graded sand with silt         |
| % sand ≥ % gravel   | 15% to 45%    | clay fines                            | SC           | Clayey sand                          |
|                     |               | silt fines                            | SM           | Silty sand                           |

<sup>(1)</sup> If soil is a gravel and contains 15% or more sand, add "with sand" to the group name. If soil is a sand and contains 15% of more gravel, add "with gravel" to the group name.

**Inorganic Fine-Grained Soil** - Fine-grained soils contain 50% or more fines and are identified based on the following table.

| Plasticity Criteria | Dry Strength      | Coarse Fraction S = Sand, G = Gravel | Group Symbol | Group Name <sup>(1)</sup> |
|---------------------|-------------------|--------------------------------------|--------------|---------------------------|
| Medium              | Medium to high    | < 15% S + G                          | CL           | Lean clay                 |
|                     |                   | ≥ 30% % S ≥ % G                      | CL           | Sandy lean clay           |
|                     |                   | S + G % S < % G                      | CL           | Gravelly lean clay        |
| Non-plastic         | None to low       | < 15% S + G                          | ML           | Silt                      |
|                     |                   | ≥ 30% % S ≥ % G                      | ML           | Sandy silt                |
|                     |                   | S + G % S < % G                      | ML           | Gravelly silt             |
| High                | High to very high | < 15% S + G                          | CH           | Fat clay                  |
|                     |                   | ≥ 30% % S ≥ % G                      | CH           | Sandy fat clay            |
|                     |                   | S + G % S < % G                      | CH           | Gravelly fat clay         |
| Low to Medium       | Low to medium     | < 15% S + G                          | MH           | Elastic silt              |
|                     |                   | ≥ 30% % S ≥ % G                      | MH           | Sandy elastic silt        |
|                     |                   | S + G % S < % G                      | MH           | Gravelly elastic silt     |

<sup>(1)</sup> If soil contains 15% to 25% sand or gravel, add "with sand" or "with gravel" to the group name.

**Organic Fine-Grained Soil** - Fine-grained soils that contain enough organic particles to influence the soil properties are identified as Organic Soil and assigned the group symbol **OL** or **OH**.

**Highly Organic Soil (Peat)** - Soils composed primarily of plant remains in various stages of decomposition are identified as Peat and given the group symbol **PT**. Peat usually has an organic odor, a dark brown to black color, and a texture ranging from fibrous (original plant structure intact or mostly intact) to amorphous (plant structure decomposed to fine particles).

## SOIL DESCRIPTION

Soils are described in the following general sequence. Deviations may occur in some instances.

### Identification Components

(1) Group Name and Group Symbol

### Description Components

- (2) Consistency (Fine-Grained) or Apparent Density (Coarse-Grained)
- (3) Color (*note, the term "to" may be used to indicate a gradational change*)
- (4) Soil Moisture
- (5) Matrix Soil Constituents (Gravel, Sand, Fines)
  - ↳ Proportion (*by weight*), particle size, plasticity of fines, angularity, etc.
- (6) Non-Matrix Soil Materials and Proportions (*by volume*)
- (7) Other Descriptive Information (Unusual Odor, Structure, Texture, etc.)
- (8) [Geologic Formation Name or Soil Survey Unit]

## SPT N-VALUE CORRELATIONS

| Consistency  | SPT N-Value | Apparent Density | SPT N-Value |
|--------------|-------------|------------------|-------------|
| Very soft    | 0 - 2       | Very loose       | 0 - 5       |
| Soft         | 2 - 4       | Loose            | 5 - 10      |
| Medium stiff | 4 - 8       | Medium dense     | 10 - 30     |
| Stiff        | 8 - 15      | Dense            | 30 - 50     |
| Very stiff   | 15 - 30     | Very dense       | > 50        |
| Hard         | > 30        |                  |             |

## SOIL MOISTURE

**Dry**..... Apparent absence of moisture; dry to the touch.  
**Moist**..... Damp but no visible water.  
**Wet**..... Visible free water; saturated.

## PROPORTIONS / PERCENTAGES

Proportions of gravel, sand, and fines (excluding cobbles, boulders, and other constituents) are stated in the following terms indicating a range of percentages **by weight** (to nearest 5%) of the minus 3-in. soil fraction and add up to 100%.

Proportions of cobbles, boulders, and other non-matrix soil materials including artificial debris, roots, plant fibers, etc. are stated in the following terms indicating a range of percentages **by volume** (to the nearest 5%) of the total soil.

|                     |              |                         |              |
|---------------------|--------------|-------------------------|--------------|
| <b>Mostly</b> ..... | 50% - 100%   | <b>Numerous</b> .....   | 40% - 50%    |
| <b>Some</b> .....   | 30% - 45%    | <b>Common</b> .....     | 25% - 35%    |
| <b>Little</b> ..... | 15% - 25%    | <b>Occasional</b> ..... | 10% - 20%    |
| <b>Few</b> .....    | 5% - 10%     | <b>Trace</b> .....      | Less than 5% |
| <b>Trace</b> .....  | Less than 5% |                         |              |

## PLASTICITY (FINES ONLY)

**Non-plastic**..... Dry specimen ball falls apart easily. Cannot be rolled into thread at any moisture content.  
**Low**..... Dry specimen ball easily crushed with fingers. Can be rolled into 1/8-in. thread with some difficulty.  
**Medium**..... Difficult to crush dry specimen ball with fingers. Easily rolled into 1/8-in. thread.  
**High**..... Cannot crush dry specimen ball with fingers. Easily rolled and re-rolled into 1/8-in. thread.

## COBBLES AND BOULDERS

**Cobbles** - Particles of rock that will pass a 12-in. square opening and be retained on a 3-in. sieve.  
**Boulders** - Particles of rock that will not pass a 12-in. square opening.

*Note: Where the percentage (by volume) of cobbles and/or boulders cannot be accurately or reliably estimated, the terms "with cobbles", "with boulders", or "with cobbles and boulders" may be used to indicate observed or inferred presence.*

# GUIDE TO SUBSURFACE EXPLORATION LOGS



# INDEX SHEET 3 ROCK DESCRIPTION

## ROCK DEFINITION

Where reported on an exploration log, *rock* is defined as any naturally formed aggregate of mineral matter occurring in large masses or fragments. This definition of rock should not be taken as a replacement for any definitions relating to rock and/or rock excavation defined in construction documents. Intensely weathered or decomposed rock that is friable and can be reduced to gravel size particles or smaller by normal hand pressure is identified and described as soil. Poorly indurated formational materials which display both rock-like and soil-like properties are identified and described as rock followed by the soil description. In such cases, the term "poorly indurated" or "weakly cemented" is added to the rock name (e.g. weakly cemented sandstone).

## ROCK IDENTIFICATION

Rock is identified by a combination of *rock type* (igneous, metamorphic, or sedimentary) followed by the *rock name* (e.g. granite, schist, sandstone).

## ROCK DESCRIPTION

Rock descriptions are presented in the following general sequence. The detail of description is dictated by the complexity and objectives of the project.

### Identification Components

(1) Rock Type and Name

### Description Components

- (2) Rock Grain Size (*for clastic sedimentary rock*)
- (3) Crystal Size (*for igneous and metamorphic rock*)
- (4) Bedding Spacing (*for sedimentary rock*)
- (5) Color
- (6) Hardness and Weathering Descriptors
- (7) Fracture Density
- (8) [Geologic Formation Name]

## ROCK QUALITY DESIGNATION

$$RQD (\%) = \frac{\sum \text{Length of intact core pieces} \geq 4 \text{ inches}}{\text{Total length of core run (inches)}} \times 100$$

The RQD should correlate with the fracture density in most cases. Higher RQD values generally indicate fewer joints and fractures.

## GRAIN / CRYSTAL SIZE

### Grain Size for Clastic Sedimentary Rock

The names of clastic sedimentary rocks are generally based on their predominant clast or grain size (e.g. fine sandstone, medium sandstone, coarse gravel conglomerate, cobble conglomerate, siltstone, claystone).

### Crystal Size for Igneous and Metamorphic Rock

| Grain Size Description           | Average Crystal Size (in.)   |
|----------------------------------|------------------------------|
| Very coarse grained (pegmatitic) | Greater than or equal to 3/8 |
| Coarse-grained                   | Between 3/16 and 3/8         |
| Medium-grained                   | Between 1/32 and 3/16        |
| Fine-grained                     | Between 1/250 and 1/32       |
| Aphanitic                        | Less than or equal to 1/250  |

## BEDDING SPACING

| Bedding Description | Thickness / Spacing |
|---------------------|---------------------|
| Massive             | Less than 10 ft.    |
| Very thickly bedded | 3 ft. to 10 ft.     |
| Thickly bedded      | 1 ft. to 3 ft.      |
| Moderately bedded   | 4 in. to 1 ft.      |
| Thinly bedded       | 1 in. to 4 in.      |
| Very thinly bedded  | 1/4 in. to 1 in.    |
| Laminated           | Less than 1/4 in.   |

Note: Bedding is generally only applicable to sedimentary or bedded volcanic rocks.

## HARDNESS

| Hardness        | Criteria   |
|-----------------|--|
| Extremely hard  | Cannot be scratched with a pocketknife or sharp pick. Can only be chipped with repeated heavy hammer blows.  |
| Very hard       | Cannot be scratched with a pocketknife or sharp pick with difficulty. Breaks with repeated heavy hammer blows.   |
| Hard            | Can be scratched with a pocketknife or sharp pick with difficulty. Breaks with heavy hammer blows.   |
| Moderately hard | Can be scratched with a pocketknife or sharp pick with light or moderate pressure. Breaks with moderate hammer blows.                                  |
| Moderately soft | Can be grooved 1/16 in. deep with a pocketknife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure. |
| Soft            | Can be grooved or gouged easily with a pocketknife or sharp pick. Breaks with light to moderate manual pressure.                                       |
| Very soft       | Can be readily indented, grooved, or gouged with fingernail, or carved with a pocketknife. Breaks with light manual pressure.                          |

## WEATHERING (INTACT ROCK)

| Weathering Description | Discoloration and/or Oxidation   | General Characteristics  |
|------------------------|--|--|
| Fresh                  | Body of rock and fracture surfaces are not discolored or oxidized.   | Rock texture unchanged. Hammer rings when crystalline rocks are struck.  |
| Slightly weathered     | Discoloration or oxidation limited to surface of, or short distance from, fractures. Most surfaces exhibit minor to complete discoloration.                      | Rock texture preserved. Hammer rings when crystalline rocks are struck. Body of rock not weakened.   |
| Moderately weathered   | Discoloration or oxidation extends usually throughout. Fe-Mg minerals appear rusty. All fracture surfaces are discolored or oxidized.                            | Rock texture generally preserved. Hammer does not ring when rock is struck. Body of rock slightly weakened.  |
| Intensely weathered    | Discoloration or oxidation throughout. Feldspar and Fe-Mg minerals altered to clay to some extent. All fracture surfaces are discolored or oxidized and friable. | Rock texture altered by chemical disintegration. Can usually be broken with moderate to heavy manual pressure or by light hammer blow. Body of rock is significantly weakened. |
| Decomposed             | Discoloration or oxidation throughout but resistant minerals such as quartz may be unaltered. All feldspar and Fe-Mg minerals are completely altered to clay.    | Resembles a soil; partial or complete remnant rock structure may be preserved. Can be granulated by hand. Resistant minerals may present as stringers or dikes.                |

## FRACTURE DENSITY

| Description              | Observed Fracture Density               |
|--------------------------|---|
| Unfractured              | No fractures                            |
| Very slightly fractured  | Core lengths greater than 3 ft.         |
| Slightly fractured       | Core lengths mostly from 1 ft. to 3 ft. |
| Moderately fractured     | Core lengths mostly from 4 in. to 1 ft. |
| Intensely fractured      | Core lengths mostly from 1 in. to 4 in. |
| Very intensely fractured | Mostly chips and fragments              |

Note: Fracture density is based on the fracture spacing in recovered core, measured along the core axis (excluding mechanical breaks).

Attachment C

Test Pit Photos



Photo 1: Boulder in STP-5.



Photo 2: Boulder in GTP-7.



Photo 3: Bottom of GTP-3 with cobbles and boulders.



Photo 4: Boulder in GTP-6.

Attachment D

Laboratory Test Results



195 Frances Avenue  
 Cranston RI, 02910  
 Phone: (401)-467-6454  
 Fax: (401)-467-2398  
[thielsch.com](http://thielsch.com)  
*Let's Build a Solid Foundation*

Client Information:  
 Weston & Sampson  
 Reading, MA  
 PM: Dan Dwyer  
 Assigned By: Dan Dwyer  
 Collected By: A. Chabot

Project Information:  
**Dawson Recreation Area Improvements**  
**Holden, MA**  
 W&S Project Number: ENG22-0852  
 Summary Page: 1 of 1  
 Report Date: 12.22.22

**LABORATORY TESTING DATA SHEET, Report No.: 7422-M-161**

| Boring No. | Sample No. | Depth (ft) | Laboratory No. | Identification Tests       |       |       |          |        |         | Corrosivity Tests      |                 |                  |                 |                      |    |  |  | Laboratory Log and Soil Description |  |
|------------|------------|------------|----------------|----------------------------|-------|-------|----------|--------|---------|------------------------|-----------------|------------------|-----------------|----------------------|----|--|--|-------------------------------------|--|
|            |            |            |                | As Rcvd Moisture Content % | LL %  | PL %  | Gravel % | Sand % | Fines % | Resistivity (Mohms-cm) | Sulfate (mg/kg) | Chloride (mg/kg) | Sulfide (mg/kg) | Redox Potential (mv) | pH | Electrical Resist. As Rcvd Ohm-cm @ 60°F | Electrical Resist. Saturated Ohm-cm @ 60°F |                                     |  |
|            |            |            |                | D2216                      | D4318 | D6913 |          |        | EPA     |                        |                 |                  | G57             |                      |    |  |  |                                     |  |
| B-1A       | S-2        | 2-4        | 22-S-5174      |                            |       |       | 51.5     | 38.4   | 10.1    |                        |                 |                  |                 |                      |    |  |  |                                     | Brown f-c GRAVEL and f-c SAND, trace Silt            |
| B-1A       | S-5        | 9-10.5     | 22-S-5175      |                            |       |       | 38.9     | 42.4   | 18.7    |                        |                 |                  |                 |                      |    |  |  |                                     | Brown f-c SAND and f-c GRAVEL, little Silt           |
| B-2        | S-2        | 2-4        | 22-S-5176      |                            |       |       | 50.4     | 41.5   | 8.1     |                        |                 |                  |                 |                      |    |  |  |                                     | Light Brown f-c GRAVEL and f-c SAND, trace Silt      |
| B-2        | S-3B       | 5-6        | 22-S-5177      |                            |       |       | 4.2      | 80.2   | 15.6    |                        |                 |                  |                 |                      |    |  |  |                                     | Red - Brown f-m SAND, little Silt, trace fine Gravel |
|            |            |            |                |                            |       |       |          |        |         |                        |                 |                  |                 |                      |    |  |  |                                     |  |
|            |            |            |                |                            |       |       |          |        |         |                        |                 |                  |                 |                      |    |  |  |                                     |  |
|            |            |            |                |                            |       |       |          |        |         |                        |                 |                  |                 |                      |    |  |  |                                     |  |
|            |            |            |                |                            |       |       |          |        |         |                        |                 |                  |                 |                      |    |  |  |                                     |  |
|            |            |            |                |                            |       |       |          |        |         |                        |                 |                  |                 |                      |    |  |  |                                     |  |
|            |            |            |                |                            |       |       |          |        |         |                        |                 |                  |                 |                      |    |  |  |                                     |  |
|            |            |            |                |                            |       |       |          |        |         |                        |                 |                  |                 |                      |    |  |  |                                     |  |
|            |            |            |                |                            |       |       |          |        |         |                        |                 |                  |                 |                      |    |  |  |                                     |  |
|            |            |            |                |                            |       |       |          |        |         |                        |                 |                  |                 |                      |    |  |  |                                     |  |

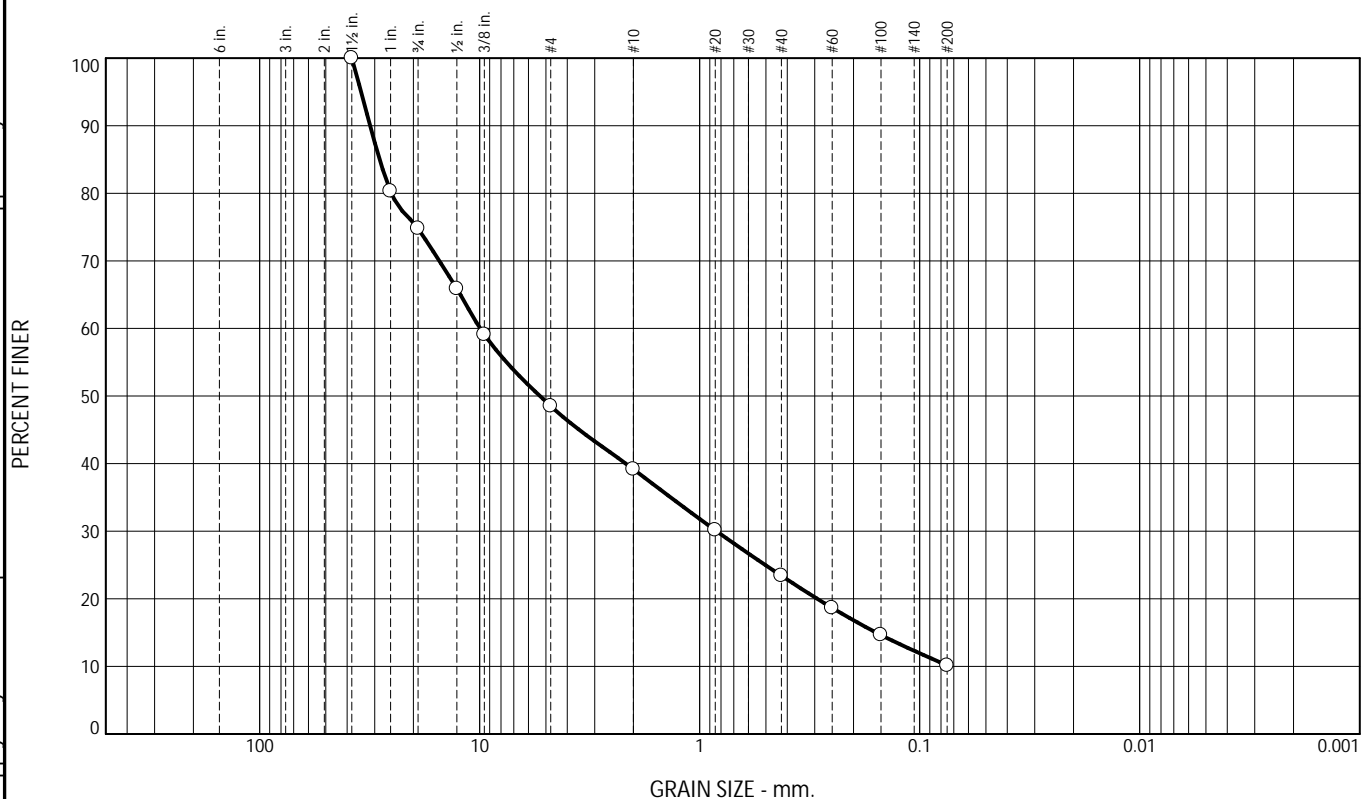
Date Received: 12.13.22 Reviewed By: *Ld Rok* Date Reviewed: 12.22.22

This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.  
 This report shall not be reproduced, except in full, without prior written approval from the Agency, as defined in ASTM E329.

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

# Particle Size Distribution Report

ASTM D6913



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 25.2     | 26.3 | 9.3    | 15.8   | 13.3 | 10.1    |      |

| Sieve Size or Diam. (mm.) | Finer (%) | Spec. * (%) | Out of Spec. (%) | Pct. of Fines |
|---------------------------|-----------|-------------|------------------|---------------|
| 1 1/2"                    | 100.0     |             |                  |               |
| 1"                        | 80.3      |             |                  |               |
| 3/4"                      | 74.8      |             |                  |               |
| 1/2"                      | 65.9      |             |                  |               |
| 3/8"                      | 59.1      |             |                  |               |
| #4                        | 48.5      |             |                  |               |
| #10                       | 39.2      |             |                  |               |
| #20                       | 30.1      |             |                  |               |
| #40                       | 23.4      |             |                  |               |
| #60                       | 18.7      |             |                  |               |
| #100                      | 14.6      |             |                  |               |
| #200                      | 10.1      |             |                  |               |

\* (no specification provided)

Material Description

Brown f-c GRAVEL and f-c SAND, trace Silt

|                           |                           |                          |
|---------------------------|---------------------------|--------------------------|
| PL= NP                    | <u>Atterberg Limits</u>   | PI= NP                   |
|                           | LL= NV                    |                          |
|                           | <u>Coefficients</u>       |                          |
| D <sub>90</sub> = 31.4637 | D <sub>85</sub> = 28.4841 | D <sub>60</sub> = 9.9503 |
| D <sub>50</sub> = 5.3222  | D <sub>30</sub> = 0.8380  | D <sub>15</sub> = 0.1576 |
| D <sub>10</sub> =         | C <sub>u</sub> =          | C <sub>c</sub> =         |
|                           | <u>Classification</u>     |                          |
| USCS= GP-GM               | AASHTO=                   | A-1-a                    |
|                           | <u>Test Remarks</u>       |                          |

Source of Sample: Boring      Depth: 2-4'  
 Sample Number: B-1A / S-2

Sample Date: 12.20.22

|  |  |
|--|--|
| <b>Thielsch Engineering Inc.</b><br><br>Cranston, RI | Client: Weston & Sampson<br>Project: Dawson Recreation Area Improvements<br>Holden, MA<br>Project No: ENG22-0852 |
| Figure 22-S-5174                                     |  |

Tested By: RB \_\_\_\_\_

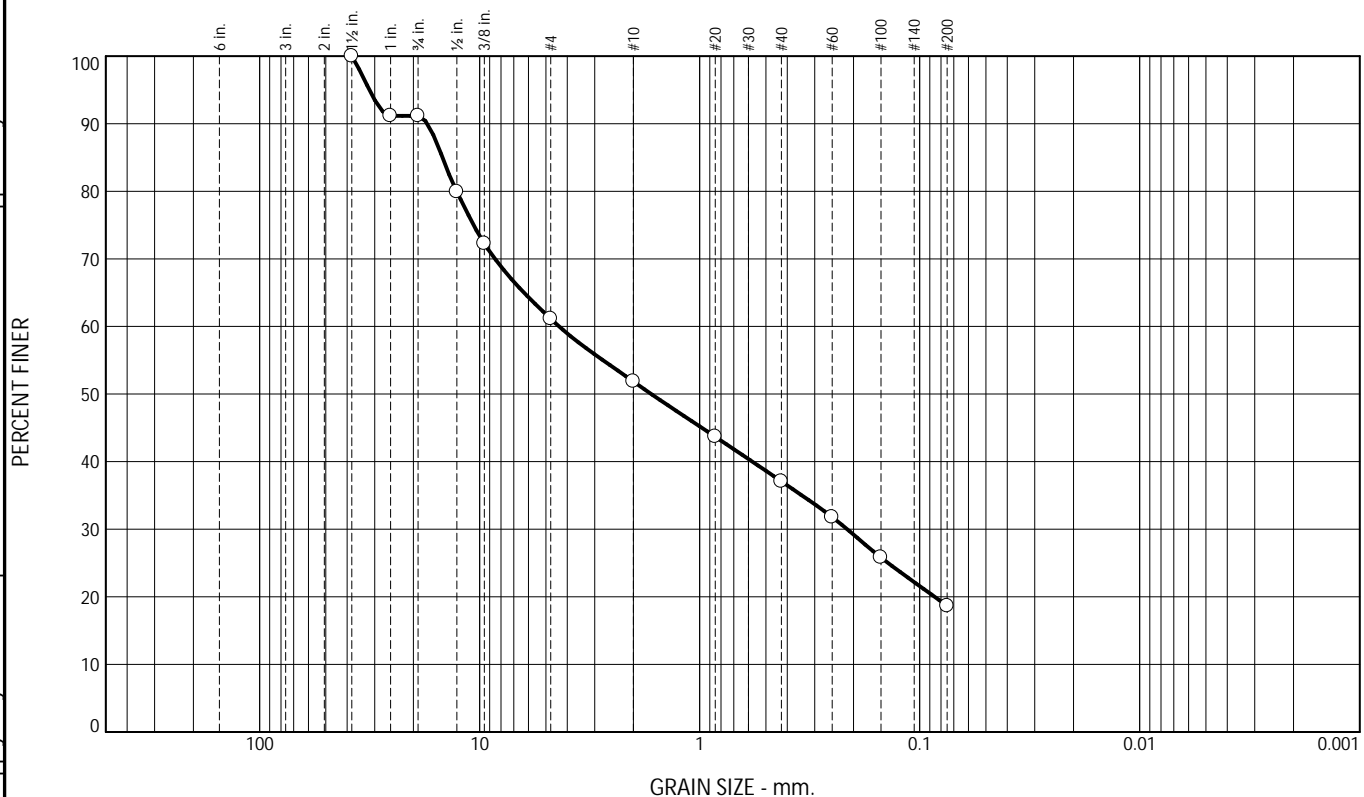
Checked By: \_\_\_\_\_



These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

# Particle Size Distribution Report

ASTM D6913



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 8.8      | 30.1 | 9.2    | 14.8   | 18.4 | 18.7    |      |

| Test Results (ASTM D6913) |           |             |                  |               |
|---------------------------|-----------|-------------|------------------|---------------|
| Sieve Size or Diam. (mm.) | Finer (%) | Spec. * (%) | Out of Spec. (%) | Pct. of Fines |
| 1 1/2"                    | 100.0     |             |                  |               |
| 1"                        | 91.2      |             |                  |               |
| 3/4"                      | 91.2      |             |                  |               |
| 1/2"                      | 79.9      |             |                  |               |
| 3/8"                      | 72.3      |             |                  |               |
| #4                        | 61.1      |             |                  |               |
| #10                       | 51.9      |             |                  |               |
| #20                       | 43.7      |             |                  |               |
| #40                       | 37.1      |             |                  |               |
| #60                       | 31.8      |             |                  |               |
| #100                      | 25.8      |             |                  |               |
| #200                      | 18.7      |             |                  |               |

Material Description

Brown f-c SAND and f-c GRAVEL, little Silt

|                           |                           |                          |
|---------------------------|---------------------------|--------------------------|
| PL= NP                    | <u>Atterberg Limits</u>   | PI= NP                   |
|                           | LL= NV                    |                          |
|                           | <u>Coefficients</u>       |                          |
| D <sub>90</sub> = 17.2799 | D <sub>85</sub> = 14.7540 | D <sub>60</sub> = 4.3548 |
| D <sub>50</sub> = 1.6584  | D <sub>30</sub> = 0.2136  | D <sub>15</sub> =        |
| D <sub>10</sub> =         | C <sub>u</sub> =          | C <sub>c</sub> =         |
|                           | <u>Classification</u>     |                          |
| USCS= SM                  | AASHTO=                   | A-1-b                    |
|                           | <u>Test Remarks</u>       |                          |

\* (no specification provided)

Source of Sample: Boring      Depth: 9-10.5'  
 Sample Number: B-1A / S-5

Sample Date: 12.20.22

|  |  |
|--|--|
| <b>Thielsch Engineering Inc.</b><br><br>Cranston, RI | Client: Weston & Sampson<br>Project: Dawson Recreation Area Improvements<br>Holden, MA<br>Project No: ENG22-0852 |
| Figure 22-S-5175                                     |  |

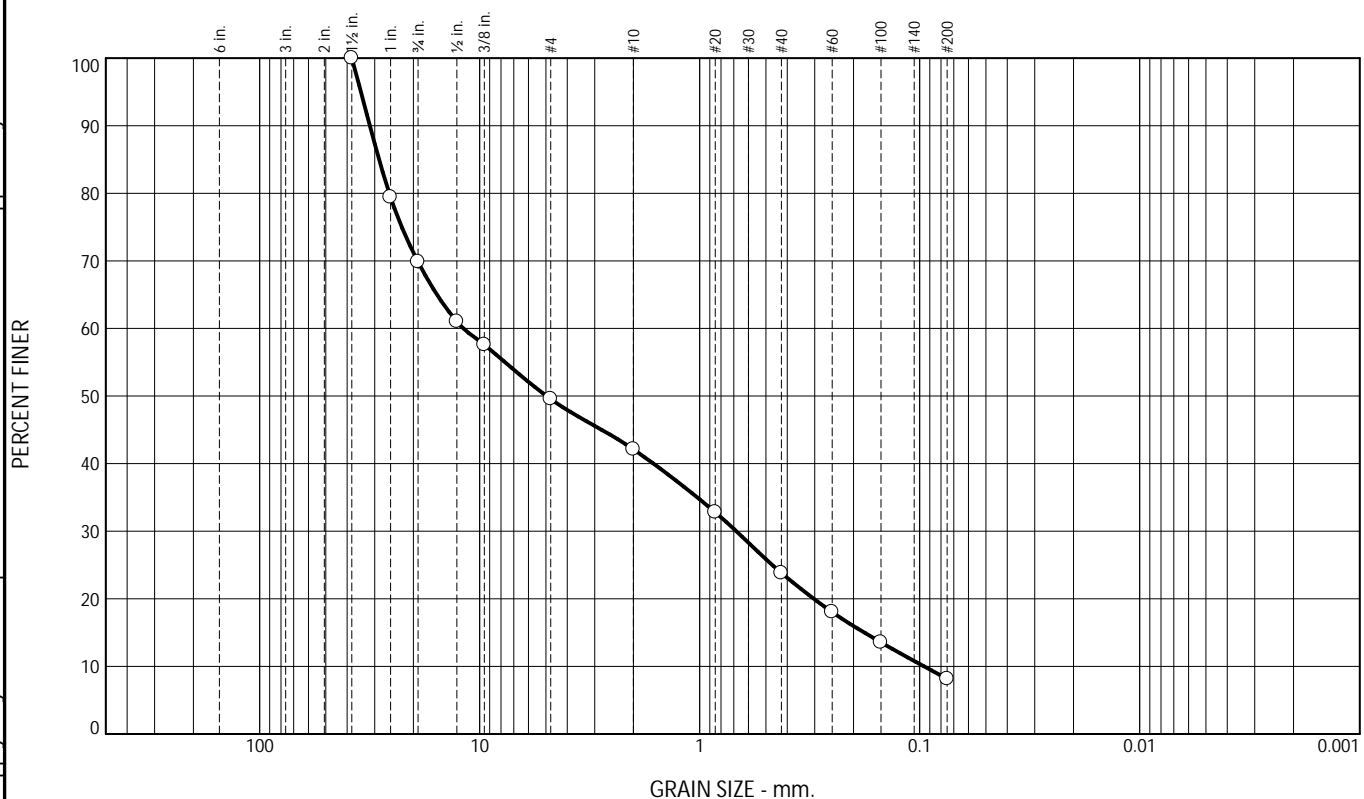
Tested By: RB \_\_\_\_\_

Checked By: \_\_\_\_\_

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

# Particle Size Distribution Report

ASTM D6913



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 30.1     | 20.3 | 7.5    | 18.3   | 15.7 | 8.1     |      |

| Test Results (ASTM D6913) |           |             |                  |               |
|---------------------------|-----------|-------------|------------------|---------------|
| Sieve Size or Diam. (mm.) | Finer (%) | Spec. * (%) | Out of Spec. (%) | Pct. of Fines |
| 1 1/2"                    | 100.0     |             |                  |               |
| 1"                        | 79.4      |             |                  |               |
| 3/4"                      | 69.9      |             |                  |               |
| 1/2"                      | 61.0      |             |                  |               |
| 3/8"                      | 57.6      |             |                  |               |
| #4                        | 49.6      |             |                  |               |
| #10                       | 42.1      |             |                  |               |
| #20                       | 32.8      |             |                  |               |
| #40                       | 23.8      |             |                  |               |
| #60                       | 18.0      |             |                  |               |
| #100                      | 13.6      |             |                  |               |
| #200                      | 8.1       |             |                  |               |

Material Description

Light Brown f-c GRAVEL and f-c SAND, trace Silt

|                           |                           |                           |
|---------------------------|---------------------------|---------------------------|
| PL= NP                    | <u>Atterberg Limits</u>   | PI= NP                    |
|                           | LL= NV                    |                           |
|                           | <u>Coefficients</u>       |                           |
| D <sub>90</sub> = 31.5416 | D <sub>85</sub> = 28.6443 | D <sub>60</sub> = 11.8602 |
| D <sub>50</sub> = 4.9605  | D <sub>30</sub> = 0.6815  | D <sub>15</sub> = 0.1784  |
| D <sub>10</sub> = 0.0954  | C <sub>u</sub> = 124.26   | C <sub>c</sub> = 0.41     |
|                           | <u>Classification</u>     |                           |
| USCS= GP-GM               | AASHTO=                   | A-1-a                     |
|                           | <u>Test Remarks</u>       |                           |

\* (no specification provided)

Source of Sample: Boring      Depth: 2-4'  
 Sample Number: B-2 / S-2

Sample Date: 12.20.22

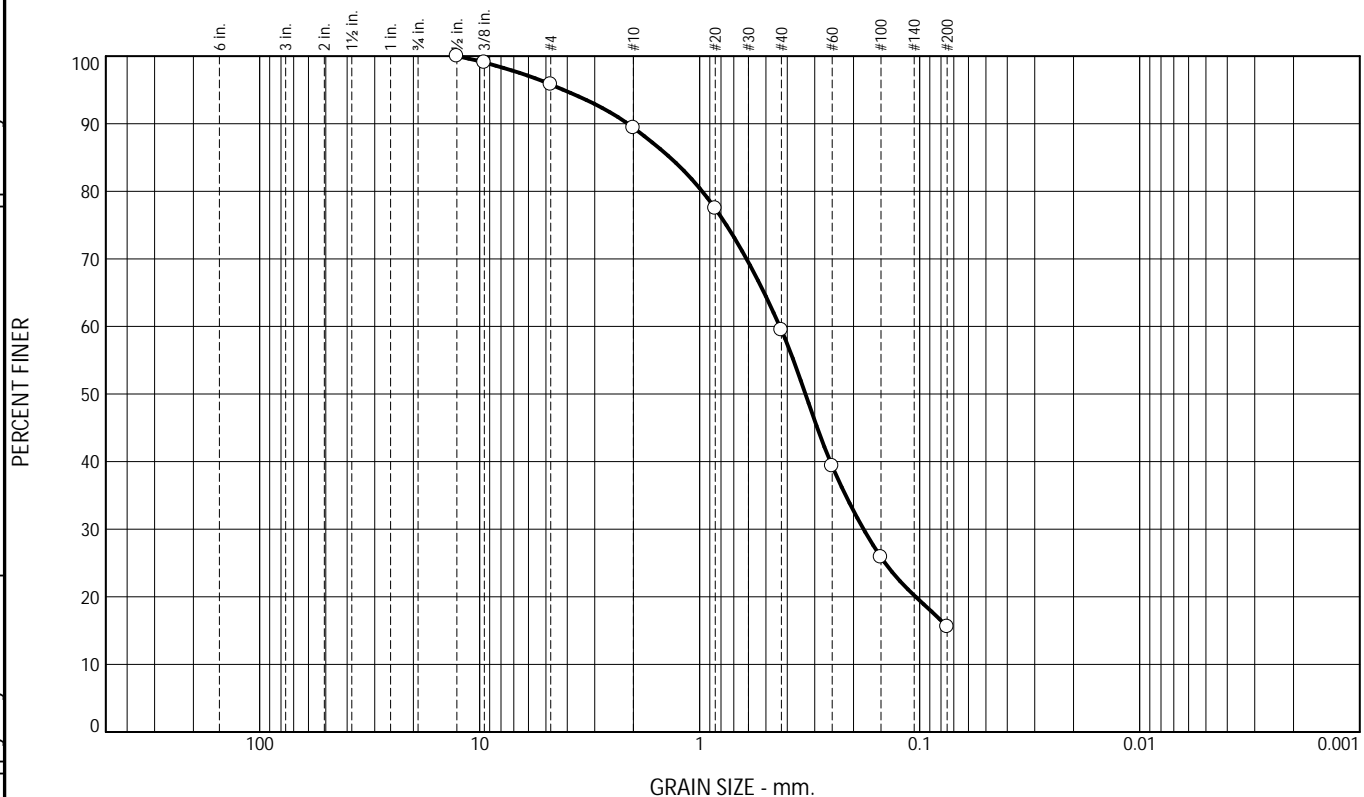
|  |  |
|--|--|
| <b>Thielsch Engineering Inc.</b><br><br>Cranston, RI | Client: Weston & Sampson<br>Project: Dawson Recreation Area Improvements<br>Holden, MA<br>Project No: ENG22-0852 |
| Figure 22-S-5176                                     |  |

Tested By: RB      Checked By:

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

# Particle Size Distribution Report

ASTM D6913



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 0.0      | 4.2  | 6.4    | 29.9   | 43.9 | 15.6    |      |

| Test Results (ASTM D6913) |           |             |                  |               |
|---------------------------|-----------|-------------|------------------|---------------|
| Sieve Size or Diam. (mm.) | Finer (%) | Spec. * (%) | Out of Spec. (%) | Pct. of Fines |
| 1/2"                      | 100.0     |             |                  |               |
| 3/8"                      | 99.1      |             |                  |               |
| #4                        | 95.8      |             |                  |               |
| #10                       | 89.4      |             |                  |               |
| #20                       | 77.5      |             |                  |               |
| #40                       | 59.5      |             |                  |               |
| #60                       | 39.3      |             |                  |               |
| #100                      | 25.9      |             |                  |               |
| #200                      | 15.6      |             |                  |               |

Material Description

Red - Brown f-m SAND, little Silt, trace fine Gravel

|                          |                          |                          |
|--------------------------|--------------------------|--------------------------|
| PL= NP                   | <u>Atterberg Limits</u>  | PI= NP                   |
|                          | LL= NV                   |                          |
|                          | <u>Coefficients</u>      |                          |
| D <sub>90</sub> = 2.1210 | D <sub>85</sub> = 1.3638 | D <sub>60</sub> = 0.4320 |
| D <sub>50</sub> = 0.3306 | D <sub>30</sub> = 0.1800 | D <sub>15</sub> =        |
| D <sub>10</sub> =        | C <sub>u</sub> =         | C <sub>c</sub> =         |
|                          | <u>Classification</u>    |                          |
| USCS= SM                 | AASHTO=                  | A-2-4(0)                 |
|                          | <u>Test Remarks</u>      |                          |

\* (no specification provided)

Source of Sample: Boring      Depth: 5-6'  
 Sample Number: B-2 / S-3B

Sample Date: 12.20.22

|  |  |
|--|--|
| <b>Thielsch Engineering Inc.</b><br><br>Cranston, RI | Client: Weston & Sampson<br>Project: Dawson Recreation Area Improvements<br>Holden, MA<br>Project No: ENG22-0852 |
| Figure 22-S-5177                                     |  |

Tested By: RB      Checked By:

Attachment E

Important Information about This Geotechnical-Engineering Report

# Important Information about This

# Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

**The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.**

## Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

## Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

## Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

## You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

### Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

### This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

### This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

### Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

*conspicuously that you’ve included the material for information purposes only.* To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

### Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

### Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

### Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* **Confront the risk of moisture infiltration** by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists.*



Telephone: 301/565-2733

e-mail: [info@geoprofessional.org](mailto:info@geoprofessional.org) [www.geoprofessional.org](http://www.geoprofessional.org)

## SECTION 00 31 43

### PERMITS

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION:

This Section provides specific information and defines specific requirements of the Contractor regarding the preparation and acquisition of permits required to perform the work of this project.

**Note to Specifier: Adjust the following to suit your job:**

##### 1.02 RELATED WORK:

- A. Section 01 11 00, CONTROL OF WORK AND MATERIALS
- B. Section 01 14 19.16, DUST CONTROL
- C. Section 01 55 26.13, SIGNAGE (TRAFFIC CONTROL)
- D. Section 01 57 19, ENVIRONMENTAL PROTECTION
- E. Section 31 00 00, EARTHWORK
- F. Section 31 23 19, DEWATERING

##### 1.03 GENERAL REQUIREMENTS:

- A. The Owner has obtained or will obtain and pay for the permits listed below, which are required for this project. The Contractor shall assist in obtaining certain permits, as indicated. The Contractor shall obtain and pay for all other permits required, as defined under the Permits subsection of Section 00 72 00, GENERAL CONDITIONS.

| <u>Permits by Owner</u>                                      | <u>Status</u> |
|--|---------------|
| Building Permit  | *             |
| Conservation Commission Order of Conditions (Ch. 131, s. 40) | (Attached)    |
| Town of Holden Stormwater Land Disturbance Permit            | TBD           |
| Backflow Preventers  | *             |
| Mass. Division of WPC Water Quality Certificate              | TBD           |
| *SWPPP Stormwater Pollution Prevention Plan                  | *             |
| *NPDES Construction General Permit                           | *             |

\*Contractor shall prepare permit application and obtain the permit after contract is awarded, bearing all expenses.

#### 1.04 CONSERVATION COMMISSION ORDERS:

The Conservation Commission has under the authority of Massachusetts General Laws Chapter 131, Section 40, issued an Order of Conditions on the work under this contract. This Order is to become a part of the Contract Documents and the Contractor shall perform all work in strict conformance with said Order. A copy of this Order is attached to this section.

#### PART 2 - PRODUCTS

Not Used.

#### PART 3 – EXECUTION

##### 3.01 PERFORM WORK IN ACCORDANCE WITH REQUIREMENTS:

- A. The Contractor shall perform the work in accordance with the Contract Documents, including the attached permits/order of conditions, and any applicable municipal requirements.



- B. Prior to commencing any construction activities, the Contractor shall demonstrate to the Owner, Engineer, and Conservation Agent through on-site inspection and submitting copies of permits or approvals, that it is in full compliance with the terms and conditions of all permits specified herein. The Contractor shall maintain full compliance with all permits throughout the performance of the work, and upon request, grant access to permitting authorities to inspect the site for the purpose of verifying such compliance.

END OF SECTION

SECTION 00 41 13  
FORM OF GENERAL BID

Proposal of \_\_\_\_\_ (hereinafter called "Bidder")\*

- a corporation, organized and existing under the laws of the State of \_\_\_\_\_
- a partnership
- a joint venture
- a limited liability company
- an individual doing business as \_\_\_\_\_

\*Check corporation, partnership, joint venture, LLC or individual as applicable.

To the \_\_\_\_\_ (hereinafter called "Owner").

Everyone:

The undersigned Bidder, in compliance with your invitation for bids for construction of **Industrial Drive Athletic Fields and Dawson Recreation Area Improvements** having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to construct the project in accordance with the contract documents, within the time set forth below, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the contract documents, of which this bid is a part.

The Bidder hereby agrees that if selected as the Contractor it will commence work under this contract on or before a date to be fixed in the written "Notice to Proceed" given by the Owner to the Contractor and to fully complete the project within \_\_\_\_\_ Consecutive days of the start date fixed in the "Notice to Proceed". The Bidder further agrees to pay as liquidated damages the sum of \$ \_\_\_\_\_ for each consecutive calendar day thereafter during which the work has

not been fully completed, as provided in the “Liquidated Damages” provisions of Section 00 73 00, SUPPLEMENTARY CONDITIONS.

Bidder acknowledges receipt of the following addenda:

No. \_\_\_\_\_ Dated: \_\_\_\_\_

No. \_\_\_\_\_ Dated: \_\_\_\_\_

No. \_\_\_\_\_ Dated: \_\_\_\_\_

No. \_\_\_\_\_ Dated: \_\_\_\_\_

**Item 1. BASE PROPOSAL:** Bidder agrees to perform all of the work described in the specification and shown on the plans for the sum of: \_\_\_\_\_ Dollars and Cents (\$ \_\_\_\_\_)

**Item 2. ADD ALTERNATE NO.1 – PLAYGROUND AT DAWSON RECREATION AREA:** Bidder agrees to perform all of the work described in the specification and shown on the plans for the sum of: \_\_\_\_\_ Dollars and Cents (\$ \_\_\_\_\_)

**Item 3. ADD ALTERNATE NO.2 – SYNTHETIC TURF BASEBALL FIELD AT DAWSON RECREATION AREA:** Bidder agrees to perform all of the work described in the specification and shown on the plans for the sum of: \_\_\_\_\_ Dollars and Cents (\$ \_\_\_\_\_)

**Item 4. ADD ALTERNATE NO.3 – BOARDWALK AND ASSOCIATED TRAILS AT DAWSON RECREATION AREA:** Bidder agrees to perform all of the work described in the specification and shown on the plans for the sum of: \_\_\_\_\_ Dollars and Cents (\$ \_\_\_\_\_)

**Item 5. ADD ALTERNATE NO.4 – ACCESS DRIVE AND HANDICAPPED PARKING SPACES AT DAWSON RECREATION AREA:** Bidder agrees to perform all of the work described in the specification and shown on the plans for the sum of:

\_\_\_\_\_ Dollars and Cents (\$ \_\_\_\_\_ )

**Item 6. ADD ALTERNATE NO.5 – ACCESSIBLE PATH FROM PARKING LOT TO TENNIS COURTS AT DAWSON RECREATION AREA:** Bidder agrees to perform all of the work described in the specification and shown on the plans for the sum of:

\_\_\_\_\_ Dollars and Cents (\$ \_\_\_\_\_ )

**Item 7. ADD ALTERNATE NO.6 – WORKOUT AREA AT INDUSTRIAL DRIVE:** Bidder agrees to perform all of the work described in the specification and shown on the plans for the sum of:

\_\_\_\_\_ Dollars and Cents (\$ \_\_\_\_\_ )

**Item 8. ADD ALTERNATE NO.7 – MANUFACTURED PRE-ENGINEERED SUPPORT BUILDING:** Bidder agrees to perform all of the work described in the specification and shown on the plans for the sum of: \_\_\_\_\_ Dollars and Cents (\$ \_\_\_\_\_ )

*(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)*

The BASE PROPOSAL and the above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, bond premiums, engineering costs, etc., to cover the finished work of the several kinds called for.

The Bidder understands that all bids for this project are subject to the applicable bidding laws of the Commonwealth of Massachusetts, including General Laws Chapter 30, Section 39M, as amended.

The contract will be awarded to the lowest responsible and eligible bidder.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 90 days, Saturdays, Sundays and legal holidays excluded, after the opening of bids.

Within 10 days of receipt of the written notice of acceptance of this bid, the Bidder will execute the formal agreement attached in Section 00 52 00 AGREEMENT and provide the requisite payment and performance bonds and certificates of insurance.

Bid security is attached in the sum of five percent (5%) of the total bid in accordance with the conditions of Section 00 21 13 INSTRUCTIONS TO BIDDERS. The bid security may become the property of the Owner in the event the contract and bond are not executed within the time set forth above.

The selected Contractor shall furnish a performance bond and a payment bond in an amount at least equal to one hundred percent (100%) of the contract prices in accordance with Section 00 61 13.13 PERFORMANCE BOND, Section 00 61 13.16 PAYMENT BOND, and as stipulated in Section 00 72 00, GENERAL CONDITIONS of these specifications.

The undersigned offers the following information as evidence of its qualifications to perform the work as bid upon according to all the requirements of the plans and specifications.

1. Have been in business under present name for \_\_\_\_\_ years.
  
2. The names and addresses of all persons interested in the bid (if made by a partnership or corporation) as Principals, are as follows:

---

---

---

---

---

(Attach supplementary list if necessary)

04/29/2022

3. The Bidder shall state below what work of a similar character to that included in the proposed contract it has done, and give references that will enable the Owner to judge its experience, skill and business standing (add supplementary page if necessary).

| Completion Date | Project Name | Contract Amount | Design Engineer | Reference Name | Telephone No. |
|-----------------|--------------|-----------------|-----------------|----------------|---------------|
|-----------------|--------------|-----------------|-----------------|----------------|---------------|

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

e. \_\_\_\_\_

f. \_\_\_\_\_

00 41 13-5

Pursuant to M.G.L. CH. 62C, Sec 49A, the undersigned Bidder certifies under the penalties of perjury that it is in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

The undersigned Bidder hereby certifies that (1) it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and 3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration.

The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity which sells materials, equipment or supplies used in or for, or engages in the performance of, the same or similar construction, reconstruction, installation, demolition, maintenance or repair work or any part thereof.

The undersigned Bidder hereby certifies, under pains and penalties of perjury, that the foregoing bid is based upon the payment to laborers to be employed on the project of wages in an amount no less than the applicable prevailing wage rates established for the project by the Massachusetts Department of Labor and Workforce Development. The undersigned bidder agrees to indemnify the awarding authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work arising out of or as a result of (1) the failure of the said bid to be based upon the payment of the said applicable prevailing wage rates or (2) the failure of the bidder, if selected as the Contractor, to pay laborers employed on the project the said applicable prevailing wage rates.

The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth of Massachusetts under the provisions of Section Twenty-Nine F of Chapter Twenty-Nine, Section 25C (10) of



Chapter 152 (workers' compensation) or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulations promulgated thereunder

Respectfully submitted:

Date \_\_\_\_\_

By \_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Name - Typed or Printed)

\_\_\_\_\_  
(Title)

(SEAL - if bid is by a corporation)

\_\_\_\_\_  
(Business Name)

\_\_\_\_\_  
(Federal ID Number)

\_\_\_\_\_  
(Business Address)

\_\_\_\_\_  
(City and State)

\_\_\_\_\_  
(Telephone Number)

SECTION 00 43 43

PREVAILING WAGE RATES

SECTION 00 52 00

AGREEMENT

THIS AGREEMENT, made this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, by and between the \_\_\_\_\_, hereinafter called "OWNER," acting herein through its \_\_\_\_\_, and doing business as (a corporation) (a limited liability company) (a partnership) (a joint venture) (an individual)\* located in the (City) (Town)\* of \_\_\_\_\_, County of \_\_\_\_\_, and State of \_\_\_\_\_, hereinafter called "CONTRACTOR."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the project described as follows:

**INDUSTRIAL DRIVE ATHLETIC FIELDS AND  
DAWSON RECREATION IMPORVEMENTS  
#41-550**

hereinafter called the project, for the sum of \_\_\_\_\_ Dollars and \_\_\_\_\_ Cents (\$ \_\_\_\_\_) and all extra work in connection therewith, under the terms as stated in the Contract Documents; and at its own proper cost and expense to furnish superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to complete the said project in accordance with the conditions and prices stated in Section 00 41 13 FORM OF GENERAL BID, Section 00 72 00, GENERAL CONDITIONS, Section 00 73 00, SUPPLEMENTARY CONDITIONS, Section 00 73 73.13, STATE REGULATIONS, the plans, which include all maps, plates, drawings, blue prints, and the specifications and all other contract documents therefor as prepared by Weston & Sampson Engineers, Inc., including all bid documents

The CONTRACTOR hereby agrees to commence work under this contract on or before a date to be fixed in the written Notice to Proceed given by the OWNER to the CONTRACTOR and to fully complete the project within \_\_\_\_\_ consecutive days of the start date fixed in the Notice to Proceed. The CONTRACTOR further agrees to pay as liquidated damages the sum of \$ \_\_\_\_\_ for each consecutive calendar day thereafter during which the work has not been fully completed, as provided in the Liquidated Damages provisions of Section 00 73 00 SUPPLEMENTARY CONDITIONS.

The CONTRACTOR shall not discriminate against or exclude any person from participation herein on grounds of race, color, religious creed, national origin, sex, sexual orientation, ancestry, or age; and that it shall take affirmative actions to insure that applicants are employed, and that

employees are treated during their employment, without regard to race, color, religious creed, national origin, sex, sexual orientation, ancestry, age, or handicapped status.

The CONTRACTOR shall not participate in or cooperate with an international boycott, as defined in Section 999 (b)(3) and (4) of the Internal Revenue Code of 1986, as amended, or engage in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws.

Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this Agreement and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where conflict between Federal and State Laws and Regulations exists, the more stringent requirement shall apply.

Subject to G.L. c.30, sec. 39K and/or sec. 39G and G.L. c.30, sec. 39F, as applicable, the OWNER agrees to pay the CONTRACTOR in current funds for the performance of the Agreement, subject to additions and deductions, as provided in Section 00 72 00, GENERAL CONDITIONS, and to make payments on account thereof as provided in Section 00 72 00, GENERAL CONDITIONS and Section 00 73 00, SUPPLEMENTARY CONDITIONS

In accordance with the requirements of G.L. c.149, §27B, the Contractor shall submit, and shall require all of its subcontractors required to keep a record of hours and wages paid to laborers employed on the project to submit, to the awarding authority on a weekly basis, copies of such records. All such weekly submissions shall be accompanied by the following certification:

The undersigned contractor hereby certifies, under the pains and penalties of perjury, that the foregoing payroll records are true and accurate records of the wages paid to laborers employed on the project for the period stated and said wages are in an amount no less than the prevailing wage rates established for the project by the Massachusetts Department of Labor and Workforce Development. The undersigned contractor agrees, in addition to any other remedies available to the awarding authority, to indemnify the awarding authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result of (1) the contractor's failure to pay laborers employed on the project the said applicable prevailing wage rates; (2) the failure of the foregoing payroll records to accurately state the said applicable prevailing wage rates; or (3) the failure of the foregoing payroll records to accurately represent the wages actually paid to laborers employed on the project.

The Agreed upon DIRECT LABOR MARKUP (percentage) for Change Orders on this project shall be \_\_\_\_\_ percent.

IN WITNESS WHEREOF, the parties to these presents have executed this Agreement in six (6) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

AGREED:

\_\_\_\_\_  
Town of Holden , Massachusetts  
(Owner)

By \_\_\_\_\_

\_\_\_\_\_  
Peter M. Lukes  
(Name)  
Town Manager  
(Title)

\_\_\_\_\_  
(Contractor)

By \_\_\_\_\_

\_\_\_\_\_  
(Name)  
\_\_\_\_\_  
(Title)  
\_\_\_\_\_  
(Address)  
\_\_\_\_\_  
(City and State)

Approved as to Form:

By \_\_\_\_\_  
(Owner's Counsel)  
\_\_\_\_\_  
(Name)

In accordance with M.G.L. C.44, Section 31C, this is to certify that an appropriation in the amount of this Contract is available therefor and that the \_\_\_\_\_ has been authorized to execute the Contract and approve all requisitions and change orders.

By \_\_\_\_\_  
(Owner's Accountant)  
\_\_\_\_\_  
(Name)

CERTIFICATE OF VOTE  
(to be filed if Contractor is a Corporation)

I, \_\_\_\_\_, hereby certify that I am the duly qualified and acting Secretary of  
(Secretary of Corporation)  
\_\_\_\_\_ and I further certify that a meeting of the Directors of said company,  
(Name of Corporation)  
duly called and held on \_\_\_\_\_, at which all members were present and voting, the  
(Date of Meeting)  
following vote was unanimously passed:

VOTED: To authorize and empower

---

---

---

---

---

---

Anyone acting singly, to execute Forms of General Bid, Contracts or Bonds on behalf of the Corporation.

I further certify that the above vote is still in effect and has not been changed or modified in any respect.

By: \_\_\_\_\_  
(Secretary of Corporation)

A True Copy:

Attest: \_\_\_\_\_  
(Notary Public)

My Commission Expires: \_\_\_\_\_  
(Date)

Contractor's Certification

A Contractor will not be eligible for award of a contract unless such Contractor has submitted the following certification, which is deemed a part of the resulting contract:

CONTRACTOR'S CERTIFICATION

\_\_\_\_\_  
Name of the General Contractor

certifies that it:

1. Will not discriminate in their employment practices;
2. Intends to use the following listed construction trades in the work under the contract:

\_\_\_\_\_  
\_\_\_\_\_

and

3. Will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained herein; and
4. Is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and
5. Will provide the provisions of the "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" to each and every subcontractor employed on the Project and will incorporate the terms of this Section into all subcontracts and work orders entered into on the Project.
6. Agrees to comply with all provisions contained herein.

\_\_\_\_\_  
Signature of authorized representative of Contractor                      Date

\_\_\_\_\_  
Printed name of authorized representative of Contractor

Contractor's Certification (Continued)

**CERTIFICATE OF NON-COLLUSION**

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean natural person, business, partnership, corporation, committee, union, club or other organization, entity, or group of individuals.

Signature \_\_\_\_\_

Date \_\_\_\_\_

\_\_\_\_\_  
Print Name & Title

\_\_\_\_\_  
Company Name

**CERTIFICATE OF TAX COMPLIANCE**

Pursuant to Chapter 62C of the Massachusetts General Laws, Section 49A (b), I

\_\_\_\_\_, authorized signatory for \_\_\_\_\_  
*Name of individual* *Name of contractor*

do hereby certify under the pains and penalties of perjury that said contractor has complied with all laws of the Commonwealth of Massachusetts relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**LABOR HARMONY AND OSHA TRAINING REQUIREMENTS**

The undersigned certifies under penalties of perjury that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed at the work ***and*** that all employees to be employed at the worksite and in the work will have completed an OSHA-approved construction safety and health course lasting at least ten (10) hours.

Signature \_\_\_\_\_

Date \_\_\_\_\_

\_\_\_\_\_  
Print Name & Title

\_\_\_\_\_  
Company Name

Subcontractor's Certification

Prior to the award of any subcontract, regardless of tier, the prospective subcontractor must execute and submit to the General Contractor the following certification, which will be deemed a part of



the resulting subcontract:

SUBCONTRACTOR'S CERTIFICATION

---

Name of the Subcontractor

certifies that it:

- 1. Will not discriminate in their employment practices;
- 2. Intends to use the following listed construction trades in the work under the contract:

---



---

and

- 3. Will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained herein; and
- 4. Is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and
- 5. Will provide the provisions of the "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" to each and every subcontractor employed on the Project and will incorporate the terms of this Section into all subcontracts and work orders entered into on the Project.
- 6. Agrees to comply with all provisions contained herein.

---

Signature of authorized representative of Subcontractor

Date

---

Printed name of authorized representative of Subcontractor

END OF SECTION

SECTION 00 61 13.16

PAYMENT BOND

KNOW EVERYONE BY THESE PRESENTS: That we \_\_\_\_\_  
(Name of Contractor)  
a \_\_\_\_\_ hereinafter called "Principal" and  
(Corporation, Partnership, Joint Venture, Limited Liability Company, or Individual)  
\_\_\_\_\_ of \_\_\_\_\_, State of \_\_\_\_\_  
(Surety) (City) (State)  
hereinafter called "Surety" and licensed by the State Division of Insurance to do business under  
the laws of the Commonwealth of Massachusetts are held and firmly bound to the City/Town of \_\_\_\_\_  
\_\_\_\_\_, Massachusetts, hereinafter called "Owner," in the penal sum of \_\_\_\_\_  
\_\_\_\_\_ Dollars and \_\_\_\_\_  
\_\_\_\_\_ Cents (\$ \_\_\_\_\_) in lawful money of the United States, for the  
payment of which sum well and truly to be made, we bind ourselves, our heirs, executors,  
administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal has  
entered into a certain contract with the Owner (the "Contract"), dated the \_\_\_\_\_ day of \_\_\_\_\_  
\_\_\_\_\_, 20\_\_\_\_, which Contract is by reference made a part hereof, for the construction  
described as follows:

**INSERT CONTRACT & NUMBER HERE**

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms,  
subcontractors, and corporations furnishing materials for or performing labor in the prosecution of  
the work provided for in such contract, and any authorized extension or modification thereof,  
including all amounts due for materials, lubricants, oil, gasoline, repairs on machinery, equipment  
and tools, consumed or used in connection with the construction of such work, and all insurance  
premiums on said work, and for all labor, performed in such work whether by subcontractor or  
otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and  
agrees that no change, extension of time, alteration or addition to the terms of the Contract or to  
the work to be performed thereunder or the specifications accompanying the same shall in any way  
affect its obligation on this bond, and it does hereby waive notice of any such change, extension  
of time, alteration or addition to the terms of this Contract or to the work or to the specifications.  
The Surety Company providing the bond shall have a rating of A or better within the Best Key  
Rating Guide.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor  
shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in \_\_\_\_ ( ) counterparts, each one of which shall be deemed an original, this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

ATTEST:

|                |                                   |
|----------------|-----------------------------------|
| _____          | _____                             |
| Principal      | Witness as to Principal Signature |
| By _____       | _____                             |
| Signature      | Name and Title                    |
| _____          | _____                             |
| Name and Title | Address                           |
| _____          | _____                             |
| Address        | City and State                    |
| _____          |                                   |
| City and State | (SEAL)                            |

ATTEST:

|                            |                                |
|----------------------------|--------------------------------|
| _____                      | _____                          |
| Surety                     | Witness as to Surety Signature |
| By _____                   | _____                          |
| Attorney-in-Fact Signature | Name and Title                 |
| _____                      | _____                          |
| Name and Title             | Address                        |
| _____                      | _____                          |
| Address                    | City and State                 |
| _____                      |                                |
| City and State             | (SEAL)                         |

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

END OF SECTION

SECTION 00 63 63

STATE REGULATIONS

ATTACHMENT D

CHANGE ORDERS

Policy:

This section supplements Article 11, Changes to the Contract, in the General Conditions and Supplementary Conditions.

All executed change orders submitted to the Engineer for review and processing must be prepared in accordance with the attached change order format (Appendix A) with the appropriate number of copies, calculation sheet(s) (Appendix B) and all other supporting documentation necessary for evaluation. Failure to comply with these instructions will result in delays in processing the change order.

In order to avoid possible delays with approval of change orders, at the beginning of the project and as circumstances warrant, the Contractor shall submit a list of construction equipment, identifying major pieces of equipment to be utilized on the project. The list shall include the Contractor's designation, if any, the manufacturer, model, year of manufacture, serial number, size and horsepower of equipment. The Contractor shall also provide for approval a proposed bluebook equipment rental rate development that separately lists for each piece of equipment the monthly rental rate, area adjustment factor, depreciation factor, estimated operating cost per hour and total hourly rate. In the event the Contractor fails or is unable to provide appropriate rate information the Engineer may develop equipment rental rates for use on change orders.

Payment of Change Orders:

Payment of all change orders shall be in accordance with the relevant provisions of Massachusetts General Laws, Chapter 30, Section 39G for non-building construction and Section 39K for building construction as amended from time to time.

Payment of change orders shall be made in accordance with one of the following three methods:

- A. Existing unit prices as set forth in the contract; or
  - B. Agreed upon lump sum or unit prices; or
  - C. Time and materials
- A. Payment for work for which there is a unit price in the contract:

Where the contract contains a unit price for work and the Engineer orders a change for

work of the same kind as other work contained in the contract and is performed under similar physical conditions, the Contractor shall accept full and final payment at the contract unit price(s) for the acceptable quantities. Under certain circumstances, the unit prices may be subject to revaluation and adjustment. See Article 13 in the Supplementary Conditions.

B. Payment for work or materials for which no price is contained in the contract:

If the Engineer directs, the Contractor shall submit promptly in writing to the Engineer an offer to do the required work on a lump sum or unit price basis, as specified by the Engineer. The stated price, either lump sum or unit price, shall be divided so as to show that it is the sum of:

1. The estimated cost of Labor, plus
2. Direct Labor Cost, plus
3. Material and Freight Costs, plus
4. Equipment Costs, plus
5. An amount not to exceed 20% of the sum of items 1 through 4 for overhead and profit, plus (if applicable),
6. In the case of work done by a subcontractor an amount not to exceed 7 ½%, for the general contractor of the sum of the cost (not including subcontractor's overhead and profit) of items 1 through 4 for his overhead and profit (less, if applicable),
7. Credits for work deleted from the contract, including actual costs of the deleted work plus the percentage of overhead, profit, bonds and insurance attributable to such credit amount.

C. Payment for work on a time and materials basis:

Unless an agreed lump sum and/or unit price is obtained as noted above and is so stated in the change price, the Contractor shall accept as full payment for which no agreement is contained in contract, an amount equal to:

1. The estimated cost of Labor, plus
2. The Direct Labor Costs, plus
3. Equipment Costs, plus
4. Material and Freight Costs, plus
5. An amount not to exceed 20% of the sum of items 1 through 4 for overhead and profit, plus, if applicable,
6. In the case of work done by a subcontractor an amount not to exceed 7 ½%, for the general contractor of the sum of the cost (not including subcontractor's overhead and profit) of items 1 through 4 for his overhead and profit (less, if applicable),
7. Credit for work deleted from the Contract, including actual costs of the deleted work plus the percentage of overhead, profit, bonds and insurance attributable to such credit amount.

Explanation of items 1 through 7 as outlined in "B" and "C" above:

1. Labor - Only those workers employed on the project who are doing the extra work, including the foreman in charge, are allowable. General foremen, superintendents, or other supervisory personnel are considered to be included in the overhead markup as provided in items 5 and/or 6. Hourly labor rates in excess of those as listed in the contract wage rates require documentation. As a minimum, an explanation and the appropriate copy of the certified payroll are required.
2. Direct Labor Costs - These costs are limited to those which are required in the contract document. Coverage in excess of the contract provisions, secured by the contractor/subcontractor(s) at his option, are ineligible. The following list of typical direct labor charges is provided for your assistance and is in no way intended to be complete or all encompassing:

Workman's Compensation

Federal/State: Social Security Tax and Unemployment Tax;

Health, Welfare and Pension Benefits; (this cost is included in the wage rates appearing in the Attachment A Massachusetts Wage Rates.

Liability insurance: Bodily injury; excess umbrella; property damage; public liability

Blasters insurance: If applied to any required direct labor costs

Builders risk insurance: If applied to any required direct labor costs

Experience modification insurance: If applied to any required direct labor costs

Surcharges: If applied to any required direct labor costs

Following award and prior to execution of a construction contract, the Contractor and filed subbidders (where applicable) shall submit for review by the Owner, documentation to establish the markup percentage(s).

The documented direct labor markup for this contract may be adjusted on an annual basis as measured from the date the contract is executed. The contract agreement will provide for the establishment of the Direct Labor Cost percentage.

3. Material and Freight - Only those materials required as a result of the change order and reasonable freight charges for delivery of same are allowable.

4. Equipment - Only the equipment required as a result of the change order is allowable. Equipment rental rates shall be governed by the current EquipmentWatch, division of Intertec Publishing [Formerly Nielson/Dataquest] Rental Rate Bluebook for Construction Equipment (the "Bluebook"). In determining the rental rate the following shall apply:
  - a. For equipment already on the project - the monthly prorated rental rate by the hourly use shall be applicable;
  - b. For equipment not on the project the daily rate, the weekly rate, or monthly rate will prevail, whichever will prove to be most cost effective. Small tools and manual equipment are examples of costs not allowable under this item. These costs are considered to be included in the overhead markup as provided in items 5 and/or 6.

(1 Month (Normal Use) = 176 hours)

- 5.& 6. Overhead and Profit - All other costs not previously mentioned are considered to be included in this item, be it for the general contractor or subcontractor(s).
7. Credits - Work deleted, material and equipment removed from the contract, stored and/or returned shall be credited to the cost of the change order, less documented costs.

This change order will be prepared in such manner as to clearly separate Eligible and Ineligible Costs (as applicable to state-funded projects).

The Contractor shall furnish itemized statements of the cost of the work ordered and shall give the Engineer access to all accounts, bills and vouchers relating thereto; and unless the Contractor shall furnish such itemized statements, and access to all accounts, bills and vouchers, he shall not be entitled to payment for any items of extra work for which such information is sought by the Engineer.

APPENDIX A

Change Order  
(Enter Project Name)  
(Enter Location)

Sheet \_\_\_ of \_\_\_

Date \_\_\_\_\_

Project No. \_\_\_\_\_ SRF No. (if applicable) \_\_\_\_\_

Contract No. \_\_\_\_\_

Change Order No. \_\_\_\_\_

Contract Amount (As Bid) \$ \_\_\_\_\_

Amount of Previous Change Orders \$ \_\_\_\_\_

Net Change in Contract Price (this Change Order) \$ \_\_\_\_\_

Total Adjusted Contract Price (including this Change Order) \$ \_\_\_\_\_

This Change Order extends the time to complete the work by \_\_\_ calendar days.

The extended completion date is \_\_\_\_\_  
\_\_\_\_\_.

This Change Order checked by: \_\_\_\_\_  
Resident Representative Date

This Change Order is requested by: \_\_\_\_\_

This Change Order is recommended by:

\_\_\_\_\_  
Consultant Engineer P.E. # Date

The undersigned agree to the terms of the Change Order.

\_\_\_\_\_  
Contractor Date

\_\_\_\_\_  
Owner Date

Certification of Appropriation under M.G.L. c.44, s.31C: Adequate funding in an amount sufficient to cover the total cost of this change order is available.

By: \_\_\_\_\_  
Certification Officer (Auditor, Accountant, Treasurer) Date

Do not write below this space: this space reserved for STATE AGENCY APPROVAL



CHANGE ORDER (continued)  
(Enter Project Name)  
(Enter Location)

Sheet \_\_\_ of

Date \_\_\_\_\_

Project No. \_\_\_\_\_ SRF No. (if applicable) \_\_\_\_\_

Contract No. \_\_\_\_\_

Change Order No. \_\_\_\_\_

Owner's Name: \_\_\_\_\_

Owner's Address: \_\_\_\_\_

Contractor's Name: \_\_\_\_\_

Contractor's Address: \_\_\_\_\_

Item 1:

Description of Change: \_\_\_\_\_

Reason for Change: \_\_\_\_\_

Backup Information: \_\_\_\_\_

Cost: \$ \_\_\_\_\_

Item 2

Description of Change: \_\_\_\_\_

Reason for Change: \_\_\_\_\_

Backup Information: \_\_\_\_\_

Cost: \$ \_\_\_\_\_

Appendix B  
Example Calculation Sheet

|    |  |            |               |                   |
|----|--|------------|---------------|-------------------|
| 1. | Labor  |            |               |                   |
|    | Foreman  | 10 hours @ | \$10.00/hour  | \$100.00          |
|    | Engineer   | 10 hours @ | 8.80/hour     | 85.00             |
|    | Operator   | 10 hours @ | 9.50/hour     | 95.00             |
|    | Laborers   | 24 hours @ | 7.00/hour     | <u>168.00</u>     |
|    |  |            |               | \$448.00          |
| 2. | Direct Labor Cost (use the agreed upon Direct Labor Cost)                                  |            |               |                   |
|    | *(30)% of \$448.   |            |               |                   |
|    | *(used for example purposes only)  |            |               | \$ 134.00         |
| 3. | Materials & Freight  |            |               |                   |
|    | 150 l.f. of 12" pipe @ \$2.00/l.f.   |            |               | \$ 300.00         |
|    | 15 v.f. precast SMH  |            |               | 1,700.00          |
|    | Freight (slip# enclosed)   |            |               | <u>25.00</u>      |
|    |  |            |               | \$2,025.00        |
| 4. | Equipment  |            |               |                   |
|    | 1 Backhoe  | 10 hours @ | \$ 80.00/hour | \$ 800.00         |
|    | 1 Truck-crane  | 10 hours @ | 100.00/hour   | <u>1000.00</u>    |
|    |  |            |               | \$1800.00         |
|    | <b>TOTAL (items 1 through 4):</b>  |            |               | <b>\$4,407.00</b> |
| 5. | (15%) markup for Overhead, Profit  |            |               |                   |
|    | (15%) of \$4,407   |            |               | \$ 881.00         |
| 6. | (5 %) markup on subcontractor's cost for general contractor (if subcontractor is involved) |            |               |                   |
|    | (5%) of \$4,407  |            |               | \$ 331.00         |
| 7. | Credits (deductibles)  |            |               | -\$323.00         |
|    | <b>TOTAL COST:</b>   |            |               | <b>\$5,296.00</b> |

**Reminder:** Provide support documentation as necessary i.e. vouchers, correspondence, calculation, photographs, reports.

END OF SECTION

Document1

SECTION 00 72 00  
GENERAL CONDITIONS  
TABLE OF CONTENTS

|   | <b>Page</b> |
|---|-------------|
| Article 1—Definitions and Terminology.....  | 1           |
| 1.01 Defined Terms.....   | 1           |
| 1.02 Terminology.....   | 5           |
| Article 2—Preliminary Matters.....  | 7           |
| 2.01 Delivery of Performance and Payment Bonds; Evidence of Insurance.....                  | 7           |
| 2.02 Copies of Documents.....   | 7           |
| 2.03 Before Starting Construction.....  | 7           |
| 2.04 Preconstruction Conference; Designation of Authorized Representatives.....             | 8           |
| 2.05 Acceptance of Schedules.....   | 8           |
| 2.06 Electronic Transmittals.....   | 8           |
| Article 3—Contract Documents: Intent, Requirements, Reuse.....                              | 9           |
| 3.01 Intent.....  | 9           |
| 3.02 Reference Standards.....   | 9           |
| 3.03 Reporting and Resolving Discrepancies.....   | 10          |
| 3.04 Requirements of the Contract Documents.....  | 10          |
| 3.05 Reuse of Documents.....  | 11          |
| Article 4—Commencement and Progress of the Work.....  | 11          |
| 4.01 Commencement of Contract Times; Notice to Proceed.....                                 | 11          |
| 4.02 Starting the Work.....   | 11          |
| 4.03 Reference Points.....  | 11          |
| 4.04 Progress Schedule.....   | 12          |
| 4.05 Delays in Contractor’s Progress.....   | 12          |
| Article 5—Site; Subsurface and Physical Conditions; Hazardous Environmental Conditions..... | 13          |
| 5.01 Availability of Lands.....   | 13          |
| 5.02 Use of Site and Other Areas.....   | 14          |
| 5.03 Subsurface and Physical Conditions.....  | 15          |
| 5.04 Differing Subsurface or Physical Conditions.....                                       | 16          |
| 5.05 Underground Facilities.....  | 17          |

|           |  |    |
|-----------|--|----|
| 5.06      | Hazardous Environmental Conditions at Site .....             | 19 |
| Article 6 | —Bonds and Insurance.....                                    | 21 |
| 6.01      | Performance, Payment, and Other Bonds.....                   | 21 |
| 6.02      | Insurance—General Provisions .....                           | 22 |
| 6.03      | Contractor’s Insurance.....                                  | 24 |
| 6.04      | Builder’s Risk and Other Property Insurance.....             | 25 |
| 6.05      | Property Losses; Subrogation .....                           | 25 |
| 6.06      | Receipt and Application of Property Insurance Proceeds ..... | 27 |
| Article 7 | —Contractor’s Responsibilities .....                         | 27 |
| 7.01      | Contractor’s Means and Methods of Construction .....         | 27 |
| 7.02      | Supervision and Superintendence .....                        | 27 |
| 7.03      | Labor; Working Hours .....                                   | 27 |
| 7.04      | Services, Materials, and Equipment .....                     | 28 |
| 7.05      | “Or Equals” .....  | 28 |
| 7.06      | Substitutes .....  | 29 |
| 7.07      | Concerning Subcontractors and Suppliers.....                 | 31 |
| 7.08      | Patent Fees and Royalties.....                               | 32 |
| 7.09      | Permits .....  | 33 |
| 7.10      | Taxes .....  | 33 |
| 7.11      | Laws and Regulations.....                                    | 33 |
| 7.12      | Record Documents.....  | 33 |
| 7.13      | Safety and Protection.....                                   | 34 |
| 7.14      | Hazard Communication Programs .....                          | 35 |
| 7.15      | Emergencies.....   | 35 |
| 7.16      | Submittals .....   | 35 |
| 7.17      | Contractor’s General Warranty and Guarantee .....            | 38 |
| 7.18      | Indemnification .....  | 39 |
| 7.19      | Delegation of Professional Design Services .....             | 39 |
| Article 8 | —Other Work at the Site.....                                 | 40 |
| 8.01      | Other Work .....   | 40 |
| 8.02      | Coordination .....   | 41 |
| 8.03      | Legal Relationships.....                                     | 41 |
| Article 9 | —Owner’s Responsibilities.....                               | 42 |

|  |   |    |
|--|---|----|
| 9.01   | Communications to Contractor .....  | 42 |
| 9.02   | Replacement of Engineer .....   | 42 |
| 9.03   | Furnish Data .....  | 42 |
| 9.04   | Pay When Due .....  | 42 |
| 9.05   | Lands and Easements; Reports, Tests, and Drawings .....                         | 43 |
| 9.06   | Insurance .....   | 43 |
| 9.07   | Change Orders .....   | 43 |
| 9.08   | Inspections, Tests, and Approvals .....   | 43 |
| 9.09   | Limitations on Owner’s Responsibilities .....                                   | 43 |
| 9.10   | Undisclosed Hazardous Environmental Condition .....                             | 43 |
| 9.11   | Evidence of Financial Arrangements .....  | 43 |
| 9.12   | Safety Programs .....   | 43 |
| Article 10—Engineer’s Status During Construction ..... |   | 44 |
| 10.01  | Owner’s Representative .....  | 44 |
| 10.02  | Visits to Site .....  | 44 |
| 10.03  | Resident Project Representative .....   | 44 |
| 10.04  | Engineer’s Authority .....  | 44 |
| 10.05  | Determinations for Unit Price Work .....  | 45 |
| 10.06  | Decisions on Requirements of Contract Documents and Acceptability of Work ..... | 45 |
| 10.07  | Limitations on Engineer’s Authority and Responsibilities .....                  | 45 |
| 10.08  | Compliance with Safety Program .....  | 45 |
| Article 11—Changes to the Contract .....               |   | 46 |
| 11.01  | Amending and Supplementing the Contract .....                                   | 46 |
| 11.02  | Change Orders .....   | 46 |
| 11.03  | Work Change Directives .....  | 46 |
| 11.04  | Field Orders .....  | 47 |
| 11.05  | Owner-Authorized Changes in the Work .....                                      | 47 |
| 11.06  | Unauthorized Changes in the Work .....  | 47 |
| 11.07  | Change of Contract Price .....  | 47 |
| 11.08  | Change of Contract Times .....  | 49 |
| 11.09  | Change Proposals .....  | 49 |
| 11.10  | Notification to Surety .....  | 50 |
| Article 12—Claims .....                                |   | 50 |

|             |   |    |
|-------------|---|----|
| 12.01       | Claims .....  | 50 |
| Article 13— | Cost of the Work; Allowances; Unit Price Work .....                               | 51 |
| 13.01       | Cost of the Work .....  | 51 |
| 13.02       | Allowances .....  | 55 |
| 13.03       | Unit Price Work .....   | 55 |
| Article 14— | Tests and Inspections; Correction, Removal, or Acceptance of Defective Work ..... | 56 |
| 14.01       | Access to Work .....  | 56 |
| 14.02       | Tests, Inspections, and Approvals .....   | 56 |
| 14.03       | Defective Work .....  | 57 |
| 14.04       | Acceptance of Defective Work .....  | 58 |
| 14.05       | Uncovering Work .....   | 58 |
| 14.06       | Owner May Stop the Work .....   | 58 |
| 14.07       | Owner May Correct Defective Work .....  | 59 |
| Article 15— | Payments to Contractor; Set-Offs; Completion; Correction Period .....             | 59 |
| 15.01       | Progress Payments .....   | 59 |
| 15.02       | Contractor’s Warranty of Title .....  | 62 |
| 15.03       | Substantial Completion .....  | 62 |
| 15.04       | Partial Use or Occupancy .....  | 63 |
| 15.05       | Final Inspection .....  | 64 |
| 15.06       | Final Payment .....   | 64 |
| 15.07       | Waiver of Claims .....  | 65 |
| 15.08       | Correction Period .....   | 66 |
| Article 16— | Suspension of Work and Termination .....  | 67 |
| 16.01       | Owner May Suspend Work .....  | 67 |
| 16.02       | Owner May Terminate for Cause .....   | 67 |
| 16.03       | Owner May Terminate for Convenience .....   | 68 |
| 16.04       | Contractor May Stop Work or Terminate .....                                       | 68 |
| Article 17— | Final Resolution of Disputes .....  | 69 |
| 17.01       | Methods and Procedures .....  | 69 |
| Article 18— | Miscellaneous .....   | 69 |
| 18.01       | Giving Notice .....   | 69 |
| 18.02       | Computation of Times .....  | 69 |
| 18.03       | Cumulative Remedies .....   | 70 |

18.04 Limitation of Damages ..... 70  
18.05 No Waiver ..... 70  
18.06 Survival of Obligations ..... 70  
18.07 Controlling Law ..... 70  
18.08 Assignment of Contract ..... 70  
18.09 Successors and Assigns ..... 70  
18.10 Headings..... 70

## ARTICLE 1—DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
  2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
  3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
  4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
  5. *Bidder*—An individual or entity that submits a Bid to Owner.
  6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
  7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
  8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
  9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
  10. *Claim*
    - a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.



- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
  - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
  - d. A demand for money or services by a third party is not a Claim.
11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
  12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
  13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
  14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
  15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
  16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
  17. *Cost of the Work*—See Paragraph 13.01 for definition.
  18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
  19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
  20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
  21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
  - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
  - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
  - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor’s plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers’ instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion of such Work.
43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

46. *Technical Data*

- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
- b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
- c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

- B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day*: The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective*: The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
1. does not conform to the Contract Documents;
  2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
  3. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
  2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
  3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
  4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.

- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## **ARTICLE 2—PRELIMINARY MATTERS**

### **2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance***

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

### **2.02 *Copies of Documents***

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

### **2.03 *Before Starting Construction***

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
  - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
  - 2. a preliminary Schedule of Submittals; and
  - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
  - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
  - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
  - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
  - 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

## ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

### 3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
  - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
  - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

### 3.02 *Reference Standards*

- A. *Standards Specifications, Codes, Laws and Regulations*
  - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
  - 2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility



inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

### 3.03 *Reporting and Resolving Discrepancies*

#### A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

#### B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
  - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
  - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

### 3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

### 3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
  - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
  - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

## **ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK**

### 4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

### 4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

### 4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

#### 4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
  - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
  - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

#### 4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
  - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
  - 2. Abnormal weather conditions;
  - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
  - 4. Acts of war or terrorism.

- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
  2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
  3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
  2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
  3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
  4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
  5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.
- Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

## **ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS**

### **5.01 *Availability of Lands***

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

## 5.02 *Use of Site and Other Areas*

### A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
  2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
  - C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

### 5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
3. Technical Data contained in such reports and drawings.

- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

- C. *Reliance by Contractor on Technical Data:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

#### 5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
  2. is of such a nature as to require a change in the Drawings or Specifications;
  3. differs materially from that shown or indicated in the Contract Documents; or
  4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
  - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
  - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
- a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
  - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
  - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

#### 5.05 *Underground Facilities*

- A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
  2. complying with applicable state and local utility damage prevention Laws and Regulations;



3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
  4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
  5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
  2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
  3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
  4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
  - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
  - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
  3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
  4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

#### 5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

- of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
  3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

## **ARTICLE 6—BONDS AND INSURANCE**

### **6.01 *Performance, Payment, and Other Bonds***

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

#### 6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.
- H. Contractor shall require:
  - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
  - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
  - 1. include at least the specific coverages required;
  - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
  - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
  - 4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and
  - 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds:* The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
  - 1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
  - 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
  - 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and
5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

#### 6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

#### 6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against



Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
  2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

**ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES**

7.01 *Contractor's Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

#### 7.04 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

#### 7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
  - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
    - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
      - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
  - 3) has a proven record of performance and availability of responsive service; and
  - 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
  - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

#### 7.06 *Substitutes*

- A. *Contractor's Request; Governing Criteria:* Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
  2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
  - a. will certify that the proposed substitute item will:
    - 1) perform adequately the functions and achieve the results called for by the general design;
    - 2) be similar in substance to the item specified; and
    - 3) be suited to the same use as the item specified.
  - b. will state:
    - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
    - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
    - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
  - c. will identify:
    - 1) all variations of the proposed substitute item from the item specified; and
    - 2) available engineering, sales, maintenance, repair, and replacement services.
  - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### 7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

#### 7.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

#### 7.11 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

#### 7.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.



### 7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
  - 1. all persons on the Site or who may be affected by the Work;
  - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

- 1. Before submitting a Shop Drawing or Sample, Contractor shall:
  - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
  - b. determine and verify:
    - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
    - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
    - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
  - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
- 2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
1. *Shop Drawings*
    - a. Contractor shall submit the number of copies required in the Specifications.
    - b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.
  2. *Samples*
    - a. Contractor shall submit the number of Samples required in the Specifications.
    - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
  3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Engineer's Review of Shop Drawings and Samples*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
  2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.
  3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
  4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

*D. Resubmittal Procedures for Shop Drawings and Samples*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

*E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
  - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
  - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
  - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

- d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
  2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

**7.17 Contractor's General Warranty and Guarantee**

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
  2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
1. Observations by Engineer;
  2. Recommendation by Engineer or payment by Owner of any progress or final payment;
  3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
  4. Use or occupancy of the Work or any part thereof by Owner;
  5. Any review and approval of a Shop Drawing or Sample submittal;
  6. The issuance of a notice of acceptability by Engineer;
  7. The end of the correction period established in Paragraph 15.08;
  8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
  - 1. Checking for conformance with the requirements of this Paragraph 7.19;
  - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
  - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

## **ARTICLE 8—OTHER WORK AT THE SITE**

### **8.01 *Other Work***

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

#### 8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
  - 1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
  - 2. An itemization of the specific matters to be covered by such authority and responsibility; and
  - 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

#### 8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.



- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
  - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
  - 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

## **ARTICLE 9—OWNER'S RESPONSIBILITIES**

### **9.01 *Communications to Contractor***

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

### **9.02 *Replacement of Engineer***

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

### **9.03 *Furnish Data***

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

### **9.04 *Pay When Due***

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

- 9.05 *Lands and Easements; Reports, Tests, and Drawings*
- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
  - B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
  - C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.
- 9.06 *Insurance*
- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.
- 9.07 *Change Orders*
- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.
- 9.08 *Inspections, Tests, and Approvals*
- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.
- 9.09 *Limitations on Owner's Responsibilities*
- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- 9.10 *Undisclosed Hazardous Environmental Condition*
- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.
- 9.11 *Evidence of Financial Arrangements*
- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).
- 9.12 *Safety Programs*
- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
  - B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

## ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

### 10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

### 10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

### 10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

### 10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

## ARTICLE 11—CHANGES TO THE CONTRACT

### 11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

### 11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
  - 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
  - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
  - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
  - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

### 11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

- B. If Owner has issued a Work Change Directive and:
  - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
  - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

#### 11.04 *Field Orders*

- A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

#### 11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

#### 11.06 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

#### 11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
  2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
  3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
1. A mutually acceptable fixed fee; or
  2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
    - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
    - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
    - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
    - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
    - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
    - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

#### 11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

#### 11.09 *Change Proposals*

- A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

#### B. *Change Proposal Procedures*

1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
  - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
  - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change



Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

#### 11.10 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

## ARTICLE 12—CLAIMS

### 12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
  1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
  2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
  3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
  4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
  - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
  - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
  - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

## **ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

### **13.01 *Cost of the Work***

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
  - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
  2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
  3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
  4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
  5. Other costs consisting of the following:
    - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
    - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are

consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
- 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
- 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.

- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
- 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 6. Expenses incurred in preparing and advancing Claims.
- 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

- 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
  - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
  - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
    - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
    - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
- 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

### 13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances*: Contractor agrees that:
1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
  2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

### 13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
  - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
  - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

**ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK**

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
  2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
  3. by manufacturers of equipment furnished under the Contract Documents;
  4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
  5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

#### 14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,



losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

#### 14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

#### 14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
  1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
  2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

#### 14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

**14.07 Owner May Correct Defective Work**

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

**ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD**

**15.01 Progress Payments**

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
  - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
  - 2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
  - a. the Work has progressed to the point indicated;
  - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
  - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
  - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
  - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
  - a. to supervise, direct, or control the Work;
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
  - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
  - a. the Work is defective, requiring correction or replacement;
  - b. the Contract Price has been reduced by Change Orders;
  - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
  - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

**D. *Payment Becomes Due***

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

**E. *Reductions in Payment by Owner***

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
  - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

- b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
  - c. Contractor has failed to provide and maintain required bonds or insurance;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
  - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
  - f. The Work is defective, requiring correction or replacement;
  - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - h. The Contract Price has been reduced by Change Orders;
  - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
  - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
  - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
  - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
  3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

#### 15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

#### 15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

#### 15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

#### 15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 15.06 *Final Payment*

##### A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents;
  - b. consent of the surety, if any, to final payment;
  - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

- d. a list of all duly pending Change Proposals and Claims; and
  - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

#### 15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,



appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

#### 15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
  - 1. correct the defective repairs to the Site or such adjacent areas;
  - 2. correct such defective Work;
  - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
  - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

## **ARTICLE 16—SUSPENSION OF WORK AND TERMINATION**

### **16.01 *Owner May Suspend Work***

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

### **16.02 *Owner May Terminate for Cause***

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
  - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
  - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
  - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
  - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
  - 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
  - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

#### 16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
  - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
  - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

#### 16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

## **ARTICLE 17—FINAL RESOLUTION OF DISPUTES**

### **17.01 *Methods and Procedures***

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
  2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
  2. agree with the other party to submit the dispute to another dispute resolution process; or
  3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

## **ARTICLE 18—MISCELLANEOUS**

### **18.01 *Giving Notice***

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
  2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
  3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

### **18.02 *Computation of Times***

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00 73 00

SUPPLEMENTARY CONDITIONS

TABLE OF CONTENTS

| <u>Article<br/>Number</u> | <u>Title</u>   |
|---------------------------|--|
| 1                         | DEFINITIONS AND TERMINOLOGY  |
| 2                         | PRELIMINARY MATTERS  |
| 3                         | CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE                              |
| 4                         | COMMENCEMENT AND PROGRESS OF THE WORK  |
| 5                         | SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS |
| 6                         | BONDS AND INSURANCE  |
| 7                         | CONTRACTOR'S RESPONSIBILITIES  |
| 8                         | OTHER WORK AT THE SITE   |
| 9                         | OWNER'S RESPONSIBILITIES   |
| 10                        | ENGINEER'S STATUS DURING CONSTRUCTION  |
| 11                        | CHANGES TO THE CONTRACT  |
| 12                        | CLAIMS   |
| 13                        | COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK                                |
| 14                        | TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK   |
| 15                        | PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD              |
| 16                        | SUSPENSION OF WORK AND TERMINATION   |
| 17                        | FINAL RESOLUTION OF DISPUTES   |



## SUPPLEMENTARY CONDITIONS

### AMENDMENTS TO GENERAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC C-700, 2018 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

#### ARTICLE 1. DEFINITIONS AND TERMINOLOGY

Delete the words "The individual or entity named as such in the Agreement" in 1.01.A.22 of the General Conditions, "Engineer", and insert the following in their place:

"The individual or entity duly appointed by the Owner to undertake the duties and powers herein assigned to the Engineer, acting either directly or through duly appointed representatives."

#### ARTICLE 2. PRELIMINARY MATTERS

##### SC-2.02

Owner shall furnish to Contractor electronic copies of the Contract Documents.

**Guidance Notes—Conformed Contract Documents**—On some projects it may be useful to produce conformed Contract Documents, in which the content of Addenda and negotiated changes are merged into the appropriate Specifications, Drawings, General Conditions, and other Contract Documents. This may be especially true on private construction projects where the terms and scope are negotiated and modified significantly after the initial release of proposed Contract Documents. Conformed documents may be considerably more convenient to use during the performance of the Work and the administration of the Contract.

EJCDC advises that if conformed documents are to be prepared and made available to Contractor, sufficient time and budget must be allocated to ensure the quality and full coordination of the conformed documents, and Owner and Engineer must recognize that Contractor, Subcontractors, and Suppliers will likely rely on the conformed version of the Contract Documents rather than the source components. If conformed documents are prepared without the level of commitment necessary to allow them to be accorded the full status of "Contract Documents," and are merely for reference or convenience, they should be accompanied by clear disclaimers of their content and a warning to consult the actual source Contract Documents.

A Supplementary Condition regarding conformed documents is necessary only if the Owner intends to provide the Contractor with conformed documents that will serve as binding Contract Documents. The following may be used for that purpose:

##### SC-2.03



3. A preliminary Schedule of Values for each Lump Sum item listed in the Bid, which includes quantities and prices of items which when added together equal the Lump Sum Bid Price and subdivides the Lump Sum Bid item into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.”

SC-2.05

3. Contractor’s Schedule of Values for Lump Sum Items will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Lump Sum Price to the component parts of the Work associated with the Lump Sum Item.”

### ARTICLE 3. CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

SC-3.01

Add the following sentence at the end of Paragraph 3.01A of the General Conditions:

“...by all. Each and every provision of law and clause required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be physically amended to make such insertion.”

SC-3.03

Delete the last phrase of paragraph 3.03 A.3 of the General Conditions starting with “had”, and substitute the following:

“knew or reasonably should have known thereof.”

### ARTICLE 4. COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01

Add a new paragraph immediately after paragraph 4.01A of the General Conditions which is to read as follows:

“B. Notwithstanding the time limitations provided in paragraph 4.01A, the OWNER may desire to commence the Contract Times later than the sixtieth day after the bid opening. The OWNER and CONTRACTOR, upon mutual agreement, may extend the commencement of the Contract Times to any date that they elect. OWNER must obtain CONTRACTOR’s approval for extending the time beyond the dates/times stated in the Contract Documents.”

SC-4.03

Add a new paragraph immediately after paragraph 4.03A of the General Conditions which is to read as follows:

"B. Engineer may check the lines, elevations and reference marks set by Contractor, and Contractor shall correct any errors disclosed by such check. Such a check shall not be considered as approval of Contractor's work and shall not relieve Contractor of the responsibility for construction of the entire Work in accordance with the Contract Documents. Contractor shall furnish personnel to assist Engineer in checking lines and grades."

SC-4.04

Add the following paragraph after paragraph 4.04B of the General Conditions:

"C. The Contractor's resident superintendent shall attend weekly progress meetings at the site of the work with the Engineer and others as appropriate to review schedule status and such other pertinent subjects as may be listed on the agenda by the Engineer."

SC-4.05

Delete Article 4.05A in its entirety and replace with the following:

"A. The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the Owner or the Engineer on account of any delay in the commencement or performance of any of the work or any delay or suspension of any portion of the work, whether such delay is caused by the Owner, the Engineer, or otherwise except as provided for within the prevailing statutes. The Contractor acknowledges that the Contractor's sole remedy for any such delay and/or suspension will be an extension of time as provided in the Contract Documents. The Contractor will under no circumstances be eligible for additional compensation on account of any delay even if an extension of time is granted by the Owner.

Add the following to the paragraph that follows 4.05E.5:

" Accumulating the amount of time required to complete a series of additional work items or delays and adding this time to the original Contract Time will not be considered justification for an extension of time. To justify an extension of Contract Time, the Contractor must prove clearly and convincingly that the critical path for construction has been impacted by circumstances beyond the control of the Contractor and that the CPM schedule cannot be revised to eliminate the need for the requested time extension."

Add the following new paragraphs after paragraph 4.05G of the General Conditions:

"4.06 Liquidated Damages:

A. If the Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does

hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contract shall be in default after the time stipulated in the Contract for completing the work. Such damages may be retained from time to time by the Owner from progress payments or any amounts owing to the Contractor, or otherwise collected.

- B. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.
- C. It is further agreed that time is of the essence of each and every portion of this Contract and of the specifications wherein as definite and certain length of times if fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract. Provided that the Contractor shall not be charged with liquidated damages of any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; Provided, further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:
- 1) to any preference, priority or allocation order duly issued by the Government;
  - 2) to unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and severe weather; and
  - 3) to any delays of subcontractors or suppliers occasioned by any of the causes specified in subsections C (1) and C (2) above;
- D. Provided, further, that the Contractor shall, within thirty (30) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the Contract, notify the Owner, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter."

## ARTICLE 5. SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

### SC-5.03

Delete the term "Supplementary Conditions" of paragraph 5.03A of the General Conditions and replace it with "Contract Documents".

Delete the term “Supplementary Conditions” of paragraph 5.03C line 2 of the General Conditions and replace it with “Contract Documents”.

SC-5.05

Delete the following words from line 3 of paragraph 5.05 F.1 of the General Conditions:

“...or was not shown or indicated with reasonable accuracy”

SC-5.06

Delete the term “Supplementary Conditions” in paragraph 5.06A of the General Conditions and replace it with “Contract Documents”.

Add the following to the first sentence of paragraph 5.06C:

“or unless Contractor caused or contributed to such Hazardous Environmental Condition.”

## ARTICLE 6. BONDS AND INSURANCE

### NOTICE TO CONTRACTOR:

1. Proof of Insurance coverage shall be furnished to the Owner in accordance with the schedule for submittal of Bonds and Agreements.
2. Additionally, refer to Article 2. PRELIMINARY MATTERS, Paragraph SC-2.01 B of the General Conditions.

SC-6.01

Insert these sentences following SC-6.01.A of the General Conditions:

“The Surety Company providing the bonds shall have a rating of A or better within the Best Key Rating Guide and be licensed by the **Massachusetts Division of Insurance** The CONTRACTOR shall pay the premiums for such Bonds.”

SC-6.02

Add the following paragraph to paragraph 6.02N:

“The Contractor shall immediately stop work on the Project and shall not resume work until the Contractor provides evidence, to the Owner and Engineer, in the form of an acceptable insurance certificate, of new insurance coverage that replaces all cancelled coverage that is required for the Project.”

SC-6.03

Add the following paragraphs to SC-6.03B of the General Conditions:

- “6. If the aggregate limits of liability indicated in Contractor's insurance provided in accordance with paragraph 6.03 are not sufficient to cover all claims for damages arising from its operations under this Contract and from any other work performed by it or if the commercial general liability insurance policy of insurance does not provide that the general aggregate limits apply on a per project and per location basis, Contractor shall have the policy amended so that the aggregate limits of liability required by this Contract will be available to cover all claims for damages due to operations under this Contract.
7. Include by endorsement that the insurer shall waive all rights of subrogation in favor of the Owner, Engineer and any other party named in the written contract against whom the insurer must agree to waive rights of subrogation.”

Insert “railroad protective liability” in line 2 of paragraph 6.03C.

Insert “except employer’s liability” after the word “insureds” in line 1 of paragraph 6.03C.1.

Add the following paragraphs after 6.03C:

- “D. *Workers’ Compensation and Employer’s Liability:* Contractor shall purchase and maintain workers’ compensation and employer’s liability insurance, including, as applicable, United States Longshoreman and Harbor Workers’ Compensation Act, Jones Act, stop-gap employer’s liability coverage for monopolistic states, and foreign voluntary workers’ compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

| <b>Workers’ Compensation and Related Policies</b>   | <b>Policy limits of not less than:</b> |
|---|--|
| <b>Workers’ Compensation</b>  |  |
| State   | Statutory                              |
| Applicable Federal (e.g., Longshoreman’s)   | Statutory                              |
| Foreign voluntary workers’ compensation (employer’s responsibility coverage), if applicable   | Statutory                              |
| Bodily injury by accident—each accident   | \$                                     |
| Bodily injury by disease—aggregate  | \$                                     |
| <b>Employer’s Liability</b>   |  |
| Each accident   | \$100,000                              |
| Each employee   | \$100,000                              |
| Policy limit  | \$500,000                              |
| <b>Stop-gap Liability Coverage***</b>   |  |
| For work performed in monopolistic states, stop-gap liability coverage must be endorsed to either the worker’s compensation or commercial general liability policy with a minimum limit of: | \$                                     |

- E. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of

Contractor, on an occurrence basis, against claims for:

1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
2. damages insured by reasonably available personal injury liability coverage, and
3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

F. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage.
  - a. Such insurance must be maintained for three years after final payment.
  - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
4. Underground, explosion, and collapse coverage.
5. Personal injury coverage.
6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10, CG 20 33 and CG 20 37 or insurer's endorsement offering similar coverage. If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
7. For design professional additional insureds, ISO Endorsement CG 20 32 or insurer's endorsement offering similar coverage.
8. Independent Contractors Coverage.

G. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of “insured contract” (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
2. Any exclusion for water intrusion or water damage.
3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
4. Any exclusion of coverage relating to earth subsidence or movement.
5. Any exclusion for the insured’s vicarious liability, strict liability, or statutory liability (other than worker’s compensation).
6. Any limitation or exclusion based on the nature of Contractor’s work.
7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

H. *Commercial General Liability—Minimum Policy Limits*

| <b>Commercial General Liability</b>               | <b>Policy limits of not less than:</b> |
|---|--|
| General Aggregate                                 | \$2,000,000                            |
| Products—Completed Operations Aggregate           | \$2,000,000                            |
| Personal and Advertising Injury                   | \$1,000,000                            |
| Bodily Injury and Property Damage—Each Occurrence | \$1,000,000                            |

I. *Automobile Liability:* Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

J. *Umbrella or Excess Liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer’s liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

| <b>Excess or Umbrella Liability</b> | <b>Policy limits of not less than:</b> |
|-------------------------------------|--|
| Each Occurrence                     | \$5,000,000                            |
| General Aggregate                   | \$5,000,000                            |

K. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements:* Contractor may meet the policy limits specified for employer’s liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy’s policy limits and partial

attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limits equivalent to those required in paragraph 6.03J after accounting for partial attribution of its limits to underlying policies, as allowed above.

- L. *Contractor’s Pollution Liability Insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor’s operations and completed operations. This insurance must be maintained for no less than three years after final completion.

| <b>Contractor’s Pollution Liability</b> | <b>Policy limits of not less than:</b> |
|---|--|
| Each Occurrence/Claim                   | \$2,000,000                            |
| General Aggregate                       | \$2,000,000                            |

- M. *Contractor’s Professional Liability Insurance:* If Contractor will provide or furnish professional services under this *Contract*, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

| <b>Contractor’s Professional Liability</b> | <b>Policy limits of not less than:</b> |
|--|--|
| Each Claim                                 | \$1,000,000                            |
| Annual Aggregate                           | \$1,000,000                            |

- N. *Railroad Protective Liability Insurance:* Prior to commencing any Work within 50 feet of railroad-owned and controlled property, Contractor shall (1) endorse its commercial general liability policy with ISO CG 24 17, removing the contractual liability exclusion for work within 50 feet of a railroad, (2) purchase and maintain railroad protective liability insurance meeting the following requirements, (3) furnish a copy of the endorsement to Owner, and (4) submit a copy of the railroad protective policy and other railroad-required documentation to the railroad, and notify Owner of such submittal.

- O. *Unmanned Aerial Vehicle Liability Insurance:* If Contractor uses unmanned aerial vehicles (UAV—commonly referred to as drones) at the Site or in support of any aspect of the Work, Contractor shall obtain UAV liability insurance in the amounts stated; name Owner, Engineer, and all individuals and entities identified in the Supplementary Conditions as additional insureds; and provide a certificate to Owner confirming Contractor’s compliance with this requirement. Such insurance will provide coverage for property damage, bodily injury or death, and invasion of privacy.



| <b>Unmanned Aerial Vehicle Liability Insurance</b> | <b>Policy limits of not less than:</b> |
|--|--|
| Each Claim   | \$500,000                              |
| General Aggregate                                  | \$1,000,000                            |

SC-6.04

“Add the following paragraphs after 6.04E:

F. *Builder’s Risk Requirements:* The builder’s risk insurance must:

1. be written on a builder’s risk “all risk” policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).
  - a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.
  - b. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake, volcanic activity, and other earth movement; or flood, are not commercially available under builder’s risk policies, by endorsement or otherwise, such insurance will be provided through other insurance policies acceptable to Owner and Contractor.
2. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).
4. extend to cover damage or loss to insured property while in temporary storage at

the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier). If this coverage is subject to a sublimit, such sublimit will be a minimum of **[\$amount]**.

5. extend to cover damage or loss to insured property while in transit. If this coverage is subject to a sublimit, such sublimit will be a minimum of **[\$amount]**.
6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.
7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.
8. include performance/hot testing and start-up, if applicable.
9. be maintained in effect until the Work is complete, as set forth in Paragraph 15.06.D of the General Conditions, or until written confirmation of Owner's procurement of property insurance following Substantial Completion, whichever occurs first.
10. include as named insureds the Owner, Contractor, Subcontractors (of every tier), and any other individuals or entities required by this Contract to be insured under such builder's risk policy. For purposes of Paragraphs 6.04, 6.05, and 6.06 of the General Conditions, and this and all other corresponding Supplementary Conditions, the parties required to be insured will be referred to collectively as "insureds." In addition to Owner, Contractor, and Subcontractors of every tier, include as insureds the following:
  11. include, in addition to the Contract Price amount, the value of the following equipment and materials to be installed by the Contractor but furnished by the Owner or third parties:
    - a. **[Here list or provide cross-reference to specific items of Owner-furnished (or third-party furnished) equipment, and purchase value; do not list items whose value is already included in the Contract Price.]**
12. If debris removal in connection with repair or replacement of insured property is subject to a coverage sublimit, such sublimit will be a minimum of **[\$amount]**.
13. In addition to the coverage sublimits stated above, the following coverages are also subject to sublimits, as follows:
  - a. **[Here list a specific coverage, or cause of loss, that has been determined to be likely to be subject to a sublimit. If not applicable, then delete Paragraph SC-6.04.F.13 in its entirety.]** If this coverage is subject to a sublimit, such sublimit will be a minimum of **[\$amount]**.

**Guidance Notes—Loss of Revenue and “Soft Cost” Coverage—**The basic coverage of a

builder's risk policy provides compensation for direct physical loss or damage to the Work. Such loss or damage often has secondary impacts associated with delays in completion of the Work. One significant secondary impact is loss of revenue. Another broad category of secondary impacts is often referred to as "soft costs"—extended financing costs, management and engineering expenses, tax and permit costs, and insurance.

It is usually possible to expand the basic builder's risk coverage to insure against loss of revenue and soft cost losses. SC-6.04.G provides a starting point for doing so. This clause should be reviewed carefully and supplemented as needed to obtain the coverage needed for the specific Project. Substantial input from Owner, working in conjunction with an insurance broker or consultant, is necessary to identify specific soft cost exposures, and to quantify the scope of possible losses. Without such input, it would be impossible for the builder's risk underwriters to assess risks and develop an appropriate premium.

For example, if soft cost coverage will extend to loss of revenue of a processing facility if it is completed late (as the result of physical damage from a covered risk, such as a fire), then it will be essential for the builder's risk insurers or brokers who price out the insurance to have a reasonable estimate of anticipated daily revenue and other financial factors. In a competitive bidding setting, and assuming that the Contractor will procure the builder's risk insurance (and include or account for the premium in the bid price), this means that such information will need to be furnished to bidders, who can then communicate it to brokers, who will furnish quotes for premiums.

As an alternative, Owner may prefer to solicit bids based on a generic requirement (such as that stated in SC-6.04.G), and then work with the selected Contractor and its insurer to refine the scope of loss of revenue and soft cost coverage and the related premiums, and issue a Change Order to document the precise coverage and any resulting change in Contract Price.

G. *Coverage for Completion Delays:* The builder's risk policy will include, for the benefit of Owner, loss of revenue and soft cost coverage for losses arising from delays in completion that result from covered physical losses or damage. Such coverage will include, without limitation, fixed expenses and debt service for a minimum of 12 months with a maximum deductible of 30 days, compensation for loss of net revenues, rental costs, and attorneys' fees and engineering or other consultants' fees, if not otherwise covered."

Delete Article 6.04 of the General Conditions in its entirety.

"Delete paragraph 6.04B in its entirety."

SC-6.05

Amend the last sentence of paragraph 6.05A of the General Conditions by striking out the words "held by Owner or Contractor as trustee or fiduciary, or."

SC-6.07

Add the following paragraph 6.07 after paragraph 6.06 of the General Conditions:

"6.07 Owner's Objections to Contractor's Insurance Coverage

A. If Owner has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by Contractor in accordance with this Article 6 on the basis of its not complying with the Contract Documents, Owner will notify Contractor in writing thereof within thirty days of the date of delivery of such certificates to Owner in accordance with paragraph 6.02D. Contractor will provide such additional information in respect of insurance provided by him as Owner may reasonably request."

## ARTICLE 7. CONTRACTOR'S RESPONSIBILITIES

### SC-7.02

Delete paragraph 7.02B of the General Conditions in its entirety and replace with the following:

"B. At the site of the Work the Contractor shall employ a full-time construction superintendent or foreman who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to the Engineer and shall be one who will be continued in the capacity for the particular job involved unless the representative ceases to be on the Contractor's payroll. If at any time during the Work the representative is deemed by the Engineer to be no longer acceptable, the representative shall be promptly replaced by the Contractor. All communications to the superintendent or foreman shall be as binding as if given to the Contractor."

### SC-7.08

Delete the second sentence in paragraph 7.08A of the General Conditions.

### SC-7.13

In line 3 of paragraph 7.13G of the General Conditions change "Supplementary Conditions" to "Contract Documents".

### SC-7.16

In paragraph 7.16C.1 of the General Conditions, delete the word "timely" from the first line.

In paragraph 7.16E.1.b of the General Conditions, delete the word "timely" from the first line.

### SC-7.18

Change the phrase "negligent act or omission" to "negligent or wrongful act or omission" in line 11 of paragraph 7.18A of the General Conditions.

Add the following to the end of paragraph 7.18A of the General Conditions:

“The Contractor hereby acknowledges its obligation under the foregoing paragraph to indemnify the Engineer and Owner against judgments suffered because of the Contractor's work and to assume the cost of defending the Engineer and Owner against claims as described in the foregoing paragraph.”

## ARTICLE 9. OWNER'S RESPONSIBILITIES

### SC-9.02

Delete the phrase “provided Contractor makes no reasonable objection to the replacement engineer” in paragraph 9.02A of the General Conditions.

### SC-9.06

Delete paragraph 9.06A of the General Conditions in its entirety.

### SC-9.09

Insert the following after the first sentence of paragraph 9.09A of the General Conditions:

“However, the Owner shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto.”

## ARTICLE 10. ENGINEER'S STATUS DURING CONSTRUCTION

### SC-10.01

Add a new paragraph 10.01B after paragraph 10.01A of the General Conditions, which is to read as follows:

"B. Nothing contained in the Contract Documents shall be construed to create a contractual relationship of any kind (1) between the Engineer and Contractor, (2) between the Owner and a Subcontractor or Subcontractors, or (3) between any person or entities other than the Owner and Contractor. The Engineer shall, however, be entitled to performance and enforcement of obligations under the Contract Documents intended to facilitate performance of the Engineer's duties."

### SC-10.02

Insert the following at the end of paragraph 10.02B of the General Conditions:

“However, the Engineer shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto.”

### SC-10.03

Delete the last sentence of paragraph 10.03B.

SC-10.07

Insert the following after the first sentence of paragraph 10.07B of the General Conditions:

“However, the Engineer shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto.”

#### ARTICLE 13. COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

Delete Article 13 of the General Conditions in its entirety and replace with the following:

"A. The unit price of an item of Unit Price work shall be subject to reevaluation and adjustment under the following conditions:

- (1) If the total extended bid price [Estimated Quantity times the Bid Unit Price] of a particular item of Unit Price Work amounts to 5 percent or more of the Original Contract Price and the variation in the quantity of the particular item of Unit Price Work performed by Contractor differs by more than 15 percent from the estimated quantity of such item indicated in the Agreement; and
- (2) If there is no corresponding adjustment with respect to any other item of work; and
- (3) If Contractor believes that Contractor has incurred additional expense as a result thereof, Contractor may make a claim for an adjustment in the Contract Price in accordance with Article 12 if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed. If Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, Owner shall be entitled to an adjustment in the unit price in an amount determined by the Engineer. Engineer shall not be liable in connection with any determination relating to adjustments which is rendered in good faith."

#### ARTICLE 14. TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

SC-14.03

Delete the word “Prompt” at the beginning of paragraph 14.03C of the General Conditions.

SC-14.07

Revise paragraph 14.07A of the General Conditions as follows:

A. Delete the word “seven” and replace it with the word “ten” so that it reads “after ten days’ written notice to Contractor.”

#### ARTICLE 15. PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION

## PERIOD

### SC-15.01

Delete paragraph 15.01B.4 of the General Conditions and insert the following in its place:

- "4. Retainage with respect to progress payments will be five percent or, if stipulated, the maximum allowed by law."

Delete the word "immediate" from line 2 of subparagraph 15.01E.2 of the General Conditions.

Delete subparagraph 15.01E.3 of the General Conditions in its entirety.

### SC-15.02

Delete paragraph 15.02A in its entirety and insert the following in its place:

- "A. Contractor warrants and guarantees that title to all work, material and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than at the time of Application for Payment free and clear of all liens. Contractor shall provide written transfer of title and a certified paid invoice provided by the supplier."

### SC-15.03

Delete the third sentence of paragraph 15.03C of the General conditions and replace it with the following:

"Owner shall review the preliminary certificate and make written objection to Engineer as to any provisions of the certificate or attached punch list."

In the same paragraph, delete the phrase "within 14 days after submission of the preliminary certificate to Owner" in the fourth sentence; delete the phrase "within said 14 days" in the fifth sentence.

### SC-15.06

Delete from lines 5 and 6 of paragraph 15.06B of the General Conditions the phrase "within 10 days after receipt of the final Application for Payment," in the first sentence.

### SC-15.08

Delete paragraph 15.08A of the General Conditions and insert the following in its place:

- "A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions: (i) correct such defective work, or, if it has

been rejected by Owner, remove it from the site and replace it with work that is not defective, and (ii) satisfactorily correct or remove and replace any damage to other work or the work of others therefrom. If Contractor does not begin the repairs within ten (10) days of receipt of written notification and promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk, loss or damage, Owner may have the defective work corrected or the rejected work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.”

## ARTICLE 16. SUSPENSION OF WORK AND TERMINATION

### SC-16.02

Add a new paragraph immediately after paragraph 16.02 A.4 of the General Conditions which is to read as follows:

"5. If the Work to be done under this Contract shall be abandoned, or if this Contract or any part thereof shall be sublet, without the previous written consent of Owner, or if the contract or any claim thereunder shall be assigned by Contractor otherwise than as herein specified."

## ARTICLE 18. MISCELLANEOUS

### SC-18.08

Replace paragraph 18.08A with the following:

“A. The Contractor shall not assign the whole or any part of this Contract or any moneys due or to become due hereunder until thirty (30) days prior notice in writing has been given to the Owner of the intention to assign, which notice shall state the identity and address of the prospective assignee. No assignment shall be made without the Owner's prior written consent. Such consent shall not be unreasonably withheld. In case the Contractor assigns all or any part of the moneys due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations of services rendered or materials supplied for the performance of the work called for in this Contract.”

### SC-18.11, 18.12, 18.13, 18.14

Add the following new paragraphs after paragraph 18.10 of the General Conditions:

#### “18.11 Liability

It is understood and agreed that members of the Owner or any agent or employees of the Owner signing this Agreement shall not be personally liable hereunder for any action incurred in connection with this Agreement.



#### 18.12 State Statutes and Regulations

See Section 00830 of these Specifications for further modifications of the General Conditions due to state statutes and regulations.

#### 18.13 Severability

If any provision of this Agreement shall be invalid or unenforceable to any extent or in any application, then the remainder of this Agreement and of such terms and conditions, except to such extent or in such application, shall not be affected thereby, and each and every term and condition of this Agreement shall be valid and enforced to the fullest extent and in the broadest application permitted by law."

END OF SECTION

00 73 73.83

ATTACHMENT F

AMERICAN IRON AND STEEL ACT REQUIREMENTS

**Note to Specifier – See Specs-MA for this document and add it after this cover page**

00 73 73.83

ATTACHMENT F

AMERICAN IRON AND STEEL ACT REQUIREMENTS

## SECTION 01 11 00

### CONTROL OF WORK AND MATERIALS

#### PART 1 – GENERAL

Not Used.

#### PART 2 – PRODUCTS

Not Used

#### PART 3 - EXECUTION

##### 3.01 HAULING, HANDLING AND STORAGE OF MATERIALS:

- A. The Contractor shall, at its own expense, handle and haul all materials furnished by it and shall remove any of its surplus materials at the completion of the work.
- B. The Contractor shall provide suitable and adequate storage for equipment and materials furnished by it that are liable to injury and shall be responsible for any loss of or damage to any equipment or materials by theft, breakage, or otherwise.
- C. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be always had to all parts of the Work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such location as will cause a minimum of inconvenience to public travel and adjoining owners, tenants, and occupants.
- D. The Contractor shall be responsible for all damages to the work under construction during its progress and until final completion and acceptance even though partial payments have been made under the Contract.

##### 3.02 EASEMENTS:

- A. As indicated on the drawings, the work is in easements obtained by the Owner. The Contractor has no rights outside of the easements unless they are obtained from the property owner.
- B. Contractor shall schedule work so that it will cause minimum inconvenience and nuisance to abutting property owners, over the shortest possible time.
- C. Easements shall be kept clean; no rubbish or discarded construction materials shall be allowed to accumulate. Storage of excess construction materials, including soil, ledge, equipment, or machinery on easements will not be allowed.

- D. Restoration of fences, shrubs, trees, and grass shall be completed promptly following completion of the work in an easement, to minimize disruption and inconvenience to property owners.
- E. Unless approved by the Engineer, the use of easements for ease of access to and egress from other areas of the project will not be permitted.

### 3.03 OPEN EXCAVATIONS:

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights, and other means to prevent accidents to persons, and damage to property. The Contractor shall, at its own expense, provide suitable and safe means for completely covering all open excavations and for accommodating travel when work is not in progress.
- B. Bridges provided for access to private property during construction shall be removed when no longer required.
- C. The length of open trench will be controlled by the surrounding conditions but shall always be confined to the limits prescribed by the Engineer.
- D. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, then special construction procedures shall be taken, such as limiting the length of trench and prohibiting stocking excavated material in the street.
- E. All street excavations shall be completely closed at the end of each work day. Backfilling or use of steel plates of adequate strength to carry traffic shall be used.

### 3.04 MAINTENANCE OF TRAFFIC:

- A. Unless permission to close the street is received in writing from the proper authority, all excavated materials and equipment shall be placed so that vehicular and pedestrian traffic may be safely always maintained.
- B. Should the Chief of Police deem it necessary, uniformed officers will be assigned to direct traffic. The Contractor shall make all arrangements in obtaining uniformed officers required.
- C. The Contractor shall at its own expense, as directed by the Police Traffic Control/Safety Officer, provide and erect acceptable barricades, barrier fences, traffic signs, and all other traffic devices not specifically covered in a bid item, to protect the work from traffic, pedestrians, and animals. The Contractor shall provide sufficient temporary lighting such as lanterns/flashers (electric battery operated) or other approved illuminated traffic signs and devices to afford adequate protection to the traveling public, at no additional cost to the Owner.

- D. The Contractor shall furnish all construction signs that are deemed necessary by and in accordance with Part VI of the Manual on Uniform Traffic Control Devices as published by the U.S. Department of Transportation. In addition, the Contractor may be required to furnish up to 128 square feet of additional special construction warning signs. Size and exact wording of signs shall be determined by the Engineer during construction.
- E. The intent of policing is to ensure public safety by direction of traffic. Police officers are not to serve as guards to protect the Contractor's equipment and materials.
- F. Nothing contained herein shall be construed as relieving the Contractor of any of its responsibilities for protection of persons and property under the terms of the Contract.

3.05 CARE AND PROTECTION OF PROPERTY:

The Contractor shall be responsible for the preservation of all public and private property and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be promptly restored by the Contractor, at its expense, to a condition similar or equal to that existing before the damage was done, to the satisfaction of the Engineer.

3.06 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

- A. All existing buildings, utilities, pipes, poles, wires fences, curbing, property line markers and other structures which the Engineer decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported, and protected from damage by the contractor. Should such property be damaged, the Contractor shall restore it, at no additional cost to the Owner.
- B. The Contractor shall determine the location of all underground structures and utilities (including existing water services, drain lines, electrical lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by Contractor.
- C. When fences interfere with the Contractor's operations, it shall remove and (unless otherwise specified) promptly restore them in accordance with Section 01 14 19.19 EXISTING FENCES.
- D. On paved surfaces the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels which are shaped to cut or otherwise damage such surfaces.
- E. All property damaged by the Contractor's operations shall be restored to a condition at least equal to that in which it was found immediately before work was begun. Suitable materials and methods shall be used for such restoration.

- F. Restoration of existing property and structures shall be carried out as promptly as practicable and shall not be left until the end of the construction period.

### 3.07 MAINTENANCE OF FLOW:

- A. The Contractor shall at its own cost, provide for the flow of sewers and drains interrupted during the progress of the work, and shall immediately cart away and dispose of all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.
- B. All existing drainage facilities including, but not limited to; brooks, streams, canals, channels, ditches, culverts, catch basins and drainage piping shall be adequately safeguarded so as not to impede drainage or to cause siltation of downstream areas in any manner whatsoever. If the Contractor damages or impairs any of the previously mentioned drainage facilities, it shall repair the same within the same day.
- C. At the conclusion of the work, the Contractor shall remove all silt in drainage structures caused by its operations as described in Section 01 74 13, CLEANING UP.

### 3.08 REJECTED MATERIALS AND DEFECTIVE WORK:

- A. Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor and shall not be made use of elsewhere in the work.
- B. Any errors, defects or omissions in the execution of the work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Engineer.
- C. The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or its employees, as determined by the Engineer, occurring before the final payment.

### 3.09 SANITARY REGULATIONS:

Sanitary conveniences for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers in such manner and at such locations as may be approved. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the committing of nuisances within, on or about the work. Any employees found violating these provisions shall be discharged and not again employed on the work without the written consent of the Engineer. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

3.10 SAFETY AND HEALTH REGULATIONS:

This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et. seq.)." The Contractor shall be familiar with the requirements of these regulations.

3.11 SITE INVESTIGATION:

The Contractor acknowledges that it has satisfied itself as to the conditions existing at the site of the work, the type of equipment required to perform this work, the quality and quantity of the materials furnished as far as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint itself with available information will not relieve it from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusion or interpretation made by the Contractor based on the information made available by the Owner.

3.12 WEATHER PROTECTION:

In conformance with Sections 44F and 44G of Chapter 149 of the General Laws of Massachusetts, the General Contractor shall install weather protection and shall furnish adequate heat in the area so protected during the months of November through March. Standards for such specifications shall be established by the Director of Building Construction in the Executive Office for Administration and Finance.

3.13 ELECTRIC SERVICE:

- A. The Contractor shall make all necessary applications and arrangements and pay for all fees and charges for electrical energy for power and light necessary for the proper completion of this contract during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.
- B. There shall be sufficient electric lighting so that all work may be done in a skillful manner where there is not sufficient daylight.

3.14 HAZARDOUS WASTE:

Should the Contractor, while performing work under this contract, uncover hazardous materials (other than those identified in this specification to be addressed by the Contractor, if applicable), as defined in Massachusetts Hazardous Waste Regulations 310 CMR 30.00, it shall immediately notify the Engineer. The Contractor is not, and has no authority to act as, a handler, generator, operator or disposer of hazardous or toxic substances found or identified at the site, and the Owner shall undertake all such functions.



END OF SECTION

Document3

## SECTION 01 12 16

### SCOPE AND SEQUENCE OF WORK

#### PART 1 – GENERAL

##### 1.01 WORK INCLUDED

- A. The proposed project will include renovations of the existing Dawson Recreation Area, located at 200 Salisbury St. and a new athletic complex located on Industrial Drive, 18 Industrial Dr. in Holden, MA. At the Dawson Recreation Area, site improvements will include regrading to allow for an ADA accessible path and vehicle access, new playground, a synthetic turf baseball/soccer field, improved trail network and a new boardwalk to allow connectivity to the Industrial Drive site.

The Industrial Drive portion of the proposed project will include the installation of a new access road, parking areas, manufacturer support building, two synthetic turf multi use fields, lighting, a workout area, and support utilities and amenities for the project.

- B. The Contractor shall furnish all labor, materials, equipment, and incidentals, required to complete the work as shown in the Contract Drawings and specified herein. .

C. Proposed Work:

1. Apply for, pay for and obtain all necessary permits as required, including but not limited to those listed in Section 00 31 43 - PERMITS, by local, State, and Federal agencies having jurisdiction over work for successful completion of this Contract.
2. Supply all submittals required by Section 01 33 23 - SUBMITTALS and those required to proceed with the completion of this scope.
3. Install temporary chain link fence as shown on the Contract Drawings and, as required, to secure the Site.
4. Furnish and install the appropriate signage as described in these Specifications.
5. Construct anti-tracking pad(s) at the Site entrance/egress gates as shown on the Contract Drawings. Install erosion and sediment control as shown on the Contract Drawings and described in these Specifications, including the Order of Conditions included as part of Section 00 31 43 - PERMITS., catch basin protection, straw wattles, straw bales, and silt fencing, as shown on the Contract Drawings and any additional measures that may be required or as determined by Engineer. Erosion and sediment control measures shall be furnished, installed, maintained and replaced by the Contractor as needed to ensure that sediment laden water/surface runoff does not leave the Limits of Work.

6. Provide all temporary utilities and obtain applicable permits that are anticipated for use during the Project, including electricity, and temporary water service, if required.

## PART 2 - PRODUCTS

Not Used.

## PART 3 – EXECUTION

### 3.01 GENERAL

- A. The Contractor shall be responsible for scheduling activities and the activities of any subcontractors involved, to meet the completion date established for the Contract. Scheduling of the work shall be coordinated with the Owner and Engineer.
- B. Prior to performing any work at the Site, the Contractor shall submit a detailed scheduling plan to the Engineer for review. The plan shall describe the proposed sequence, methods, and timing of the work.
- C. The schedule shall consist of a Critical Path Method showing the sequence of work described herein including permitting, submittal preparation, Site mobilization, Site work, project closeout, demobilization, and chart contract completion. See Section 01 32 16 - Construction Scheduling for additional requirements.

END OF SECTION

## SECTION 01 14 00

### SPECIAL PROVISIONS

1. Water for Construction Purposes
2. Occupying Private Property
3. Existing Utility Locations and Dimensions
4. Coordination of Work
5. Time for Completion of Contract
6. Project Signs
7. Compliance with Permits
8. Cutting, Fitting and Patching
9. Connections to Existing Water Systems
10. Contractor's Representative
11. Hours of Site Activity and Trucking Requirements

#### 1. WATER FOR CONSTRUCTION PURPOSES

The Contractor shall provide necessary hoses to use nearby hydrant located on Industrial Drive and or Salisbury Street, including approvals/ requirements from the Holden Department of Public Works (DPW) and Framingham Fire Department, or provide a water truck, for dust control. The Contractor shall install temporary metered water lines with backflow preventers, as required, to provide water for dust control activities, and shall provide protection for the hydrant. Backflow preventers and meters are to be inspected and approved by the DPW prior to: (1) installation; and (2) use. Hydrants shall at all times be left clear of obstructions and readily accessible to fire apparatus, and no material or other obstructions shall be placed within ten (10) feet of a hydrant. The Contractor is responsible for all Town of Holden Department of Public Works permit/set-up fees, and water usage at the Town of Holden water rate.

#### 2. OCCUPYING PRIVATE PROPERTY

The Contractor shall not enter upon nor occupy with men, equipment or materials any property outside of the Limits of Work shown on the Contract Drawings, except with the written consent of the property owner or property owner's agent.

#### 3. EXISTING UTILITY LOCATIONS AND DIMENSIONS

- A. The location of existing underground services and utilities shown on the Contract Drawings is based on available records. It is not warranted that all existing utilities and services are shown, or that shown locations are correct. The Contractor shall be responsible for having the utility companies locate their respective utilities on the ground prior to excavating.

- B. To satisfy the requirements of Massachusetts law, Chapter 82, Section 40, the Contractor shall, at least 72 hours, exclusive of Saturdays, Sundays and holidays, prior to excavation on the Site, notify utilities by calling "DIG SAFE" at 811 or 1-888-344-7233 and MWRA Permitting Department, Field Operations at (617) 305-5956.
- C. The Contractor shall coordinate all work involving utilities and shall satisfy itself as to the existing conditions of the areas in which it is to perform his work. It shall conduct and arrange its work so as not to impede or interfere with the work of other contractors working in the same or adjacent areas.
- D. Where the dimensions and locations of existing structures and pipes are of importance for any part of the Work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment that is dependent on the correctness of such information

4. COORDINATION OF WORK

The General Contractor shall be responsible for coordinating its own work as well as that of any subcontractors. It shall be responsible for notification of the Engineer when each phase of work is expected to begin and the approximate completion date.

5. TIME FOR COMPLETION OF CONTRACT

The time for completion of this contract is 18 months from the NTP. The Bidder shall base its bid on completing the proposed work by the completion date stipulated in Section 00 41 43 – FORM FOR GENERAL BID.

6. PROJECT SIGNS

- A. The Contractor shall install and maintain construction signs for the duration of the Project. Signs to be installed every 100 linear feet and maintained by the Contractor include, but not limited to: Twenty (20) of each of the following project signs, 1-foot by 2-foot (minimum), "Construction Area" signs and "No Trespassing/Keep Out" signs. Locations, wording, and size of signs shall be coordinated with Owner after the Contract is awarded. All signs shall be printed in English, Spanish, and Portuguese. The Contractor shall fabricate and install signs as specified in Section 01 11 00 – CONTROL AND WORK OF MATERIALS, including up to 128 square feet of additional traffic and/or project signs. Prior to sign fabrication, the Contractor shall submit a draft template of the sign to the Engineer for approval of the layout and wording. See Section 01 55 26.13 – SIGNAGE (TRAFFIC CONTROL) for additional sign requirements.
- B. The Contractor shall provide, and install where directed by the Engineer, two 4-foot by 8-foot project sign. The sign shall be plywood, MDO Exterior APA, supported on two 4-inch by 4-inch posts, with adequate bracing. Paint all surfaces with sign paint and provide lettering of size and type as required by the Owner and Engineer. Owner shall provide a template for the Project sign to the Contractor, including a QR code.

- C. The project signs shall be erected prior to commencement of Site work. The project signs shall be fabricated, erected, and maintained by the Contractor.
- D. The Contractor shall provide adequate support for the signs as determined by the Engineer.
- E. The project signs shall be maintained by the Contractor in good condition at all times for the duration of construction. The Contractor shall remove the signs upon completion of construction.

7. COMPLIANCE WITH PERMITS

The Contractor shall perform all work in conformance with requirements of the permits, which appear in Section 00 31 43 - PERMITS.

8. CONNECTIONS TO EXISTING WATER SYSTEMS

The Contractor shall coordinate with the Framingham DPW and Framingham Fire Department for water hydrant usage.

9. CONTRACTOR'S REPRESENTATIVE

The Contractor shall designate a representative who will be available to respond to emergency calls by the Owner at any time day and night and on weekends and holidays should such a situation arise.

10. HOURS OF SITE ACTIVITY AND TRUCKING REQUIREMENTS

- A. The Contractor shall conduct all construction activity between 7:00 a.m. and 5:00 p.m., Monday through Friday. No construction work shall be allowed on Saturdays, Sundays or Holidays without written authorization from the Owner.
- B. The Contractor shall limit all construction-related trucking (which shall mean all trucking of construction materials, excavated materials, and demolition debris by vehicles over 18,000 pounds GVW) to and from the Site to the hours of 7:00 a.m. to 5:00 p.m. Monday through Friday, except holidays. No trucks will be allowed to idle on any City streets. Trucks must enter the Site upon arrival.
- C. The Contractor shall be responsible for scheduling any necessary police details with the Framingham Police Department. All detail officers will be paid by the Owner directly and fees should not be included in the Contractor bid prices.

END OF SECTION

## SECTION 01 14 19.16

### DUST CONTROL

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

This section of the specification covers the control of dust via calcium chloride and water, complete.

#### PART 2 - PRODUCTS

##### 2.01 CALCIUM CHLORIDE:

- A. 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.
- B. 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 Engineer.

##### 2.02 WATER:

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

#### PART 3 - EXECUTION

##### 3.01 APPLICATION:

- A. Calcium chloride shall be applied when ordered by the Engineer and only in areas which will not be adversely affected by the application. See Section 01 57 19, ENVIRONMENTAL PROTECTION.
- B. Calcium chloride shall be uniformly applied at the rate of 1-1/2 pounds per square yard or at any other rate as required by the Engineer. Application shall be by means of a

mechanical spreader, or other approved methods. The number and frequency of applications shall be determined by the Engineer.

- C. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar.
- D. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

END OF SECTION

Document1



SECTION 01 22 00.13

PRICE ADJUSTMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. Price adjustments, as required by MGL Chapter 30, Section 38A, shall be implemented for this Project. Price adjustments, as enumerated in Part 3 of this specification, shall be made for the following items:

Water and Sewer Projects

- Diesel fuel and gasoline
- Liquid asphalt
- Portland cement contained in cast-in-place concrete

Road and Bridge Projects

- Diesel fuel and gasoline
- Asphalt
- Concrete
- Steel

- B. Price adjustments shall be made in accordance with the methodology adopted by the Massachusetts Department of Transportation in the following SPECIAL PROVISIONS documents, which are attached, but modified as contained herein:

1. Document 00811 Monthly Price Adjustment for Hot Mix Asphalt Mixtures, revised July 8, 2016
2. Document 00812 Monthly Price Adjustment for Diesel fuel and Gasoline, revised January 26, 2009
3. Document 00813 Price Adjustments for Structural Steel and Reinforcing Steel, dated March 16, 2023
4. Document 00814 Price Adjustments for Portland Cement concrete Mixes, dated January 12, 2009

- C. Base and Period Prices used to calculate price adjustments shall be as published by the Massachusetts Department of Transportation as presented in Documents 00811 through 00814.

1.02 CONTRACTOR CREDIT TO OWNER SHOULD PRICES DECREASE:

- A. Price adjustments will only be made if the variance between the base price and the period price is Five Percent (5%) or more.
- B. In the instance where the period price is below the base price by 5% or more, then the Contractor shall credit the Owner the adjustment.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.01 DIESEL FUEL AND GASOLINE:

- A. Price adjustments shall be determined based on documented quantities of diesel fuel and gasoline usage for site dedicated equipment. This methodology shall replace the price adjustment basis on fuel usage factors, as described within the Massachusetts Department of Transportation Document 00812.
- B. All site dedicated equipment shall be approved by the Engineer for the calculation of any qualifying price adjustment. Prior to the start of work the Contractor shall submit to the Engineer a list of all dedicated equipment for the project. The Contractor shall forward updated submittals, as necessary, throughout the duration of the contract. Only that equipment included within the current approved list shall be considered eligible for calculating a price adjustment under this Section 01 22 00.13.
- C. The Contractor shall submit fuel delivery slips to the Engineer as a basis for calculating total diesel fuel and gasoline usage for site dedicated equipment. At a minimum, the delivery slips will include the name of the fuel delivery company, the date and location of fueling, the type of fuel, description of the fueled equipment and the quantity for each type of fuel delivered in gallons. Any slips not providing the minimum information shall not be included in the calculation of total diesel fuel and gasoline usage for price adjustment purposes.

3.02 LIQUID ASPHALT:

- A. The "Period Price Method" shall be used to determine price adjustments. For projects utilizing reclaimed asphalt include Reclaimed Asphalt Pavement (RAP) Factor (0.0 to <1.0) in calculation of the total price adjustment. Otherwise, use RAP Factor = 1.0.
- B. For bid items involving asphalt paving that are measured and paid on a linear foot basis, or some other basis besides tonnage, the number of tons shall be determined by the Engineer using compacted measure of thickness within the established payment limits.

- C. Asphalt paving not separately measured for payment but rather included as an incidental component of work under a related bid item shall not be considered for price adjustment.

3.03 STRUCTURAL AND REINFORCING STEEL:

- A. Steel price adjustments shall not be made for water and sewer projects.
- B. Period prices for steel are subject to change up to four (4) months after the date of original publication. Therefore, no price adjustment will be made until the index for the period is finalized.

3.04 PORTLAND CEMENT AND CONCRETE:

- A. The price adjustment applies to all projects contained herein in Section 1.01A.
- B. Field Concrete used in water and sewer projects, typically used for thrust blocks and concrete encasement, shall not be considered for price adjustment. Cast-in-place concrete used on these projects will be included in the price adjustment determination.

END OF SECTION

ATTACHMENT FOR SECTION 01 22 00.13 PRICE ADJUSTMENTS

MASSDOT DOCUMENTS 00811-00814

## SECTION 01 25 00

### SUBSTITUTION PROCEDURES

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.

##### 1.03 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

##### 1.04 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use form acceptable to Engineer.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific

features and requirements indicated. Indicate deviations, if any, from the Work specified.

- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. Samples, where applicable or requested.
  - f. Certificates and qualification data, where applicable or requested.
  - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
  - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Engineer's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.05 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

#### 1.06 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.07 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - b. Substitution request is fully documented and properly submitted.
  - c. Requested substitution will not adversely affect Contractor's construction schedule.
  - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - e. Requested substitution is compatible with other portions of the Work.
  - f. Requested substitution has been coordinated with other portions of the Work.
  - g. Requested substitution provides specified warranty.
  - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

## SECTION 01 26 00

### CONTRACT MODIFICATION PROCEDURES

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
  - 1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

##### 1.03 MINOR CHANGES IN THE WORK

- A. Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

##### 1.04 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and



finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

e. Quotation Form: Use forms acceptable to Engineer.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Engineer.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Engineer.

#### 1.05 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Engineer will issue a Change Order for signatures of Owner and Contractor on AIA Document G701

#### 1.06 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Engineer may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.07 WORK CHANGE DIRECTIVE

- A. Work Change Directive: Engineer may issue a Work Change Directive on form acceptable to Owner / Engineer. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
  - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

## SECTION 01 29 00

### PAYMENT PROCEDURES

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

##### 1.03 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

##### 1.04 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the schedule of values to Engineer and Owner at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
  - 4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
  - a. Project name and location.
  - b. Owner's name.
  - c. Owner's Project number.
  - d. Name of Engineer.
  - e. Engineer's Project number.
  - f. Contractor's name and address.
  - g. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
  - a. Related Specification Section or division.
  - b. Description of the Work.
  - c. Name of subcontractor.
  - d. Name of manufacturer or fabricator.
  - e. Name of supplier.
  - f. Change Orders (numbers) that affect value.
  - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
    - 1) Labor.
    - 2) Materials.
    - 3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - a. Differentiate between items stored on-site and items stored off-site.
6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
8. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.

11. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

#### 1.05 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Engineer and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
  1. Other Application for Payment forms proposed by the Contractor may be acceptable to Engineer and Owner. Submit forms for approval with initial submittal of schedule of values.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.
  1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
  2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.

- b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
  - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
  - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
  - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit conditional final or full waivers.
  - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  - 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
  - 1. List of subcontractors.
  - 2. Schedule of values.
  - 3. Contractor's construction schedule (preliminary if not final).
  - 4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
  - 5. Products list (preliminary if not final).
  - 6. Sustainable design action plans, including preliminary project materials cost data.
  - 7. Schedule of unit prices.
  - 8. Submittal schedule (preliminary if not final).
  - 9. List of Contractor's staff assignments.
  - 10. List of Contractor's principal consultants.
  - 11. Copies of building permits.
  - 12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  - 13. Initial progress report.
  - 14. Report of preconstruction conference.
  - 15. Certificates of insurance and insurance policies.
  - 16. Performance and payment bonds.
  - 17. Data needed to acquire Owner's insurance.

- I. Application for Payment at Substantial Completion: After Engineer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
  1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
    - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 01 77 00 "Closeout Procedures."
  2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
  1. Evidence of completion of Project closeout requirements.
  2. Certification of completion of final punch list items.
  3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  4. Updated final statement, accounting for final changes to the Contract Sum.
  5. AIA Document G706.
  6. AIA Document G706A.
  7. AIA Document G707.
  8. Evidence that claims have been settled.
  9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  10. Final liquidated damages settlement statement.
  11. Proof that taxes, fees, and similar obligations are paid.
  12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

## SECTION 01 31 19.23

### CONSTRUCTION MEETINGS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. This Section specifies requirements for project meetings including but not limited to Pre-Construction Conference and Progress Meetings.
- B. It shall be the responsibility of the Contractor to coordinate work between all subcontractors, sections, and trades required for the proper completion of the Work.

##### 1.02 PRE-CONSTRUCTION CONFERENCE:

- A. After the bids have been opened but prior to the start of the construction there will be a pre-construction conference to discuss the phasing and scheduling of the Project. The specific time and place of the conference shall be arranged by the Engineer after the Contract has been awarded.
- B. This pre-construction conference is intended to establish lines of communication between the parties involved, review responsibilities and personnel assignments, establish project schedules, discuss proposed performance methods, and coordinate Work to be performed by subcontractors.
- C. Authorized representatives of the Owner, Engineer and their consultants, the Contractor, its Superintendent and Site Foreman, and all others invited by the Contractor, shall attend the pre-construction conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
- D. Discuss items of significance at the pre-construction conference that could affect progress including at least the following:
  - 1. Tentative construction schedule
  - 2. Critical Work sequencing
  - 3. Designation of responsible personnel
  - 4. Procedures for processing field decisions and Change Orders
  - 5. Procedures for processing Applications for Payment
  - 6. Review of Davis Bacon and other federal requirements
  - 7. Distribution of Contract Documents
  - 8. Submittal of Shop Drawings, Product Data and Samples
  - 9. Preparation of record documents



10. Use of the premises
11. Office, work and storage, and laydown areas
12. Equipment deliveries
13. Construction safety procedures
14. Environmental health and safety procedures
15. First aid
16. Security
17. Housekeeping
18. Working hours
19. Traffic Control
20. Emergency Vehicle Access to and around work site
21. Environmental protection measures for construction site

1.03 PROGRESS MEETINGS:

A. During the course of the Project, the Contractor shall attend weekly progress meetings as scheduled by the Owner. The Owner, based on work progress and activities, may adjust the progress meetings to biweekly or other. The attendance of subcontractors may be required during the progress of the Work. The Contractor's delegate to the meeting shall be prepared and authorized to discuss the following items:

1. Progress of Work/Critical Work Sequencing in relation to Contract Schedule
2. Proposed Work activities for forthcoming period
3. Resources committed to Contract
4. Coordination of Work with others
5. Status of procurement of equipment and materials
6. Status of Submittals
7. Outstanding actions, decisions, or approvals that affect Work activities
8. Site access and/or security issues
9. Hazards and risks
10. Housekeeping
11. Quality issues
12. Potential Claims
13. Change Orders
14. Costs, budget, and payment requests

B. The Contractor shall revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized and the revised schedule shall be submitted to the Engineer and Owner.

PART 2 - PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

## SECTION 01 32 16

### CONSTRUCTION SCHEDULING

#### PART 1- GENERAL

##### 1.01 PROGRAM DESCRIPTION:

- A. A Critical Path Method (CPM) construction schedule shall be used to control the work of this Contract and to provide a definitive basis for determining job progress. The Contractor shall prepare the construction schedule. All work shall be done in accordance with the established CPM schedule and the Contractor and its subcontractors shall be responsible for cooperating fully with the Engineer and the Owner in effectively utilizing the CPM schedule.
- B. The CPM schedule to be prepared and submitted by the Contractor shall consist of a CPM network (diagram of activities) and a computer-generated schedule (print-out) as specified herein. The format shall be the activity-on-node precedence network.
- C. The Contractor shall develop its own outline of the work and prepare its proposed CPM schedule. The computer-based schedule shall be the product of a recognized commercial computer software producer and shall meet all of the requirements defined herein.

##### 1.02 QUALIFICATIONS:

- A. The Contractor shall have the capability of preparing and utilizing the specified CPM scheduling technique. A statement of CPM capability shall be submitted by the Contractor in writing to the Engineer within 10 days after the issuance of the Notice to Proceed to verify that either the Contractor's organization has in-house capability qualified to use the technique or that the Contractor employs a consultant who is so qualified. Capability shall be verified by description of the construction projects to which the Contractor or its consultant has successfully applied the CPM scheduling technique and which were controlled throughout the duration of the project by means of systematic use and updating of a computer-based CPM schedule. The submittal shall include the name of the individual on the Contractor's staff who will be responsible for the CPM schedule and for providing the required updating information.

##### 1.03 SUBMITTALS:

- A. Submit under provisions of Section 01 33 23.
- B. Within 5 days of Notice to Proceed, and thereafter on a quarterly basis, Contractor shall submit a projection of costs for the upcoming quarter ("Quarterly Estimate"). This report shall be in Excel format using the Bid Form, and any subsequent modifications thereto. In addition to the projection for the upcoming quarter, each Quarterly Estimate shall include a comparison of the estimated versus actual amounts per Bid Item for the prior

quarter; a presentation of the “over” and “under” amounts for each Bid Item; and a sum total of the “over” and “under” for the project.

- C. Within 10 days following the issuance of the Notice to Proceed, the Contractor shall submit the CPM Schedule to the Engineer for review and acceptance. The Contractor shall submit to the Engineer a preliminary network defining the planned operations during the first 60 calendar days after the issuance of the Notice to Proceed. The Contractor's general approach for the balance of the project shall be indicated. Cost of activities expected to be completed or partially completed before submission and approval of the complete network shall be included.

#### 1.04 APPROVED CPM SCHEDULE:

- A. Following review by the Engineer, the Contractor shall incorporate the Engineer's comments into the network and submit the revised network and computer-generated schedule. This final submittal shall be delivered to the Engineer within 60 days after the issuance of the Notice to Proceed.
- B. CPM schedules, which contain activities showing negative, float or which extend beyond the contract completion date in the computer-generated schedule will not be approved.
- C. The approved network shall then be the approved CPM schedule to be used by the Contractor for planning, organizing and directing the work, and reporting progress.
- D. Approval of the CPM activity network by the Engineer is advisory only and shall not relieve the Contractor of responsibility for accomplishing the work within the contract completion date. Omissions and errors in the approved CPM schedule shall not excuse performance less than that required by the Contract. Approval by the Engineer in no way makes the Engineer an insurer of the CPM schedule's success or liable for time or cost overruns flowing from its shortcomings. The Owner hereby disclaims any obligation or liability by reason of approval by its agent, the Engineer, of the CPM schedule.
- E. The CPM activity network shall be submitted on sheets 24-in by 36-in and may be divided into as many separate sheets as required. An electronic file in PDF format shall be submitted concurrent with the hard copy schedule.

## PART 2 – PRODUCTS

NOT USED

## PART 3 – EXECUTION

### 3.01 NETWORK REQUIREMENTS:

- A. The network shall show the order and inter-dependence of activities and the sequence in which the work is to be accomplished as planned by the Contractor. The **basic concept of a network analysis diagram** shall be followed to show how the start of a given

activity is dependent on the completion of preceding activities and its completion restricts the start of following activities.

- B. Detailed network activities shall include: construction activities, the submittal and approval of shop drawings, the procurement of materials and equipment, fabrication of materials and equipment and their delivery, installation and testing, start-up and training. The Contractor shall break the work into activities with durations no longer than twenty working days each, except as to non-construction activities (such as procurement of materials and delivery of equipment) and any other activities for which the Engineer may approve the showing of longer duration. To the extent feasible, **activities related** to a specific physical area of the work should be grouped on the network for ease of understanding and simplification.
- C. Separate activities shall be provided for each significant identifiable function in each trade area in each facility. Activities shall be so identified that there will be no reasonable doubt as to how much work remains on each. Specific activities which shall be included are: all subcontract work, all interface work between subcontractors and between the Contractor and subcontractors, leakage tests of pipelines, electrical connections to each item of equipment, supplier and manufacturer technical assistance, mechanical connections to each item of equipment, all tests, concrete finishing, each item of site work, (including restraints on other activities) and all utilities, fuels and chemicals.
- D. Each activity on the network shall have the following indicated on the NODE representing it.
  - 1. A single duration (i.e., the single best estimate of elapsed time considering the scope of the work involved in the activity and the resources planned for accomplishing the activity) expressed in working days.
  - 2. A five character (or less) code indicative of the party responsible for accomplishing the activity.
  - 3. A cost estimate for each activity which, when accumulated with the cost of all activities, equals the total contract cost. Estimated overhead and profit shall be prorated throughout all activities. Materials costs shall be assigned to delivery activities.
  - 4. A brief description of the activity.
- E. The selection and number of activities shall be subject to the Engineer's approval. The detailed network need not be time scaled but shall be drafted to show a continuous flow from left to right with no flow from right to left. In addition to the brief description, the Contractor shall submit a separate list of all activities containing a detailed narrative of the scope of each activity, including the trades, subcontractors involved, and number of man-hours estimated.
- F. To the extent that the network or any revision thereof shows anything not jointly agreed upon or fails to show anything jointly agreed upon, it shall not be deemed to have been approved by the Engineer. Failure to include on a network any element of work required

for the performance of this Contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding the review of the network by the Engineer.

- G. Except where earlier completions are specified, CPM schedules, which show completion of all work prior to the contract completion date, may be approved by the Engineer but in no event shall they be acceptable as a basis for claim for delay against the Owner by the Contractor.

### 3.02 COMPUTER-GENERATED SCHEDULE REQUIREMENTS:

- A. Each computer-generated schedule submittal from the CPM activity network shall include the following tabulations: a list of activities in numerical order, a list of activity precedence's, a schedule sequenced by Early Start Date and a schedule sequenced by Total Float. Each schedule shall include the following minimum items:

1. Activity numbers
2. Estimated duration
3. Activity description
4. Early start date (calendar dated)
5. Early finish date (calendar dated)
6. Latest allowable start date (calendar dated)
7. Latest allowable finish date (calendar dated)
8. Status (whether critical)
9. Estimated cost of the activity
10. Total float and free float

- B. In addition, each schedule shall be prefaced with the following summary data:

1. Contract name and number
2. Contractor's Name
3. Contract duration
4. Contract schedule
5. The effective or starting date of the schedule.

- C. The workday to calendar date correlation shall be based on an 8-hour day and 40-hour week with adequate allowance for holidays, adverse weather and all other special requirements of the work.

### 3.03 PROGRESS REPORTING:

- A. Progress under the approved CPM schedule shall be evaluated monthly by the Contractor. Not less than seven days prior to each monthly progress meeting, The Contractor shall evaluate the status of each activity on which work has started or is due to start, based on the preceding CPM schedule; to **show actual progress**, to identify those activities started and those completed during the previous period, to show the estimated time required to complete or the percent complete of each activity started but not yet completed and to reflect any changes indicated for the network. Activities shall not be considered complete until they are, in fact, 100 percent complete.
- B. At each progress meeting the Contractor shall submit a narrative report based on the CPM schedule evaluation described above, in a format agreed upon by the Contractor and the Engineer. The report shall include a description of the progress during the previous period in terms of completed activities, an explanation of each activity which is showing a delay, a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates and an explanation of corrective action taken or proposed. This report, as well as the CPM Status Report, will be discussed at each progress meeting.
- C. Within 5 days of Notice to Proceed, and thereafter on a quarterly basis, Contractor shall submit a projection of costs for the upcoming quarter (“Quarterly Estimate”). This report shall be in Excel format using the Bid Form, and any subsequent modifications thereto. In addition to the projection for the upcoming quarter, each Quarterly Estimate shall include a comparison of the estimated versus actual amounts per Bid Item for the prior quarter; a presentation of the “over” and “under” amounts for each Bid Item; and a sum total of the “over” and “under” for the project.
- D. The Contractor shall provide the Engineer and OPM with a daily report, including all labor, equipment, work areas, survey verified quantities (if applicable), work performed for General Site Work Items, Park Remediation Items, Sewer and Drain Rehabilitation Items, and Park Construction Items. Each report should be provided by 10:00 AM the next working day.

### 3.04 RESPONSIBILITY FOR SCHEDULE COMPLIANCE:

- A. Whenever it becomes apparent from the current CPM schedule and narrative report that delays to the critical path have resulted and the contract completion date will not be met, the Contractor shall take some or all of the following actions at no additional cost to the Owner. It shall submit to the Engineer for approval, a written statement of the steps it intends to take to remove or arrest the delay to the critical path in the approved schedule.

### 3.05 ADJUSTMENT OF CONTRACT SCHEDULE AND COMPLETION TIME:

- A. If the Contractor desires to make changes in its method of operating which affect the approved CPM schedule, it shall notify the Engineer in writing stating what changes are proposed and the reason for the change. If the Engineer approves these changes, the Contractor shall revise and submit for approval, without additional cost to the Owner, all of the affected portions of the CPM network. The Contractor shall adjust the CPM schedule only after prior approval of its proposed changes by the Engineer.
- B. If the completion of any activity, whether or not critical, falls more than 100 percent behind its approved duration, the Contractor shall submit for approval a schedule adjustment showing each such activity divided into two activities reflecting completed versus uncompleted work.
- C. Shop drawings which are not approved on the first submittal or within the schedule time and equipment which do not pass the specified tests shall be immediately rescheduled.
- D. The contract time will be adjusted only for causes specified in this Contract. In the event the Contractor requests an extension of any contract completion date, it shall furnish such justification and supporting evidence as the Engineer may deem necessary to determine whether the Contractor is entitled to an extension of time under the provisions of this Contract. The Engineer will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing thereof. If the Engineer finds that the Contractor is entitled to any extension of any contract completion date, the Engineer's determination as to the total number of day's extension shall be based upon the currently approved CPM schedule and on all data relevant to the extension. Such data shall be included in the next updating of the schedule. Actual delays in activities, which, according to the CPM schedule, do not affect any contract completion date shown by the critical path in the network, will not be the basis for a change therein.
- E. Each request for change in any contract completion date shall be submitted by the Contractor to the Engineer within 30 days after the beginning of the delay for which a time extension is requested but before the date of final payment under this Contract. No time extension will be granted for requests, which are not submitted within the foregoing time limit.

### 3.06 COORDINATING SCHEDULES WITH OTHER CONTRACT SCHEDULES:

- A. Where work is to be performed under this Contract concurrently with or contingent upon work performed on the same facilities or area under other contracts, the Contractor's CPM Schedule shall be coordinated with the schedules of the other contracts. The Contractor shall obtain the schedules of the other appropriate contracts from the Owner for the preparation and updating of its CPM schedule and shall make the required changes in its schedule when indicated by changes in corresponding schedules.
- B. In case of interference between the operations of different contractors, the Owner will determine the work priority of each Contractor and the sequence of work necessary to expedite the completion of the entire project. In all such cases, the decision of the Owner shall be accepted as final. The temporary delay of the Contractor's work due to such circumstances shall not be considered as justification for claims for additional



compensation.

END OF SECTION

## SECTION 01 33 23

### SUBMITTALS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. The Contractor shall provide the Engineer with submittals as required by the contract documents.
- B. The Contractor shall use the attached Submittal Register to track all submittal progress. The Submittal Register is included as an attachment to this Section.

##### 1.02 RELATED WORK:

- A. Divisions 1 – 32 of these specifications that require submittals.

#### PART 2 - PRODUCTS

NOT USED

#### PART 3 - EXECUTION

##### 3.01 GENERAL:

- A. As required by the General Conditions, the Contractor shall submit a schedule of shop and working drawing submittals.
- B. The Contractor shall submit the shop and working drawing submittals electronically as specified below.

##### 3.02 ELECTRONIC SUBMITTAL PROCEDURES:

- A. In accordance with the accepted schedule, the Contractor shall submit promptly to the Engineer through the Owner's Smart File site ([fdpw.smartfile.com](http://fdpw.smartfile.com)), one electronic copy in Portable Document Format (PDF) of shop or working drawings required as noted in the specifications, of equipment, structural details and materials fabricated especially for this Contract.
- B. Each electronic copy of the shop or working drawing shall be accompanied by the Engineer's standard shop drawing transmittal form, included as Exhibit 1 of this section, on which is a list of the drawings, descriptions and numbers and the names of the Owner, Project, Contractor and building, equipment or structure.
- C. The Contractor shall receive a shop drawing memorandum with the Engineer's approval or comments via email.

### 3.04 SHOP AND WORKING DRAWINGS:

- A. Shop and working drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish of shop coat, grease fittings, etc., depending on the subject of the drawings. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for this Contract.
- B. All shop and working drawings shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from its subcontractors and returning reviewed drawings to them. All shop and working drawings shall be prepared on standard size, 24-inch by 36-inch sheets, except those, which are made by changing existing standard shop or working drawings. All drawings shall be clearly marked with the names of the Owner, Project, Contractor and building, equipment or structure to which the drawing applies, and shall be suitably numbered. Each shipment of drawings shall be accompanied by the Engineer's (if applicable) standard shop drawing transmittal form on which is a list of the drawings, descriptions and numbers and the names mentioned above.
- C. Only drawings that have been prepared, checked and corrected by the fabricator should be submitted to the Contractor by its subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to satisfy itself that the subject matter thereof conforms to the Contract Documents in all respects. Shop drawings shall be reviewed and marked with the date, checker's name and indication of the Contractor's approval, and only then shall be submitted to the Engineer. Shop drawings unsatisfactory to the Contractor shall be returned directly to their source for correction, without submittal to the Engineer. Shop drawings submitted to the Engineer without the Contractor's approval stamp and signature will be rejected. Any deviation from the Contract Documents indicated on the shop drawings must be identified on the drawings and in a separate submittal to the Engineer.
- D. The Contractor shall be responsible for the prompt submittal and resubmittal, as necessary, of all shop and working drawings so that there will be no delay in the work due to the absence of such drawings.
- E. The Engineer will review the shop and working drawings as to their general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections of comments made on the drawings during the review do not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating its work with that of all other trades; and performing its work in a safe and satisfactory manner. The review of the shop drawings is general and shall not relieve the Contractor of the responsibility for details of design, dimensions, code compliance, etc., necessary for interfacing with other components, proper fitting and construction of the work required by the Contract and for achieving the specified performance. The Engineer will review submittals two times: once upon

original submission and a second time if the Engineer requires a revision or corrections. The Contractor shall reimburse the Owner amounts charged to the Owner by the Engineer for performing any review of a submittal for the third time or greater.

- F. With few exceptions, shop drawings will be reviewed and returned to the Contractor within 30 days of submittal.
- G. No material or equipment shall be purchased or fabricated especially for this Contract nor shall the Contractor proceed with any portion of the work, the design and details of which are dependent upon the design and details of equipment or other features for which review is required, until the required shop and working drawings have been submitted and reviewed by the Engineer as to their general conformance and compliance with the project and its Contract Documents. All materials and work involved in the construction shall then be as represented by said drawings.
- H. Two copies of the shop and working drawings and/or catalog cuts will be returned to the Contractor. The Contractor shall furnish additional copies of such drawings or catalog cuts when it needs more than two copies or when so requested.

### 3.05 SAMPLES:

- A. Samples specified in individual Sections include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols, and units of work to be used by the Engineer or the Owner for independent inspection and testing, as applicable to the work.
- B. The number of samples submitted shall be as specified. Submittal and processing of samples shall follow the procedures outlined for shop and working drawings unless the specifications call for a field submittal or mock-up.
- C. Acceptance of samples will be acknowledged via a copy of the transmittal noting status. When samples are not acceptable, prompt resubmittal will be required.

END OF SECTION

EXHIBIT 1 TO SECTION 01 33 23 SUBMITTALS

SHOP DRAWING TRANSMITTAL FORM

SECTION 01 37 00  
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Provide Schedule of Values covering each bid item.

B. Related Sections:

1. Section 01 22 00 – MEASUREMENT AND PAYMENT
2. Section 01 33 23 – SUBMITTALS

1.02 SUBMITTALS:

A. Submit the following in accordance with Section 01 33 23 - SUBMITTALS:

1. Schedule of Values.

- a. Submit draft Schedule of Values within 5 days of NTP.
- b. Revise and resubmit Schedule of Values until acceptable to the Engineer.

2. Itemize separate line-item cost for work comprising each lump sum bid item:

- a. Ensure that the sum of the items listed in the Schedule of Values for each lump sum item equals the price bid for the respective lump sum item. See Section 01 22 00 – MEASUREMENT AND PAYMENT for items that should be included, at a minimum, within each lump sum item.

3. Work requiring verification of proper disposal

- a. A separate line item shall be included for any items requiring documentation of proper legal disposal. Payment shall be withheld pending submission of required documentation (e.g., certified weight slips and signed disposal documentation).

4. Schedule of Values shall include an item for Close-Out Documentation & Reports

5. An unbalanced Schedule of Values providing for overpayment on items of work performed first will not be accepted.

1.03 SEQUENCING AND SCHEDULING:

- A. Before submitting any application for payment, obtain the Engineer's approval of the Schedule of Values.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

## SECTION 01 40 00

### QUALITY REQUIREMENTS

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

##### 1.03 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
  - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).



- D. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- E. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."
- G. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- H. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

#### 1.04 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

#### 1.05 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as

appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
  - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
  - 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Entity responsible for performing tests and inspections.
  - 3. Description of test and inspection.
  - 4. Identification of applicable standards.
  - 5. Identification of test and inspection methods.
  - 6. Number of tests and inspections required.
  - 7. Time schedule or time span for tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

#### 1.07 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to

coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
  - 1. Project quality-control manager may also serve as Project superintendent
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
  - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
  - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
  - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.08 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, telephone number, and email address of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.

10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

## 1.09 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged in the activities indicated.
  - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

#### 1.010 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
  - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Engage a qualified testing agency to perform quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies & Owner at least 48 hours in advance of time when Work that requires testing or inspection will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
  2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.011 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
  2. Notifying Architect, Owner, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
  4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  5. Interpreting tests and inspections and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
  6. Retesting and reinspecting corrected Work.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.01 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
  - 1. Date test or inspection was conducted.
  - 2. Description of the Work tested or inspected.
  - 3. Date test or inspection results were transmitted to Architect.
  - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.
  - 1. Submit log at Project closeout as part of Project Record Documents.

### 3.02 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00



## SECTION 01 42 00

### REFERENCES

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

##### 1.02 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

##### 1.03 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied

directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
  - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

#### 1.04 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Abbreviations and acronyms not included in this list shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.
  - 1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com).
  - 2. AAMA - American Architectural Manufacturers Association; [www.aamanet.org](http://www.aamanet.org).
  - 3. AAPFCO - Association of American Plant Food Control Officials; [www.aapfco.org](http://www.aapfco.org).
  - 4. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
  - 5. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
  - 6. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
  - 7. ABMA - American Boiler Manufacturers Association; [www.abma.com](http://www.abma.com).
  - 8. ACI - American Concrete Institute; (Formerly: ACI International); [www.concrete.org](http://www.concrete.org).
  - 9. ACPA - American Concrete Pipe Association; [www.concrete-pipe.org](http://www.concrete-pipe.org).
  - 10. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
  - 11. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
  - 12. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
  - 13. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
  - 14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
  - 15. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
  - 16. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
  - 17. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).
  - 18. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).

19. AITC - American Institute of Timber Construction; [www.aitc-glulam.org](http://www.aitc-glulam.org).
20. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
21. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
22. AOSA - Association of Official Seed Analysts, Inc.; [www.aosaseed.com](http://www.aosaseed.com).
23. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
24. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).
25. API - American Petroleum Institute; [www.api.org](http://www.api.org).
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
29. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
32. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
33. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).
34. ASSP - American Society of Safety Professionals (The); [www.assp.org](http://www.assp.org).
35. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
36. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
37. AVIXA - Audiovisual and Integrated Experience Association; (Formerly: Infocomm International); [www.soundandcommunications.com](http://www.soundandcommunications.com).
38. AWEA - American Wind Energy Association; [www.awea.org](http://www.awea.org).
39. AWI - Architectural Woodwork Institute; [www.awinet.org](http://www.awinet.org).
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; [www.awmac.com](http://www.awmac.com).
41. AWPA - American Wood Protection Association; [www.awpa.com](http://www.awpa.com).
42. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
43. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
44. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
45. BIA - Brick Industry Association (The); [www.gobrick.com](http://www.gobrick.com).
46. BICSI - BICSI, Inc.; [www.bicsi.org](http://www.bicsi.org).
47. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); [www.bifma.org](http://www.bifma.org).
48. BISSC - Baking Industry Sanitation Standards Committee; [www.bissc.org](http://www.bissc.org).
49. BWF - Badminton World Federation; (Formerly: International Badminton Federation); [www.bissc.org](http://www.bissc.org).
50. CDA - Copper Development Association; [www.copper.org](http://www.copper.org).
51. CE - Conformite Europeenne; <http://ec.europa.eu/growth/single-market/ce-marking/>.
52. CEA - Canadian Electricity Association; [www.electricity.ca](http://www.electricity.ca).
53. CFFA - Chemical Fabrics and Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
54. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
55. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
56. CIMA - Cellulose Insulation Manufacturers Association; [www.cellulose.org](http://www.cellulose.org).
57. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).
58. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
59. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
60. CPA - Composite Panel Association; [www.compositepanel.org](http://www.compositepanel.org).
61. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
62. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).

63. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).
64. CSA - CSA Group; [www.csa-group.org](http://www.csa-group.org).
65. CSI - Construction Specifications Institute (The); [www.csiresources.org](http://www.csiresources.org).
66. CSSB - Cedar Shake & Shingle Bureau; [www.cedarbureau.org](http://www.cedarbureau.org).
67. CTA - Consumer Technology Association; [www.cta.tech](http://www.cta.tech).
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.coolingtechnology.org](http://www.coolingtechnology.org).
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).
71. DHA - Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association); [www.decorativehardwoods.org](http://www.decorativehardwoods.org).
72. DHI - Door and Hardware Institute; [www.dhi.org](http://www.dhi.org).
73. ECA - Electronic Components Association; (See ECIA).
74. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
75. ECIA - Electronic Components Industry Association; [www.eciaonline.org](http://www.eciaonline.org).
76. EIA - Electronic Industries Alliance; (See TIA).
77. EIMA - EIFS Industry Members Association; [www.eima.com](http://www.eima.com).
78. EJMA - Expansion Joint Manufacturers Association, Inc.; [www.ejma.org](http://www.ejma.org).
79. EOS/ESD Association; (Electrostatic Discharge Association); [www.esda.org](http://www.esda.org).
80. ESTA - Entertainment Services and Technology Association; (See PLASA).
81. ETL - Intertek (See Intertek); [www.intertek.com](http://www.intertek.com).
82. EVO - Efficiency Valuation Organization; [www.evo-world.org](http://www.evo-world.org).
83. FCI - Fluid Controls Institute; [www.fluidcontrolsinstitute.org](http://www.fluidcontrolsinstitute.org).
84. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); [www.fiba.com](http://www.fiba.com).
85. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); [www.fivb.org](http://www.fivb.org).
86. FM Approvals - FM Approvals LLC; [www.fmglobal.com](http://www.fmglobal.com).
87. FM Global - FM Global; (Formerly: FMG - FM Global); [www.fmglobal.com](http://www.fmglobal.com).
88. FRSA - Florida Roofing, Sheet Metal Contractors Association, Inc.; [www.floridarroof.com](http://www.floridarroof.com).
89. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
90. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
91. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
92. GANA - Glass Association of North America; (See NGA).
93. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
94. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
95. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
96. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
97. HPVA - Hardwood Plywood & Veneer Association; (See DHA).
98. HPW - H. P. White Laboratory, Inc.; [www.hpwhite.com](http://www.hpwhite.com).
99. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
100. IAS - International Accreditation Service; [www.iasonline.org](http://www.iasonline.org).
101. ICBO - International Conference of Building Officials; (See ICC).
102. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
103. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
104. ICPA - International Cast Polymer Alliance; [www.icpa-hq.org](http://www.icpa-hq.org).
105. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
106. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
107. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
108. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); [www.ies.org](http://www.ies.org).

109. IESNA - Illuminating Engineering Society of North America; (See IES).
110. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
111. IGMA - Insulating Glass Manufacturers Alliance; [www.igmaonline.org](http://www.igmaonline.org).
112. IGSHPA - International Ground Source Heat Pump Association; [www.igshpa.org](http://www.igshpa.org).
113. II - Infocomm International; (See AVIXA).
114. ILI - Indiana Limestone Institute of America, Inc.; [www.iliai.com](http://www.iliai.com).
115. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); [www.intertek.com](http://www.intertek.com).
116. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); [www.isa.org](http://www.isa.org).
117. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
118. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); [www.isfanow.org](http://www.isfanow.org).
119. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
120. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
121. ITU - International Telecommunication Union; [www.itu.int/home](http://www.itu.int/home).
122. KCMA - Kitchen Cabinet Manufacturers Association; [www.kcma.org](http://www.kcma.org).
123. LMA - Laminating Materials Association; (See CPA).
124. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
125. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
126. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).
127. MFMA - Maple Flooring Manufacturers Association, Inc.; [www.maplefloor.org](http://www.maplefloor.org).
128. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
129. MHIA - Material Handling Industry of America; [www.mhia.org](http://www.mhia.org).
130. MIA - Marble Institute of America; (See NSI).
131. MMPA - Moulding & Millwork Producers Association; [www.wmmpa.com](http://www.wmmpa.com).
132. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
133. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
134. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
135. NACE - NACE International; (National Association of Corrosion Engineers International); [www.nace.org](http://www.nace.org).
136. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
137. NAIMA - North American Insulation Manufacturers Association; [www.naima.org](http://www.naima.org).
138. NALP - National Association of Landscape Professionals; [www.landscapeprofessionals.org](http://www.landscapeprofessionals.org).
139. NBGQA - National Building Granite Quarries Association, Inc.; [www.nbgqa.com](http://www.nbgqa.com).
140. NBI - New Buildings Institute; [www.newbuildings.org](http://www.newbuildings.org).
141. NCAA - National Collegiate Athletic Association (The); [www.ncaa.org](http://www.ncaa.org).
142. NCMA - National Concrete Masonry Association; [www.ncma.org](http://www.ncma.org).
143. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
144. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
145. NeLMA - Northeastern Lumber Manufacturers Association; [www.nelma.org](http://www.nelma.org).
146. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
147. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
148. NFHS - National Federation of State High School Associations; [www.nfhs.org](http://www.nfhs.org).
149. NFPA - National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org).
150. NFPA - NFPA International; (See NFPA).
151. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
152. NGA - National Glass Association (The); (Formerly: Glass Association of North America); [www.glass.org](http://www.glass.org).

153. NHLA - National Hardwood Lumber Association; [www.nhla.com](http://www.nhla.com).
154. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).
155. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
156. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
157. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
158. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
159. NSF - NSF International; [www.nsf.org](http://www.nsf.org).
160. NSI - National Stone Institute; (Formerly: Marble Institute of America); [www.naturalstoneinstitute.org](http://www.naturalstoneinstitute.org).
161. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
162. NSSGA - National Stone, Sand & Gravel Association; [www.nssga.org](http://www.nssga.org).
163. NTMA - National Terrazzo & Mosaic Association, Inc. (The); [www.ntma.com](http://www.ntma.com).
164. NWFA - National Wood Flooring Association; [www.nwfa.org](http://www.nwfa.org).
165. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
166. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
167. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); [www.plasa.org](http://www.plasa.org).
168. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
169. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
170. RIS - Redwood Inspection Service; [www.redwoodinspection.com](http://www.redwoodinspection.com).
171. SAE - SAE International; [www.sae.org](http://www.sae.org).
172. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
173. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).
174. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
175. SEFA - Scientific Equipment and Furniture Association (The); [www.sefalabs.com](http://www.sefalabs.com).
176. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
177. SIA - Security Industry Association; [www.siaonline.org](http://www.siaonline.org).
178. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
179. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
180. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
181. SMPTE - Society of Motion Picture and Television Engineers; [www.smpte.org](http://www.smpte.org).
182. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
183. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
184. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
185. SRCC - Solar Rating & Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
186. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
187. SSPC - SSPC: The Society for Protective Coatings; [www.sspc.org](http://www.sspc.org).
188. STI - Steel Tank Institute; [www.steeltank.com](http://www.steeltank.com).
189. SWI - Steel Window Institute; [www.steelwindows.com](http://www.steelwindows.com).
190. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).
191. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
192. TCNA - Tile Council of North America, Inc.; [www.tileusa.com](http://www.tileusa.com).
193. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
194. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); [www.tiaonline.org](http://www.tiaonline.org).
195. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
196. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).

197. TPI - Truss Plate Institute; [www.tpinst.org](http://www.tpinst.org).
198. TPI - Turfgrass Producers International; [www.turfgrasssod.org](http://www.turfgrasssod.org).
199. TRI - Tile Roofing Institute; [www.tilerroofing.org](http://www.tilerroofing.org).
200. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).
201. UNI - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).
202. USAV - USA Volleyball; [www.usavolleyball.org](http://www.usavolleyball.org).
203. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
204. USITT - United States Institute for Theatre Technology, Inc.; [www.usitt.org](http://www.usitt.org).
205. WA - Wallcoverings Association; [www.wallcoverings.org](http://www.wallcoverings.org).
206. WASTEC - Waste Equipment Technology Association; [www.wastec.org](http://www.wastec.org).
207. WCLIB - West Coast Lumber Inspection Bureau; [www.wclib.org](http://www.wclib.org).
208. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
209. WDMA - Window & Door Manufacturers Association; [www.wdma.com](http://www.wdma.com).
210. WI - Woodwork Institute; [www.wicnet.org](http://www.wicnet.org).
211. WSRCA - Western States Roofing Contractors Association; [www.wsrca.com](http://www.wsrca.com).

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut für Normung e.V.; [www.din.de](http://www.din.de).
2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
3. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
4. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
2. CPSC - Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
3. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
4. DOD - Department of Defense; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
5. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
6. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
7. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).
8. FG - Federal Government Publications; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
9. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
10. HUD - Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; [www.eetd.lbl.gov](http://www.eetd.lbl.gov).
12. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
13. SD - Department of State; [www.state.gov](http://www.state.gov).
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; [www.trb.org](http://www.trb.org).
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
16. USDA - Department of Agriculture; Rural Utilities Service; [www.usda.gov](http://www.usda.gov).

17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).
18. USP - U.S. Pharmacopeial Convention; [www.usp.org](http://www.usp.org).
19. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.govinfo.gov](http://www.govinfo.gov).
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
  - a. Available from Defense Standardization Program; [www.dsp.dla.mil](http://www.dsp.dla.mil).
  - b. Available from General Services Administration; [www.gsa.gov](http://www.gsa.gov).
  - c. Available from National Institute of Building Sciences/Whole Building Design Guide; [www.wbdg.org](http://www.wbdg.org).
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; [www.bearhfti.ca.gov](http://www.bearhfti.ca.gov).
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; [www.calregs.com](http://www.calregs.com).
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; [www.cal-iaq.org](http://www.cal-iaq.org).
5. CPUC; California Public Utilities Commission; [www.cpuc.ca.gov](http://www.cpuc.ca.gov).
6. SCAQMD; South Coast Air Quality Management District; [www.aqmd.gov](http://www.aqmd.gov).
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; [www.txforestservation.tamu.edu](http://www.txforestservation.tamu.edu).



PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

## SECTION 01 45 16.13

### CONTRACTOR QUALITY CONTROL

#### PART 1 - GENERAL

##### 1.01 GENERAL PROVISIONS:

Attention is directed to the General Conditions of the Contract, all Divisions of the Specifications and the Drawings, all of which apply to this section.

##### 1.02. WORK INCLUDED:

- A. The scope of the work under this Specification section, without limiting the generality thereof, includes the furnishing of all labor, materials, equipment, services, and incidentals necessary to complete all of the work in accordance with the Contract Documents, which are intended to describe and provide for a finished piece of work.
- B. The work includes the following, without limiting the generality thereof:
  - 1. The making available samples or specimens which the laboratory may require to perform quality control testing on concrete, fill materials, or other material as the Engineer may elect.
  - 2. The coordinating and scheduling of work and the giving of timely notice to afford the testing laboratory the opportunity to take samples and make observations or tests.
  - 3. Provide safe access to the site or area for the Engineer to collect data, samples, and the like.

##### 1.03. TESTING LABORATORY:

- A. The Contractor will select, engage, and pay for the services of an independent testing laboratory to perform structural tests on concrete, soil testing, compaction testing and such other materials as the Engineer may deem appropriate.
- B. Retesting of materials which fail the original test shall be paid for by the Contractor.

#### PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

SECTION 01 45 23

STRUCTURAL TESTS AND INSPECTIONS

PART 1 -GENERAL

1.01 WORK INCLUDED:

- A. Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
  - 1. Obtaining, coordinating, and providing notifications to the Owner and Engineer.
  - 2. Provide safe access to the work of this Contract to accommodate the indicated tests and inspections.
  - 3. Implementing corrective action and providing additional tests and/or inspections for work identified as non-conforming by the Independent Testing Agency.

1.02 GENERAL REQUIREMENTS:

- A. The Massachusetts State Building Code, Latest Edition, 780 CMR, requires the Structural Engineer of Record (SER) to provide a program of structural tests and inspections for this project.
- B. Attachment A, Program of Structural Tests and Inspections, shall not relieve the Contractor or its subcontractors of their responsibilities and obligations for quality control of the Work; their other obligations for supervising the Work; for any design work which is included in their scope of services; for full compliance with the requirements of the Contract Documents; the detection of, or failure to detect, deficiencies or defects, whether detected or undetected, in all parts of the Work, and to otherwise comply with all requirements of the Contract Documents.
- C. The Program of Structural Tests and Inspection does not apply to the Contractor's equipment, temporary structures used by the Contractor to construct the project, the Contractor's means, methods, procedures, and job site safety.

1.03 CONTRACTOR RESPONSIBILITIES:

- A. The Contractor shall provide free and safe access to the Work for the SER and all other individuals who are observing the Work or performing structural tests or inspections. The Contractor shall provide all ladders, scaffolding, staging, and up-

to-date safety equipment, all in good and safe working order, and qualified personnel to handle and erect them, as may be required for safe access.

- B. The Contractor shall give reasonable notice to the Owner and the Engineer of when the various parts of the Work will be ready for testing and/or inspection. The Contractor shall notify the Owner and the Engineer a minimum of 48 hours before such tests and/or inspections are to take place.

## PART 2 - PRODUCTS

NOT USED.

## PART 3 - EXECUTION

NOT USED.

## ATTACHMENT A

### PROGRAM OF STRUCTURAL TESTS AND INSPECTIONS

The following is a summary of Work subject to Tests and Inspections under the Program.

1. In-situ Bearing Strata for Footings
2. Controlled Structural Fill
3. Cast-In-Place Concrete
4. Structural Steel

Abbreviation      Agent

SER                      Structural Engineer of Record

ITA                      Contractor – Independent Testing Agency

#### **In-Situ Bearing Strata for Footings**

| Item                             | Agent | Scope  |
|----------------------------------|-------|--|
| 1. Bearing Strata QC Review      | ITA   | Review Contractor's field quality control procedures.  |
| 2. General Excavation            | ITA   | Inspect strata for conformance to the structural drawings, specifications, and/or geotechnical report.                               |
| 3. General Excavation            | ITA   | Ensure that excavation is to proper depth or material.   |
| 4. General Excavation            | ITA   | Ensure that excavation is controlled and contains no unsuitable materials.   |
| 5. Bearing surfaces for footings | ITA   | Inspect bearing surfaces for conformance to the requirements of the structural drawings, specifications, and/or geotechnical report. |

## Controlled Structural Fill

| Item  | Agent | Scope   |
|---|-------|---|
| 1. Controlled Structural Fill QC Review       | SER   | Review Contractor's field quality control procedures  |
| 2. Fill Material                              | ITA   | Test material for conformance to specifications or geotechnical report. Perform laboratory compaction tests in accordance with the specifications to determine optimum water content and maximum dry density. |
| 3. Installation of controlled structural fill | ITA   | Provide full-time inspection of the installation, in accordance with the specifications.  |
| 4. Density of Fill                            | ITA   | Perform field density tests of the in-place fill in accordance with the specifications.   |
|   |       |   |

## Cast-In-Place Concrete Construction

| Item  | Agent | Scope  |
|---|-------|--|
| 1. Cast-In-Place Concrete Construction QC Review  | SER   | Review Contractor's field quality control procedures. Review frequency and scope of field testing and inspections.   |
| 2. Mix Design                                     | SER   | Review Mix Designs   |
| 3. Materials                                      | SER   | Review material certifications for conformance to Specifications   |
| 4. Batching Plant                                 | ITA   | Review Plant quality control procedures and batching and mixing methods  |
| 5. Reinforcement Installation                     | ITA   | Inspect reinforcing for size, quantity, condition and placement  |
| 6. Anchor Rods                                    | ITA   | Inspect anchor rods prior to and during placement of concrete.   |
| 6. Formwork                                       | ITA   | Inspect form sizes for proper sizes of concrete members.   |
| 7. Concrete Placement and Sampling fresh Concrete | ITA   | Observe concrete placement operations. Verify conformance to specifications including cold-weather and hot-weather placement procedures. Perform slump, density and air content tests at point of discharge. |
| 8. Evaluation of Concrete                         | ITA   | Test and evaluate in accordance with the specifications.   |
| 9. Curing and Protection                          | ITA   | Observe procedures for conformance to the specifications.  |



**Structural Steel**

| Item   | Agent | Scope  |
|--|-------|--|
| 1. Fabricator Certification/Quality Control Procedures | SER   | Review Contractor's field quality control procedures. Review frequency and scope of field testing and inspections.   |
| 2. Fabricator Certification/Quality Control Procedures | SER   | Review each Fabricator's quality control procedures.   |
| 3. Fabricator Inspection                               | SER   | Inspect in-plant fabrication, or review Fabricator's approved Independent Inspection Agency's reports.   |
| 4. Materials   | SER   | Review materials certifications for conformance to the specifications.   |
| 5. Anchor Rods   | SER   | Review Contractor's as-built survey.   |
| 6. Anchor Rods   | ITA   | Verify that all anchor rods have been properly torqued and have adequate fit-up.   |
| 7. Bolting   | ITA   | Test and inspect bolted connections in accordance with specifications. Verify bolt size and grade.   |
| 8. Welding   | ITA   | Check welder qualifications. Visually inspect fillet welds and test full penetration field welds in accordance with specifications                         |
| 9. Shear Connectors                                    | ITA   | Inspect for size and placement. Test for proper weld attachment  |
| 10. Structural Framing, Details, and Assembly          | ITA   | Inspect for size, grade of steel, camber, installation and connection details. Check against Contract Documents and approved shop drawings.                |
| 11. Open Web Steel Joists                              | ITA   | Inspect for size, placement, bridging, bearing and connection to structure. Visually inspect all welds of a minimum of 5% of the joists randomly selected. |
| 12. Expansion and Adhesive Anchors                     | SER   | Review installation procedures for both mechanical anchors and adhesive anchors. Verify that materials are suitable for job conditions.                    |

|  |     |   |
|--|-----|---|
| 13. Metal Decking                        | ITA | Verify gage, width, and type. Inspect placement, laps, welds, side laps attachment and screws or other mechanical fasteners. Check welder qualifications. |
| 14. Field Correction of Fabricated Items | ITA | Review documentation of approved repairs and verify completion of repairs.  |

END OF SECTION

## SECTION 01 45 29

### SAMPLING AND TESTING

#### PART 1- GENERAL

##### 1.01 SCOPE OF WORK

- A. The work under this Section shall consist of performing or ordering the work of collecting samples for testing, having tests performed by a Certified Testing Laboratory satisfactory to the Owner's Representative, having all test results forwarded to the Owner's Representative for approval, and paying all costs associated with the collection and sampling, transportation, shipping, postage, and testing, and the coordination of test results and approvals.

##### 1.02 SUBMITTALS

- A. In accordance with Section 01 33 00 SUBMITTALS of these Specifications, submit the names, addresses and certification of laboratories to be utilized for approval by the Engineer.

#### PART 2 - MATERIALS

##### 2.01 CONTAINERS AND TOOLS

- A. Utilize tools recommended by the laboratory to obtain samples, packaging or containers suitable to or furnished by, the laboratory, and collect all samples in the proper number and quantity to permit tests to be conducted.

##### 2.02 TESTS

- A. Refer to technical section specifications for test requirements and criteria for results; coordinate with the Engineer.
- B. All irrigation systems, and any other components from the scope of work as requested by the Engineer shall be tested to ensure complete compliance with manufacturer's installation instructions and warranty requirements.
- E. The Contractor shall provide up to test (8) test pits where indicated by the Engineer to perform percolation and water quality testing as required at no additional expense to the owner.
- F. Compaction tests are required on all base surfaces. Contractor shall provide testing at 10 locations at designer's direction or per Engineer's direction. At the Contractor's expense, an independent testing agency must perform the work and

submit the results directly to the Engineer.

- G. All other tests as indicated or required in the drawings and specifications.

### PART 3 - EXECUTION

#### 3.01 METHODOLOGY

- A. Unless otherwise directed by the Section specifications, perform sampling and testing will be ordered by the Contractor and approved by the Engineer. Locations, number and quantity of samples shall be submitted for approval as directed in accordance with the Specifications.
- B. Sampling and Testing results must be provided to the Engineer and Approved prior to the installation of any work potentially impacted by unacceptable test results.

END OF SECTION

## SECTION 01 52 13

## TEMPORARY FACILITIES

PART 1 - GENERAL

## 1.01 SCOPE OF WORK:

- A. The Contractor shall provide all temporary facilities as described in this Section for the proper completion of the work, as required and as specified.

## 1.02 TEMPORARY FIELD OFFICE TRAILER:

- A. Promptly at the start of work on the project, the Contractor shall furnish all labor, materials and equipment, perform all work to furnish, deliver, set up, and maintain for the duration of the project a field office trailer for the exclusive use of the Engineer, including the connection of electric and telephone services. The trailer and furniture shall be relatively new and in good condition and acceptable to the Engineer.
- B. At a minimum, the trailer shall be 440 square feet with 2 private offices and a conference room for site meetings.
- B. The office shall be adequately lighted for detailed working conditions, heated and air conditioned during the appropriate seasons. The office shall have at least one closet for storage of equipment. The Contractor shall enclose and weatherproof the areas beneath the trailer with insulation and exterior grade plywood.
- C. The trailer shall be located at the work site where it will not interfere with the construction as approved by the Engineer, and shall be not less than 400 square feet. The trailer shall have provisions for locking and the Contractor shall provide two sets of keys to the Engineer.
- D. Space shall be provided adjacent to the trailer for parking for the exclusive use of the Engineer and visitors to the Engineer's trailer. The Contractor shall be responsible for snow removal, dust control etc. for the parking area.

## 1.03 TEMPORARY FIELD OFFICE TRAILER UTILITIES:

- A. All electric services shall be continuously connected. Electric lights and adequate electric power, proper heat, hot water and satisfactorily cooled drinking water. Enough electrical outlets shall be provided and suitably located in the trailer for the equipment and desks specified in this section of the specifications. The trailer shall have thermostatically controlled heating and air conditioning units to maintain a minimum temperature of 68°F and a maximum temperature of 72°F.
- B. Toilet facilities shall be provided and maintained in continual service; trash, garbage and other wastes shall be properly and satisfactorily disposed of. The toilet facility shall

#

be built into the trailer or at minimum, a portable type as manufactured by Comfort Castle, Inc., Handy House Toilet Co., Port-o-Let, or an approved equal. This unit shall be installed as a complete facility with regular maintenance and pump-outs as required.

- C. The Contractor shall submit catalogs and vendors' data for the trailer and for the additional equipment and furnishings for review and approval by the Engineer.

#### 1.04 TEMPORARY FIELD OFFICE TRAILER EQUIPMENT AND FURNISHINGS:

- A. The Contractor shall also furnish the following computer equipment:

- 1. **Internet Access:** All computers must have an Internet access account. Broadband internet is preferred where available (minimum 200 mbps down/50 mbps up). Only high-speed internet access will be provided. DSL or mobile broadband (assuming adequate cellular signal exists at the location) are acceptable in areas where broadband is unavailable.

- B. The Contractor shall also furnish the following, as a minimum:

- 1 Class ABC type Fire Extinguisher of at least 4-lb capacity
- 1 First aid kit
- 2 Double desk - Formica top with three 2 drawer, steel file cabinets under
- 2 Straight back chairs – metal
- 12 Folding metal chairs
- 4 3' X 6' Conference Table
- 1 Air conditioner - Automatic heating - gas or electric
- 1 Toilet facility
- 1 Electric water cooler with refrigerator compartment and continual supply of spring water and paper cups
- 1 Four-drawer filing cabinet with lock, fire proof or fire resistant
- 2 Wastebaskets with provisions for trash collection
- 1 Plan Rack
- 1 High Speed Printer/Copier/Scanner (plain paper) including color printing, 11x17 printing capabilities, paper and toner.
- 1 Conference Speaker Phone

#### 1.05 TEMPORARY TOILETS:

- A. The Contractor shall provide and pay all costs for toilet booths with chemical type toilets, as necessary for all persons engaged in the Work. See Section 01 11 00 – CONTROL OF WORK AND MATERIALS for additional information.

#### 1.06 TEMPORARY WATER:

- A. The Contractor shall make all arrangements for obtaining temporary water connections including extensions required for the needs of the Project, and shall pay all costs incurred. It shall furnish, install, and remove all equipment and piping required to provide temporary water. See Section 01 14 00 – SPECIAL PROVISIONS for additional information.

#

- B. All water used for construction purposes shall be metered as follows:
  - (a) All persons desiring to use such water from a hydrant or any other appurtenances shall apply and pay for a Hydrant Permit at the Town of Holden Department of Public Works.

#### 1.07 TEMPORARY ELECTRICITY:

- A. The Contractor shall at his own expense make all arrangements Holden Municipal Light Department for and provide all temporary light and power for all Subcontractors and trades, except as otherwise specified herein. The temporary electrical service shall include, but not be limited to, all labor, materials, and equipment necessary to supply temporary power of adequate capacity for the Project operations and testing. Transformers and meters, when required by the power company will be furnished and installed by the appropriate power company, and the Contractor shall pay all costs therefor.
- B. The Contractor shall pay the cost of all electrical energy consumed during prosecution of the Work. The Contractor at his own expense shall maintain all lamps in operating condition. The Contractor and each Subcontractor shall furnish their own extension cords and all additional lamps as they may require. Temporary wiring of a special nature not otherwise specified, shall be furnished, installed, maintained, and paid for by the trade requiring such wiring.
- C. All temporary work shall be furnished and installed in conformity with the National Electrical Code and state and city laws, and requirements of the applicable power company. Particular attention is called to the Commonwealth of Massachusetts 454 CMR 10.0, "Construction Industry Rules and Regulations".
- D. The Contractor shall dismantle and completely remove from the Project all temporary wiring and other temporary electrical accessories only when the permanent electrical system has been installed and in operation, and then only with written approval of the Engineer.

#### 1.08 TEMPORARY STRUCTURES:

- A. The Contractor shall provide, maintain, and remove such additional storage sheds, temporary buildings, or trailers as required for performance of the Work. Location of all such temporary structures shall be acceptable to the Engineer. If the Contractor is required to relocate these Temporary Structures during the prosecution of the Work, the Contractor shall promptly do so at no increase in Contract Price or Contract Time.



#

## PART 2 - PRODUCTS

NOT PART OF THIS SECTION

## PART 3 - EXECUTION

### 3.01 UTILITIES:

- A. All monthly service charges for telephone, electricity, Dial-Up connection service, water supply, and heating of the Temporary Field Office Trailer shall be paid for by the Contractor.

### 3.02 COMPUTER EQUIPMENT:

- A. All monthly charges and maintenance fees for the computer system and digital camera and associated hardware and software licenses provided shall be paid for by the Contractor.

### 3.03 TEMPORARY FACILITIES:

- A. The CONTRACTOR shall perform the following work:
  - 1. Protect excavations, trenches, buildings, and materials always from rain and/or ground water, and from water damage of any origin. Provide all pumps, piping, coverings, and other materials and required equipment as specified.
  - 5. Protect concrete surfaces which are to receive work of other Subcontractors and trades from any soiling which will prevent proper adhesion of subsequent work. The Contractor shall leave surfaces broom clean and free of all blemishes at the time other Subcontractors and trades begin the application of their work.
  - 6. Protect all exposed concrete surfaces and finished floors against mechanical damage, plaster droppings, oil, grease, paint, or other materials which will stain the floor finish. The Contractor shall install and maintain protective coverings on finished floors in areas where other work will be done.
  - 7. Roof and waterproofed surfaces shall not be subjected to traffic nor used for storage of materials. The Contractor shall provide protection for such surfaces where some activity must take place to carry out the Work.
- B. After the Work of a Subcontractor has been properly completed, the Contractor shall be responsible for its protection and for repairing, replacing, or cleaning any such Work which has been damaged by other Subcontractors or trades or by any other cause, so that the entire Work is in perfect condition at the time of Substantial Completion.

END OF SECTION

## SECTION 01 55 26.13

### SIGNAGE (TRAFFIC CONTROL)

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This Section covers furnishing and installing traffic control signs and other devices.

##### 1.02 SYSTEM DESCRIPTION:

The Contractor shall furnish and install all construction signs deemed necessary by and in accordance with the latest edition of Part VI of the Manual on Uniform Traffic Control Devices (MUTCD) as published by the U.S. Department of Transportation.

#### PART 2 - PRODUCTS

##### 2.01 TRAFFIC WARNING AND REGULATING DEVICES:

- A. Contractor shall provide warning signs, barricades and other devices in accordance with the specifications provided in the MUTCD. Size of signs, lettering, colors, method of support and other factors prescribed in the MUTCD shall be adhered to.
- B. See Section 01 11 00 – CONTROL OF WORK AND MATERIALS and Section 01 14 00 – SPECIAL PROVISIONS for additional construction signage requirements. Locations, wording, and size of signs shall be coordinated with the Owner after the Contract is awarded.

#### PART 3 - EXECUTION

##### 3.01 INSTALLATION:

- A. The Contractor shall erect traffic signs, and other traffic control devices as required by the Manual on Uniform Traffic Control Devices as published by the U.S. Department of Transportation, this Section, and the Contract Drawings, or as required by the Engineer, to provide traffic safety and convenience, and to protect the work area from traffic, pedestrians, and animals.
- B. The Contractor shall relocate barricades, signs and other devices as necessary as the work progresses.
- C. Unless extended protection is required for specific areas, when the work has been completed, all temporary warning and regulatory devices used by the Contractor shall be

removed so that traffic can move unimpeded through the area.

- D. Conduct operations and removal of debris to ensure minimum interference with the normal use of public ways and other adjacent facilities. Do not close or obstruct traffic ways, streets, walks or other facilities without the written permission of the Owner and authorities having jurisdiction.
- E. Provision shall be made for safe passage at all times for emergency vehicles onto the work site.

END OF SECTION

SECTION 01 56 26

TEMPORARY CHAIN LINK FENCE

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. The Contractor shall be responsible for securing the Site from trespassers. Existing fencing exists on the Site as shown on the Contract Drawings; it will be at the discretion of the Contractor to determine whether the existing fence is suitable for Site safety and security. If the existing fencing is to be used, it must meet the requirements of this section. The Contractor shall install temporary chain link fencing across lengths of damaged/unsuitable existing fencing to secure the Site and prevent trespassers.
- B. The Contractor shall provide all labor, materials and appurtenances necessary for the installation, maintenance and dismantling of 6-foot-high temporary fencing where required.
- C. The Contractor shall provide all labor, materials and appurtenances necessary for the installation, maintenance and removal at completion of project of mesh fabric wind screen on all perimeter fencing (i.e., existing fencing and temporary chain link fencing).

1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of manufacturers literature of the materials specified herein shall be submitted to the Engineer for review.
- B. Six sets of shop drawings of the temporary chain link fence and gates shall be submitted to the Engineers for review.
  - 1. Shop drawings shall indicate layout of temporary fencing and other site-specific conditions. Prepare drawing after site observation and verification of existing conditions.
  - 2. Shop drawings shall include information for the mesh fabric/wind screens specified herein.

PART 2 - PRODUCTS-GALVANIZED

2.01 TEMPORARY CHAIN LINK FENCING

- A. Unless otherwise indicated, type of temporary chain link fencing shall be the Contractor's option. The following types are acceptable:

1. New materials or previously used salvaged chain link fencing in good condition.
2. Posts: Galvanized steel pipe of diameter to provide rigidity. Post shall be suitable for driving into ground.
3. Chain link fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.
4. Height: 6-foot high temporary fencing.
5. Gates: Provide gates of the quantity and size indicated on the Contract Drawings or required for functional access to the Site:
  - a. Fabricate of same material as used for fencing.
  - b. Vehicle gates:
    - i. Minimum width: 20-feet to allow access for emergency vehicles.
    - ii. Capable of manual operation by one person.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. The fence and gates shall be erected by skilled mechanics in accordance with the recommendations of the manufacturer and these specifications. These specifications shall take precedence over the recommendations of the manufacturer if any discrepancy exists between them.
- B. Posts
  1. Maximum post spacing shall be 10-feet. Post spacing shall be uniform and posts shall be plumb.
  2. Drive posts, set in holes and backfill, as shown on the Detail Sheets of the Contract Drawings. Posts shall be securely installed to support fence.
  3. For soft and unstable ground conditions, cast concrete plug around post.
  4. Posts over pavement: Use steel post plates or precast concrete blocks.
  5. Gate posts: Use bracing or concrete footings to provide rigidity for accommodating size of gate.
  4. Temporary terminal posts shall be securely installed to prevent Site

access/trespassing.

- C. Securely attach wire fabric to posts. Maximum area of unbraced fence fabric shall not exceed 1,500 square feet.
- D. Install with required hardware.
- E. Fabric shall be stretched taut, with the bottom edge following the existing grade, and shall be a continuous mesh between terminal posts. Each span of fabric shall be attached independently at terminal posts. Where terminal posts do not have provisions for weaving fabric to posts, stretcher bars shall be placed through the end weave of the fabric and secured to the post with bar bands spaced not more than 15-inches apart on the post. Temporary terminal posts shall be secured to existing fence posts to prevent Site access/trespassing.
- F. Fabric shall be attached with ties to line posts at intervals of not more than 14-inches (and to the top railing and braces at intervals not exceeding 24-inches).
- G. The bottom tension wire shall be interlaced in the weave of the fabric, pulled taut and fastened to terminal posts.

### 3.02 MAINTENANCE AND REMOVAL

- A. Maintain fencing in good condition. If damaged, immediately repair.
- B. Remove temporary fencing and mesh fabric/wind screens upon completion of Work. Backfill holes and compact. Holes in pavement shall be surfaced to match existing paving. Repair damage caused by installation of temporary fencing.

END OF SECTION

## SECTION 01 56 39

### TREE PROTECTION AND TRIMMING

#### PART 1 – GENERAL

##### 1.01 WORK INCLUDED:

- A. This section includes the protection and trimming of trees that are to remain but interfere with, or are affected by, execution of the Work, whether temporary or new construction.

##### 1.02 RELATED WORK:

- A. SECTION 31 00 00 EARTHWORK
- B. SECTION 31 11 00 CLEARING AND GRUBBING
- C. SECTION 31 23 00 EXCAVATION, BORROW AND BACKFILL
- D. SECTION 31 25 00 EROSION AND SEDIMENT CONTROL
- E. SECTION 32 91 13 SOIL PREPARATION AND SOIL MIXES
- F. SECTION 32 91 19 LOAMING AND SEEDING

##### 1.03 QUALITY ASSURANCE:

- A. Tree Pruning Standards: Comply with the National Arborist Association's "Pruning Standards for Shade Trees" except where more stringent requirements are indicated.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS:

- A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D448, size 24, with 90 to 100 percent passing a 2-½-inch (63-mm) sieve and not more than 10 percent passing a ¾-inch (19-mm) sieve.
- B. Topsoil: As per Specification Section 32 91 13: Soil Preparation and Soil Mixes.
- C. Filter Fabric: Manufacturer's standard, non-woven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.

## PART 3 - EXECUTION

### 3.01 PREPARATION:

- A. Temporary Protection: Provide temporary fencing, barricades, or other suitable guards located outside the drip line (outer perimeter of branches) to protect remaining trees and other plants from damage.
- B. Protect tree root systems from damage due to noxious materials caused by run-off or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations.
- C. Do not store construction materials, debris, or excavated material within the drip line of remaining trees. Do not permit vehicles or foot traffic within the drip line and prevent soil compaction over root systems.
- D. Do not allow fires.

### 3.02 EXCAVATION:

- A. Install shoring or other protecting support systems to minimize sloping or benching of excavations.
- B. Do not excavate within tree drip line, unless otherwise indicated.
- C. Where excavation for new construction is required within tree drip lines, hand excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.
  - 1. Relocate roots in backfill areas wherever possible. If encountering large, main lateral roots, expose beyond excavation limits as required to bend and relocate without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3-inches (75 mm) back from new construction.
  - 2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition and temporarily support and protect roots from damage until they are permanently relocated and covered with earth.
- D. Where utilities trenches are required within tree drip lines, tunnel under or around the roots by drilling, auger boring, pipe jacking, or digging by hand.
  - 1. Root Pruning: Do not cut main lateral roots to tap roots; cut only smaller roots that interfere with installation of new work. Cut roots with sharp



pruning instruments; do not break or chop.

### 3.03 REGRADING:

- A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond tree drip line. Maintain existing grades within tree drip lines.
  - 1. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots to tap roots; cut only smaller roots. Cut roots cleanly with sharp pruning instruments; do not break or chop.
- B. Minor Fill: Where existing grade is 6-inches (150 mm) or less below elevation of finish grade shown, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.
- C. Moderate Fill: Where existing grade is more than 6-inches (150 mm) but less than 12-inches (300 mm) below finish grade elevation, place a layer of drainage fill, filter fabric, and a final layer of topsoil on existing grade.
  - 1. Carefully place drainage fill against tree trunk approximately 2-inches (50 mm) above finish grade elevation and extend not less than 18-inches (450 mm) from tree trunk on all sides. For balance of area within drip line perimeter, place drainage fill to an elevation 6-inches (150 mm) below grade.
  - 2. Place filter fabric with overlapping edges of 6-inches (150 mm) minimum.
  - 3. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

### 3.04 TREE PRUNING:

- A. If required, prune remaining trees to compensate for root loss caused by damaging or cutting root system as required by the Engineer in accordance with accepted horticultural practices.
- B. Cut branches with sharp pruning instruments; do not break or chop.

### 3.05 TREE REPAIR AND REPLACEMENT:

- A. Promptly repair trees damaged by construction operations to prevent progressive deterioration.
  - 1. Provide new trees of size and species selected by the Engineer when trees over 6-inches (150 mm) in caliper, measured 12-inches (300 mm) above grade, are required to be replaced, due to abuse/damage/neglect of contractor.

3.06 DISPOSAL OF WASTE MATERIALS:

- A. Burning on Owner's Property: Burning is not permitted on Owner's property.
- B. Disposal: Remove excess excavated material, displaced trees, and excess chips from Owner's property.

END OF SECTION

## SECTION 01 57 16

### RODENT CONTROL

#### PART 1 - GENERAL

##### 1.01 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.

##### 1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Within ten days after Notice to Proceed, submit to the Engineer 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.

#### PART 2 - PRODUCTS

##### 2.01 CONTAINERS:

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 Engineer 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.

3.02 LAYDOWN AREAS OUTSIDE THE CONTRACT AREA:

- A. Implement pest control at all laydown areas that are not areas of this Contract, but that are used by the Contractor in connection with this Contract. Undertake rodent control at least two weeks prior to use of the area and with time to ensure that the site is free of rodent populations (rats and mice) prior to site occupancy. Maintain the site free of rodents throughout the duration of its use.
- B. Clear laydown areas of trash, debris, and weeds prior to occupancy. Initiate those actions only after rodent populations have been effectively controlled.
- C. Maintain 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. Dispose of all garbage or trash associated with food in refuse containers with tight-fitting lids as described in 2.01 of this Section. Have refuse containers emptied daily to maintain site sanitation.

END OF SECTION

## SECTION 01 57 19

### ENVIRONMENTAL PROTECTION

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION:

- 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.
- B. The requirements set forth in this section of the specifications apply to cross-country areas, river and stream crossings, and construction in and adjacent to wetlands, unless otherwise specifically stated.
- C. All work under this Contract shall be in accordance with the Conservation Commissions' Orders of Conditions as well as any conditional requirements applied, all of which are attached to Section 00 31 43, PERMITS.
- D. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the environmental protection program.

##### 1.02 RELATED WORK:

- A. Section 00 31 43, PERMITS
- B. Section 01 14 19.16, DUST CONTROL
- C. Section 01 33 23, SUBMITTALS
- D. Section 31 00 00, EARTHWORK
- E. Section 31 11 00, CLEARING AND GRUBBING
- G. Section 31 23 19, DEWATERING
- H. Section 31 50 00, SUPPORT OF EXCAVATION
- I. Section 32 92 00, SURFACE RESTORATION OF CROSS COUNTRY AREAS

##### 1.03 SUBMITTALS:

- A. The Contractor shall submit details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of wetlands or across areas designated as wetlands.

**PART 2 - PRODUCTS**

**2.01 SILT FENCE:**

- A. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a mesh backing, and stapled to preweathered oak posts installed as shown on the drawings. The oak posts shall be 1-1/4-inches by 1-1/4-inches (Minimum Dimension) by 48-inches and shall be tapered. The bottom edge of the silt fence shall be buried as shown on the drawings.
- B. The silt fence shall be DOT Silt Fence PPDM3611, as manufactured by U.S. Silt & Site Supply/Getsco, Concord, NH, or approved equal.
- C. Silt fence properties:

| <b><u>Physical Properties</u></b>           | <b><u>Test Method</u></b> | <b><u>Minimum Value</u></b> |
|---|---------------------------|-----------------------------|
| Grab Strength, lbs.                         | ASTM-D-4632               | 124                         |
| Grab Elongation, %                          | ASTM-D-4632               | 15                          |
| Mullen burst, psi                           | ASTM-D-3786               | 300                         |
| Puncture, lbs.                              | ASTM-D-4833               | 65                          |
| Trapezoidal Tear, lbs.                      | ASTM-D-4533               | 65                          |
| UV Resistance <sup>2</sup> , % <sup>3</sup> | ASTM-D-4355               | 80@500 hrs.                 |
| AOS, US Sieve No.                           | ASTM-D-4751               | 30                          |
| Flow Rate, gal/min/sq ft                    | ASTM-D-4491               | 10                          |
| Permittivity,(1/sec)gal/min/sq ft           | ASTM-D-4491               | 0.05 sec <sup>-1</sup>      |

**2.02 STRAW BALES:**

- A. Straw bales shall consist of certified seed free stems of agricultural grain and cereal crops and shall be free of grasses and legumes. Standard bales shall be 14-inches high, 18- inches wide and 36- to 40-inches long tied with polypropylene twine and weigh within 5 percent of 7 lbs. per cubic ft.

**2.03 STRAW WATTLES:**

- A. Straw Wattles shall consist of a 100% biodegradable exterior jute or coir netting with 100% wheat straw interior filling as manufactured by GEI Works, Sebastian, Florida (Phone: 772-646-0597; website: [www.erosionpollution.com](http://www.erosionpollution.com)), or approved equal.

**2.04 CATCH BASIN PROTECTION:**

- A. To trap sediment and to prevent sediment from clogging drainage systems, catch basin protection in the form of a siltation sack (Silt sack as manufactured by ACF Environmental, Inc. or approved equal) shall be provided as approved by the Engineer.

### PART 3- EXECUTION

#### 3.01 NOTIFICATION AND STOPPAGE OF WORK:

- A. The Engineer will notify the Contractor in writing of any non-compliance with the provisions of the Order of Conditions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or its authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Owner may order stoppage of all or part of the work through the Engineer 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.

#### 3.02 AREA OF CONSTRUCTION ACTIVITY:

- A. Insofar as possible, the Contractor shall confine its construction activities to those areas defined by the plans 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.

#### 3.03 PROTECTION OF WATER RESOURCES:

- A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. 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.

#### 3.04 CONSTRUCTION IN AREAS DESIGNATED AS WETLANDS ON THE DRAWINGS:

- A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within areas designated as wetlands or within 100-feet of wetland resource areas. Total easement widths shall be limited to the widths shown.
- B. The Contractor shall perform its work in such a way that these areas are left in the condition existing prior to construction.

- C. The elevations of areas designated as wetlands shall not be unduly disturbed by the Contractor's operations outside of the trench limits. If such disturbance does occur, the Contractor shall take all measures necessary to return these areas to the elevations which existed prior to construction.
- D. In areas designated as wetlands, the Contractor shall carefully remove and stockpile the top 24 inches of soil. This topsoil material shall be used as backfill for the trench excavation top layer. The elevation of the trench shall be restored to the preconstruction elevations wherever disturbed by the Contractor's operation.
- E. The Contractor shall use a trench box, sheeting or bracing to support the excavation in areas designated as wetlands.
- F. Excavated materials shall not be permanently placed or temporarily stored in areas designated as wetlands. Temporary storage areas for excavated material shall be as required by the Engineer.
- G. The use of a temporary gravel roadway to construct the pipeline in the wetlands area is not acceptable. The Contractor will be required to utilize timber or rubber matting to support its equipment in these areas. The timber or rubber matting shall be constructed in such a way that it is capable of supporting all equipment necessary to install the pipeline. The timber or rubber matting shall be constructed of materials and placed in such a way that when removed the material below the matting will not be unduly disturbed, mixed or compacted so as to adversely affect recovery of the existing plant life.
- H. Bentonite dams shall be placed in wetlands to prevent drainage. Locations for dams are as indicated on the drawings or as required by the Engineer.
- I. During construction, easements within wetlands shall be lined with a continuous siltation fence barrier and straw wattle.

### 3.05 PROTECTING AND MINIMIZING EXPOSED AREAS:

- A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.
- B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to insure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.



- C. The Contractor shall install additional straw wattle erosion control lines internal of the Limit Of Work as to provide temporary sediment control. The Contractor should take into account their construction phasing plan and adjust or move the wattles as field condition dictate.

### 3.06 LOCATION OF STORAGE AREAS:

- A. The location of the Contractor's storage areas for equipment and/or materials shall be 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 Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.
- 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 silt-fence and/or straw wattles around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.
- C. There shall be no storage of equipment or materials in areas designated as wetlands.
- D. The Engineer may designate a particular area or areas where the Contractor may store materials used in its operations.
- E. Storage areas in cross-country locations shall be restored to pre-construction conditions with the planting of native species of trees and shrubs.

### 3.07 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 Engineer. 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 Engineer. 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 Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by its blasting or other operations, the Engineer may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of under the provisions of Section 31 11 00, CLEARING AND GRUBBING.
- D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

### 3.08 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 construction operations, as approved by the Engineer. Removal of mature trees (4-inches or greater DBH) will not be allowed on temporary easements.
- B. The Contractor shall not remove trees in the Owner's temporary easements without permission of the Engineer.

### 3.09 DISCHARGE OF DEWATERING OPERATIONS:

- A. Any water that is pumped and discharged from the 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 the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.
- C. The pumped water shall be filtered through filter fabric and 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.

### 3.10 DUST CONTROL:

- A. During the progress of the work, the Contractor shall conduct its operations and maintain the area of its activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed. Calcium chloride shall be as specified under Section 01 14 19.16, DUST CONTROL.
- B. Calcium Chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

### 3.11 SEPARATION AND REPLACEMENT OF TOPSOIL:

- A. Topsoil shall be carefully removed from cross-country areas where excavations are to be made, and separately stored to be used again as required. The topsoil shall be stored in an area acceptable to the Engineer and adequate measures shall be employed to prevent erosion of said material.

### 3.12 BALED HAY OR STRAW:

- A. To trap sediment and to prevent sediment from clogging drainage systems, baled **hay or straw** shall be used where shown on the drawings. Care shall be taken to keep the bales from breaking apart. The bales should be securely staked to prevent overturning, flotation, or displacement. All deposited sediment shall be removed periodically. **Hay** bales shall not be placed within a waterway during construction of the pipeline crossing.

### 3.13 ERECTION AND MAINTENANCE OF SILT FENCE:

- A. Where indicated on the drawings or where required by the Engineer, the Contractor shall erect and maintain a temporary silt fence. In areas designated as wetlands, the Contractor shall line the limits of the construction easement with a silt fence. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.

### 3.14 SURFACE RESTORATION OF CROSS COUNTRY AREAS:

- A. Plantings detailed in Section 32 92 00 shall be conducted when construction of the pipeline has been completed within the areas designated. A one-year guarantee of maintenance will be required on these plantings to ensure that they establish in the area.

### 3.15 CATCH BASIN PROTECTION:

- A. Catch basin protection shall be used for every catch basin, shown on the plans or as required by the Engineer, to trap sediment and prevent it from clogging drainage systems and entering wetlands. Siltation sack shall be securely installed under the catch basin grate. Care shall be taken to keep the siltation sack from breaking apart or clogging. All deposited sediment shall be removed periodically and at times prior to predicted precipitation to allow free drainage flow. Prior to working in areas where catch basins are to be protected, each catch basin sump shall be cleaned of all debris and protected. The Contractor shall properly dispose of all debris at no additional cost to the Owner.
- B. All catch basin protection shall be removed by the Contractor after construction is complete.

### 3.16 STRAW WATTLES:

- A. The wattles will be placed in a shallow trench (2-3 inches deep) and staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.
- B. The wattles shall be regularly inspected and before and after every forecasted major weather event. All deposited sediment shall be removed and not allowed to accumulate to the top of the wattles. Wattles damaged during construction shall be repaired or replaced as required by the Engineer at no additional cost to the Owner.
- C. The Contractor shall remove all wattles after construction is completed.

END OF SECTION

## SECTION 01 74 13

### CLEANING UP

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

The Contractor must employ at all times during the progress of his work adequate cleanup measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon request by the Engineer provide adequate material, equipment and labor to cleanup and make safe any and all areas deemed necessary by the Engineer.

##### 1.02 RELATED WORK:

- A. Section 01 11 00 – CONTROL OF WORK AND MATERIALS
- B. Section 01 14 00 – SPECIAL PROVISIONS
- C. Section 01 57 19 – ENVIRONMENTAL PROTECTION

#### PART 2 - PRODUCTS

Not applicable

#### PART 3 - EXECUTION

##### 2.01 DAILY CLEANUP:

- A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.
- B. Upon written notification by the Engineer, the Contractor shall within 24 hours clean up those areas, which in the Engineer's opinion are in violation of this section and the above referenced sections of the Specifications.
- C. If in the opinion of the Engineer, the referenced areas are not satisfactorily cleaned up, all other work on the project shall stop until the cleanup is satisfactory.

##### 2.02 MATERIAL OR DEBRIS IN DRAINAGE FACILITIES:

- A. Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the

ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

2.03 REMOVAL OF TEMPORARY BUILDINGS, STRUCTURES AND EQUIPMENT:

- A. On or before completion of the work, the Contractor shall, unless otherwise specifically directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools and machinery or other construction equipment furnished by him; shall remove all rubbish from any grounds, which he has occupied; shall remove silt fences and straw wattles used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by his operations in a neat and satisfactory condition.

2.04 RESTORATION OF DAMAGED PROPERTY:

- A. The Contractor shall restore or replace, when and as directed, any property damaged by his work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk and landscaping work. Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

2.05 FINAL CLEANUP:

- A. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing all trash and debris off of the premises. Before acceptance, the Engineer shall approve the condition of the site.

END OF SECTION

SECTION 01 78 00

PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers administrative and procedural requirements for closing out the project, including, but not limited to:
  - 1. Project As-Built Documents
  - 2. Checkout and Certification
  - 3. Final Cleaning
  - 4. Substantial Completion
  - 5. Closeout Procedures
  - 6. Final Completion
- B. Closeout checklist to be completed by the Engineer.

1.02 RELATED WORK:

- A. General Requirements in their entirety.
- B. Section 01 74 13 - CLEANING UP

1.03 AS-BUILT DOCUMENTS:

- A. The Contractor shall maintain on site, separate from the documents used for construction, one set of the documents listed below, and as construction progresses, shall legibly record on these documents all changes made during construction.
  - 1. Contract Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other Modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.
  - 6. Written interpretations and clarifications.
  - 7. Field Orders.
  - 8. Field test reports properly verified.
- B. The completed set of As-Built Documents shall be submitted to the Engineer with the final Application for Payment. As-Built documents shall include:

1. Complete topographic and detail base plans at 1" = 20' and showing 1 foot contour intervals and spot grades on a 25-foot (maximum) grid for both final grades and subgrades (elevation of geotextile protective liner). The subgrade elevation grid points shall coincide with the final elevation grid points for capping thickness verification.
  2. Depths below grade, for all structures left in place.
- C. The Contractor shall provide final as-built plans surveyed by a Massachusetts-licensed surveyor that will survey the final Site conditions, including metes and bounds, of the Site and eight (8) off-park properties that are part of the MCP Disposal Site (44 and 48 Beaver Street; 170, 176 and 186 Waverly Street; and, 5, 9-11 and 15 Morton Street).

#### 1.04 CHECKOUT AND CERTIFICATIONS:

- A. Prior to checkout and certifications, the following tasks shall be completed:
1. Construction shall be complete. For this purpose, completion of construction is defined as follows:
    - a. The Contractor has completed site activities in conformance with the Contract Drawings and Specifications.
  2. All shop drawings shall have final approval.
  3. All sampling test results, if required, submitted to the Engineer.

#### 1.05 FINAL CLEANING:

- A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
1. Clean the site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to smooth, even textured surfaces.
  2. Remove waste and surplus materials, rubbish, fencing equipment, temporary utilities and construction facilities from the Site, unless otherwise required by the Engineer.
  3. Comply with requirements of Section 01 74 13 - CLEANING UP.

#### 1.06 SUBSTANTIAL COMPLETION:



A. Substantial Completion is officially defined in the General and Supplementary Conditions. The date of substantial completion will be certified by the Engineer. This date will not be certified until the following requirements have been satisfied by the Contractor:

1. All Contract requirements are complete. All individual units of equipment and treatment are fully operative and performing at specified efficiencies. Where efficiencies are not specified, performance shall meet acceptable standards for the particular unit.
2. All field tests and inspections have been satisfactorily completed and reports forwarded to the Engineer.

1.07 CLOSEOUT PROCEDURES:

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and is complete in accordance with Contract Documents and ready for the Engineer's and the Owner's inspection.
- B. Accompany the Engineer and Owner on inspection to verify conformance with the Contract Documents. Prepare a punch list of work items that have been determined by inspection to not conform to Contract Documents. Punch list items shall include work items that are missing, incomplete, damaged, incorrect items, or improperly installed or constructed. The Contractor shall correct the punch list deficiencies by re-work, modifications, or replacement, as appropriate, until the items conform to the Contract Documents. The initial punch list shall be produced by the Contractor, with copies to the Engineer and Owner's Project Manager. When the Contractor has reduced the number of deficient items to a reasonable level, the Engineer will develop a definitive punch list for the use of the Contractor.
- C. Provide submittals to Engineer that are required by governing or other authorities.
- D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due. The Contractor shall submit the following documents with or prior to Final Application for Payment: Set of as-built documents, Contract Completion and Acceptance Certificate, Consent of Surety to Final Payment, Release and Waiver of Liens and Claims (Section 01 78 00 – Attachment A), Affidavit of Payment of Debts and Claims, and remaining releases, waivers, warranties/guarantees, and all other data required by the Contract Documents.

1.08 CLOSEOUT SUBMITTALS

- A. The closeout submittals include but are not necessarily limited to:
  - a. Evidence of payment and release of liens.

- b. Waste shipment manifests, Bills of Lading (if required), weight slips, and shipping records.
- c. Records of quantities/weights of materials shipped off-Site, including all contaminated materials to disposal facilities, construction debris to recycling/disposal facilities, and all recycled/reused materials.
- d. All other records or documents as necessary (i.e. personal air sampling records, injury reports, etc.)
- e. Construction photographs
- f. As-Built drawings, including survey/GPS information as described in Paragraph 1.03.B of this Section and final grades.

1.09 FINAL COMPLETION:

- A. Prior to final completion, the following tasks shall be completed:
  - 1. All items in the punch list shall be completed.
  - 2. All Contract closeout documentation shall be submitted to and accepted by the Engineer.

1.10 COMPLETION CHECKLIST:

- A. When the project has been fully completed, Final Payment can be approved.

## PROJECT COMPLETION CHECKLIST

Project \_\_\_\_\_

Job No. \_\_\_\_\_

As part of the project closeout, all items listed below must be checked off as being complete or otherwise accounted for. The person verifying completion of the item shall list the completion date and his/her initials.

| <b>Project Closeout Checklist</b>                   |                                |             |
|---|--------------------------------|-------------|
|   | Date<br>Completion<br>Verified | Verified by |
| <b>AS-BUILT DOCUMENTS HANDED OVER</b>               |                                |             |
| 1. Contract Drawings                                |                                |             |
| 2. Specifications                                   |                                |             |
| 3. Addenda  |                                |             |
| 4. Change Orders/Contract Modifications             |                                |             |
| 5. Reviewed Shop Drawings, Product Data and Samples |                                |             |
| 6. Written Interpretations/Clarifications           |                                |             |
| 7. Field Orders                                     |                                |             |
| 8. Field Test Reports                               |                                |             |

**Project Closeout Checklist**

|  | Date<br>Completion<br>Verified | Verified By |
|--|--------------------------------|-------------|
| <b>FINAL CLEANING</b>  |                                |             |
| 1. All Construction Facilities Removed   |                                |             |
| 2. All Construction Debris Removed   |                                |             |
| 3. All Areas Swept/Cleared   |                                |             |
| <b>SUBSTANTIAL COMPLETION</b>  |                                |             |
| 1. All Items Complete  |                                |             |
| <b>CLOSEOUT PROCEDURES</b>   |                                |             |
| 1. Written Certification Submitted that Work is Ready for Owner & Engineer Inspector |                                |             |
| 2. Inspection by Owner, Engineer, Contractor completed                               |                                |             |
| 3. Punch List of Nonconforming Items Prepared  |                                |             |
| 4. Documents Required by Governing or Other Authorities Submitted (List Them)        |                                |             |
| 5. Final Application for Payment Received  |                                |             |
| 6. Contact Completion and Acceptance Certificate Submittal                           |                                |             |
| 7. Consent of Surety to Final Payment Submittal                                      |                                |             |
| 8. Release and Waiver of Liens and Claims Submitted                                  |                                |             |
| 9. Affidavit of Payment of Debts and Claims Submitted                                |                                |             |
| 10. Warranties/Guarantees Submitted  |                                |             |
| 11. Other Required Releases and Waivers Submitted (List Them)                        |                                |             |
| 12. Permits Submitted (List Them)  |                                |             |
| 13. Weekly Payrolls Submitted as Required by Law                                     |                                |             |
| <b>FINAL COMPLETION</b>  |                                |             |
| 1. All Items in Punch List Completed   |                                |             |
| 2. All Other Required Documentation Submitted (List It)                              |                                |             |

**Project Closeout Checklist**

|   | Date<br>Completion<br>Verified | Verified By              |  |  |  |
|---|--------------------------------|--------------------------|--|--|--|
| <b>CORRECTION/WARRANTY PERIOD</b>   |                                |                          |  |  |  |
| 1. Correction Period Start Date: _____<br><br>End Date: _____   |                                |                          |  |  |  |
| 2. Specific Warranties Provided<br><br><table border="0" style="width: 100%;"> <tr> <td style="text-align: center; width: 30%;"><u>Item</u></td> <td style="text-align: center; width: 30%;"><u>Warranty Duration</u></td> <td style="width: 40%;"></td> </tr> </table> | <u>Item</u>                    | <u>Warranty Duration</u> |  |  |  |
| <u>Item</u>   | <u>Warranty Duration</u>       |                          |  |  |  |

Full name of persons signing their initials on this checklist:

---

---

---

---

---

END OF SECTION

## SECTION 01 78 39

### PROJECT AS-BUILT RECORD DRAWINGS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This Section covers the Contractors As-Built Record drawings for the project. The As-Built Record drawings for the project shall include, but are not limited to:

A. The Contractors construction coordination drawings for all the project disciplines. The Contractors construction coordination drawings for the project disciplines shall be submitted to the Engineer prior to Construction of the said discipline. The Contractors construction coordination drawings for the project disciplines shall include but are not limited to the following:

1. Architectural
2. Site / Civil
3. Structural
4. Electrical
5. Mechanical
6. Plumbing
7. Process
8. Instrumentation

B. Draft Record Documents Review

Upon completion of the project construction the Contractor shall submit a complete copy of 24- by 36-inch Record Drawings to the Owner and the Engineer for review. The Owner and the Engineer shall jointly review the Record Drawings and provide comments to the Contractor. The Contractor shall modify the Record Drawings as necessary based on the comments provided by the Owner and the Engineer.

C. Final Record Documents

Upon incorporation and acceptance of the Draft Record Drawings comments from the Owner and the Engineer, the Contractor shall submit the Final Record Drawings and documentation. The Contractor shall submit two sets of 24- by 36-inch Record Drawings to the Owner and an additional two sets of 24- by 36-inch Record Drawings to the Engineer for their records. The Contractor shall also submit to the Engineer a minimum 20 gigabyte flash drive with the electronic Record Drawing files. The electronic Record Drawing files shall be obtained from the Owner (the Engineer shall provide on behalf of the Owner if the Engineer was the project designer) and developed in AutoCAD 2010/Revit 2017 (or later) and the submittal shall include the Final AutoCAD DWG/Revit RVT file documents, drawing line

types, blocks, etc. The actual version of AutoCAD/Revit shall be coordinated with the Engineer.

D. Post-Construction Survey

The Contractor shall perform a post-construction survey of the entire project area. The topographic survey shall be performed by or under the supervision of and certified by a Registered Land Surveyor in the State of Massachusetts. The Contractor shall also submit to the Engineer a minimum 20 gigabyte flash drive with the electronic pre- and post-construction survey files. The Contractor shall send the electronic pre- and post-construction survey files to the Engineer which shall be developed in AutoCAD 2010/ Revit 2017 (or later) and the submittal shall include the Final AutoCAD DWG / Revit RVT file documents, drawing line types, blocks, etc. The actual version of AutoCAD / Revit shall be coordinated with the Engineer. The Contractor shall notify the Owner and Engineer at least 48-hours in advance of each survey.

1.02 RELATED WORK:

- A. General Requirements in their entirety.
- B. Division 02 through Division 48.

1.03 AS-BUILT DOCUMENTS:

- A. Contractor shall maintain on site, separate from the documents used for construction, one complete set of the documents listed below, and as construction progresses, shall legibly record on these documents all changes made during construction.
  - 1. Contract Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other Modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.
  - 6. Written interpretations and clarifications.
  - 7. Field Orders.
  - 8. Field test reports properly verified.
- B. The completed set of documents shall include but are not limited to:
  - 1. Significant deviations of any nature made during construction.
- C. The completed set of as-built documents shall be submitted to the Engineer with the final Application for Payment.



PART 2 - MATERIALS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

Document1

## SECTION 01 92 13

### OPERATION AND MAINTENANCE MANUALS

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK:

- A. This section includes procedural requirements for compiling and submitting operation and maintenance data required to complete the project.

##### 1.02 RELATED WORK:

- A. General Requirements in their entirety (Section 00 72 00 through Section 01 78 00)
- B. Individual Technical Specification Sections Specific for Operation and Maintenance Data.
- C. Section 01 33 23.13, SUBMITTALS FOR OPERATION AND MAINTENANCE MANUALS
- D. Section 01 33 23, SUBMITTALS

##### 1.03 FORMAT:

- A. Prepare data in form of an instructional manual.
- B. Binders: Commercial quality, 8 ½- x 11-inch three-ring binders with hardback, washable, plastic covers; two inch maximum ring size. When multiple binders are used, correlate data into related, consistent groupings. Provide a table of contents in each binder.
- C. Cover: Identify each binder cover and spine with typed or printed title OPERATION AND MAINTENANCE INSTRUCTION; list title of Project facility; identify subject matter of contents.
- D. Arrange contents by systems under section numbers and sequence of Table of Contents.
- E. Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: Manufacturer's printed data, or typewritten data - on 20-pound paper.
- G. Drawings: Provide with reinforced punched, binder tab. Bind in with text; fold larger drawings to size of text pages.
- H. Submit certification that the data and drawings provided pertain exactly to the model, size, and series product and equipment installed in the work.
- I. All documents will be electronically scannable.

J. All products, systems, and drawings must be cross-referenced with tag ID numbers.

K. The manual for each piece of equipment shall be a separate document with the following specific requirement:

1. Contents:

Table of Contents and Index

Brief description of each system and components

Starting and stopping procedures

Special operating instructions

Routine maintenance procedures

Manufacturer's printed operating and maintenance instructions, parts list, illustrations, and diagrams

One copy of each wiring diagram

One copy of each approved shop drawing and each Contractor's coordination and layout drawing

List of spare parts, manufacturer's price, and recommended quantity

Name, address and telephone number of local service representatives.

2. Material

Loose leaf on 60 pound, punched paper

Holes reinforced with plastic cloth or metal

Page size, 8 ½- x 11-inches

Diagrams, illustrations and attached foldouts as required, of original quality, reproduced by dry copy method

Covers: oil, moisture and wear resistant 9 x 12 size

1.04 QUALITY ASSURANCE:

- A. Prepare instructions and data by personnel experienced in maintenance and operations of described products.

#### 1.05 CONTENTS, EACH VOLUME (BINDER):

- A. Table of Contents: Provide title of Contract, schedule of products and systems, indexed to content of the volume. A listing of all relevant tag ID numbers for each volume shall be placed immediately after the Table of Contents.
- B. For each product or systems: List names, addresses, and telephone numbers of subcontractors and suppliers, including local source of suppliers and replacement parts.
- C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- E. Text: As required to supplement product data, provide logical sequence of instructions for each procedure incorporating manufacturer's instructions.
- F. Warranties, Guarantees, and Bonds: Bind copy of each
- G. See O&M Manual Review Checklist at end of this specification section.

#### 1.06 MANUAL FOR MATERIALS AND FINISHES:

- A. Building Products, Applied Materials, and Finishes: Include product data with catalog number, size composition, and color and texture designations. Provide information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: As specified in individual product specification sections.

#### 1.07 MANUAL FOR EQUIPMENT AND SYSTEMS:

- A. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics and

limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

- B. Data submitted on all equipment shall include complete maintenance instructions (including preventive and corrective maintenance) and parts lists in sufficient detail to facilitate ordering replacements.
- C. All products, systems, equipment, electrical wiring, instrumentation wiring, personnel protection systems wiring, presented in this manual will have tag numbers corresponding to contract drawings and specifications. In the event, numbers do not exist; the Engineer will specify a series of numbers.
- D. Panelboard Circuit Directories: Provide electrical service characteristics, controls and communications.
- E. Include color-coded wiring diagrams as installed.
- F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequence. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter and any special operating instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required. Cross-reference lubricants to products offered by at least three major lubricant suppliers.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color-coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- O. Include test and balancing reports, calibration data, alignment records, and other information.
- P. Additional Requirements: as specified in individual product specification sections.

- Q. Provide a listing in table of Contents for design data with tabbed flysheet and space for insertion of data.
- R. Incorporation of all Physical Checkout information obtained through the field-testing and correction phases of the Work. Input must be specific to the actions and information obtained during those phases.

1.08 SUBMITTALS:

- A. Submit draft and final copies of operation and maintenance manuals as described in Section 01 33 23.13 SUBMITTAL OF OPERATION AND MAINTENANCE MANUALS.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

**OPERATION AND MAINTENANCE MANUAL  
REVIEW CHECKLIST**

1. Name, address, telephone/fax number of the manufacturer
2. Name, address, contact name, telephone/fax of local representative
3. Name, address, telephone/fax number of the contractor
4. Exploded view/general arrangement of materials of construction
5. Description of operation/operating principal
6. Project specific Operating parameters
7. Wiring Diagrams (If Applicable)
8. Troubleshooting checklist
9. Recommended spare parts list with prices, and ordering instructions
10. Model number and the serial number of the model provided
12. Routine Maintenance instructions/service instructions with recommended Intervals
13. Assembly and disassembly instructions
15. Approved copies of Shop Drawings are to be included in the manual
16. Startup/break-in and adjustment instructions
17. Warranty information

Reviewed By: \_\_\_\_\_  
Weston & Sampson Engineers

Date: \_\_\_\_\_

END OF SECTION

## SECTION 02 32 13.13

### SOIL BORINGS

#### PART 1 GENERAL

##### 1.01 WORK INCLUDED:

###### A. Geotechnical Borings

1. The work to be done under this Contract includes the furnishing of all materials, labor, equipment, water supply, and all else necessary for making and completing borings as described herein.
2. Soil borings shall be performed a maximum of 100 feet horizontal spacing along both the top and toe of the two (2) reinforced soil slopes (RSS). Up to eight (8) borings will be required. The exact location of borings will be established by the Engineer in the field.
3. Borings from the top shall terminate a minimum depth of 1.5 times the proposed height of the RSS system or refusal in competent bedrock, whichever is shallower. Borings at the toe shall terminate at the same elevation as the borings advanced from the top or upon refusal in competent bedrock, whichever is shallower.
4. If bedrock is encountered above the boring depths, up to four 10-foot rock cores shall be performed at locations determined by the Engineer.
5. If it is determined that the refusal was on a boulder, the split-spoon sample method shall be used through the underlying earth to the termination depth or competent bedrock.
6. One boring advanced from the top of each RSS shall be completed as a groundwater observation well.

B. Borings shall be advanced in the presence of the Engineer who will log the borings. Provide minimum 4 business days notice of the work to the Engineer.

C. All work shall be performed to avoid damage to existing utilities and structures. Contractor shall be responsible for damage and repairs resulting from their work.

##### 1.02 APPLICABLE STANDARDS:

- A. ASTM D1586 - Standard Penetration Test and Split-Barrel Sampling of Soils.
- B. ASTM D1587 - Thin-Walled Tube Sampling of Soils.



C. ASTM D2113 - Practice for Diamond Core Drilling for Site Investigation.

1.03 RELATED WORK

A. Section 00 31 32, SUBSURFACE DATA

1.04 REGULATORY REQUIREMENTS:

A. Apply for, pay for, and obtain all necessary permits and licenses for lawful execution of this work. These include, but not limited to, permits and fees for water, sidewalk crossing, shed erection, pavement cuts, and repairing streets and sidewalks and all other buildings, electrical, plumbing, gas, and sewer permits from authorities having jurisdictions. At the written approval of the Engineer, some or all regulatory requirements could be waived.

1.05 CONTRACTOR'S PLANT AND EQUIPMENT:

A. All equipment, and methods to be used by the Contractor shall be subject to approval by the Engineer before starting, and during the course of the work. Approval of the equipment and methods shall not be construed as approval of the performance of the work. Provide additional equipment, where ordered by the Engineer, to perform work according to the specifications.

1.06 PROJECT RECORD DOCUMENTS:

A. Assist the Engineer in collecting data as required to complete logs for each boring. Each log shall include:

1. General

- a. Name of Contractor and foreman.
- b. Location and identification number of exploration, ground surface elevation and datum used for elevations.
- c. Results of all exploration details arranged in tabular form giving full information on vertical arrangement, thickness, and classification of the materials penetrated.

2. Soil Boring

- a. Height and weight of drop hammer used to drive sampler and to drive split-barrel samples and casing.
- b. Type, number, and depth of each sample.

- c. Number of blows required to drive split-barrel sampler for six-inch penetration of split-barrel sampler and each twelve-inch penetration of the casing.
  - d. Size, length, and depth to bottom of casing.
  - e. Depth to groundwater measurement and time and date of each measurement. Take measurement on each day if boring takes longer than one day to complete. If no water is encountered, the log shall read "No Water".
  - f. Amount of recovery in inches for each sample attempted.
  - g. Description of each soil sample in accordance with the applicable soil classification system selected by the Engineer.
  - h. Depth at which rock was encountered and depth of bottom of borehole or depth to refusal (where encountered).
3. Rock Coring
- a. Type and size of barrel and bit.
  - b. Depth of each core run and length of core recovery.
  - c. Time required to core each foot of sample.
  - d. Description of rock.

B. Deliver all samples to Engineer together at the end of the work.

## PART 2 MATERIALS

### 2.01 EQUIPMENT FOR GEOTECHNICAL BORINGS:

A. Casing: Flush jointed, extra heavy, machine threaded, steel pipe with driving shoe at bottom end. Minimum inside diameter:

Type B - 2-3/8 inch

Type N - 3 inch

Type H - 4 inch

B. Hollow stem Augers: Minimum inside diameter two and two tenths (2.2) inches. Maximum inside diameter six and a half (6.5) inches. Auger lengths five (5) feet maximum. Equipped with center rod plug and pilot bit. C. Drill Rods: Cold drawn steel tubes with flush joints and square threads. Stiffness (moment of inertia) equal or greater than that of a parallel wall A-rod (1 5/8-inch OD and 1 1/8-inch ID).

- C. Split Barrel Sampler: ASTM D1586. Effective length of split tube between 22 inches and 30 inches. Equipped with top check valves and core catchers for use as directed by the Engineer. Each drill rig shall be equipped with a minimum of two complete split barrel samplers acceptable to the Engineer.
- D. Thin-Walled Tubes: ASTM D1587. Three (3) inch outside diameter bright, clean and free from dents, rust, and scars, coated with lacquer on other rust inhibitors.
- E. Rock Core Barrel and Bits: ASTM D2113 Double Tube, Swivel Type, NX. All coring shall be completed in lengths of 5 feet.

#### H. Sample Containers

##### 1. Split Barrel Samples

- a. Preserve all samples in wide mouth, round, screw-top, airtight, clean glass jars, eight ounces or larger.

Place representative samples in jars at same time they were obtained to preserve original moisture in the material. Tightly cap all jars, identify each jar with legible labels. On each label show the date, boring number, sample number, depth of sample, number of blows for each six inches of penetration. Jars should be placed in suitable boxes labeled and identified on the outside.

- b. Store and protect all samples from freezing at or near the site during the course of the work.
- c. Deliver fully identified samples to the Engineer at the completion of work.

##### 2. Rock Cores

- a. Supply new wooden core boxes 5 feet in length with a capacity for 20 feet of core in each box. Equip all boxes with necessary partitions, hinges, and latches for securing the cover. Label each box with project name, boring number, and core run numbers and representative depths.
- b. Place rock core in suitable wooden boxes so partitioned that the cores will be kept separate.
- c. Arrange and label rock cores neatly in the boxes in the sequence in which the material was removed from the hole with the depth of the top and bottom of each run clearly marked.

##### 3. Thin-Wall Tube Samples

- a. Prepare tubes for shipment in accordance with ASTM D1587 "Preparation for Shipment"

#### 2.02 DRILL WATER:

- A. Drill water shall be clean and free of any hazardous materials, oil or any deleterious materials that might negatively affect strata or the environment.
- B. It is the SUBCONTRACTOR responsibility to secure water for the drilling operation. The Engineer will notify the SUBCONTRACTOR if water is available at the project site. In such a case, the Engineer will obtain the OWNER'S permission to use such water.

#### 2.03 OBSERVATION WELL MATERIALS:

- A. Riser Pipe: 2-inch-inside-diameter, schedule 40, PVC with flush threaded joints.
- B. Well screen: 2-inch-inside-diameters, schedule 40, PVC with 0.010-inch wide machined slots; 10-foot length of screen ten; PVC plug on bottom end.
- C. Filter Sand: surrounding well screen, uniformly graded, washed silica sand such as Ottawa sand or approved equal. Gradation of filter sand to be selected by Engineer based on grain size distribution of native soils for each project.
- D. Bentonite for Seals: pure Wyoming bentonite pellets or approved equal.
- E. Cement Bentonite Grout: general slurry consisting of a minimum 5 percent Bentonite with remainder Portland cement.
- F. Protective Casing: 4-inch diameter, extra-heavy steel pipe, 5-foot-long, threaded at top end with a vented cap and locking device.

### PART 3 EXECUTION

#### 3.01 PREPARATION:

- A. Before performing drilling at any location, the Contractor shall contact DIGSAFE and the OWNER of property and any other local utilities (e.g., water, sanitary sewer, storm drainage, etc.) to avoid damage to any existing utilities.
- B. Provide, place and erect all necessary barricades, warning signs, and lighting required to protect work from traffic and pedestrians.
- C. Verify that site conditions will support equipment for performing subsurface exploration program.

- D. Notify Engineer a minimum of forty-eight (48) hours in advance of proposed starting date and time as required.

### 3.02 DRILLING AND SAMPLING:

#### A. Depth of Boring:

1. Carry borings to the depths indicated herein. Do not carry boring below the depth indicated unless directed by the Engineer.
2. If refusal is encountered above the specified depth, core drill a minimum of 10 feet as directed by the Engineer. As used in these specifications, refusal is defined as the resistance to penetration of the split spoon sampler of not less than 100 blows per one inch when driven with a 140-pound weight free-falling 30 inches. In each case, the Engineer shall determine that refusal actually has been encountered and will determine the need to core drill.

#### B. Advancing Casing:

1. Drive casing vertically with a weight of at least 300 pounds free-falling 24 inches through earth and other materials to such depth below the ground surface as required to maintain an open borehole or as directed by the Engineer. Record the blows per foot, hammer weight and free-fall distances and include on drill records. Simultaneous washing and driving of casing will not be permitted except with the specific approval of the Engineer. Where so permitted, indicate on drill records the depths between which water was used while driving the casing.
2. Measure groundwater level before removing casing at completion of boring if no instrumentation installation or testing will be performed in borehole.

#### C. Advancing Hollow Stem Augers:

1. Maintain a center rod plug and pilot bit in place while advancing the hole by rotation. When sampling below the groundwater table, completely fill the hollow stem with water or drilling fluid prior to and during withdrawal of the plug and during sampling.

#### D. Advancing Uncased Boreholes:

1. Uncased boreholes may be employed for Type B borings only. In such boreholes, drive casing to such depth as required to maintain an open borehole. Utilize water or commercial drilling fluid as required to maintain a fully open hole. Maintain the level of drilling fluid as near as practicable to the ground surface at all times.

#### E. Split Spoon Sampling:

1. Perform split spoon sampling in accordance with ASTM D1586. For each sample, drive sampler twenty-four (24) inches or to refusal whichever occurs first. Obtain split spoon samples at 5-foot intervals or as otherwise directed by the Engineer. A recovery of less than 6 inches of soil in the split barrel portion of the sampler shall be an unacceptable sample. Attempt another sample immediately below the recovery until acceptable recovery is obtained.
2. When sampling in sandy or loose silt deposits below the ground water table, maintain the water level in the borehole at ground surface at all times. If this is insufficient to prevent the formation material from rising into casing or augers, use commercial drilling mud to maintain bottom stability when approved by the Engineer.

#### F. Rock Core Drilling

1. Prior to coring, firmly seat casing in rock and wash out before inserting diamond core bit.
2. Core in runs of 5 feet or less until depth is sufficient to satisfy Engineer of the character of the rock penetrated.
3. For each core run withdraw core, label, and store in approved core box before drilling is continued. Handle carefully to ensure proper identification and placement in the core box in the order they are removed from the hole.
4. Take care to recover as large a percentage of core as possible. Regulate the speed of drill and remove core as often as necessary to assure maximum percentage of recovery.
5. If unable to obtain satisfactory core recovery, take whatever measures the Engineer may authorize to improve core recovery. Measures to improve core recovery may include changes in:

- Type of drill bit
- Rate of feed
- Speed of rotation
- Volume of cooling water
- Style of core barrel
- Length of coring interval
- Type of machine

No additional payment will be made for such changes unless authorized by the Engineer.

#### 3.03 OBSERVATION WELLS:

- A. Observation wells shall be constructed as follows:

1. Place a minimum of 6-inches of filter sand at the bottom of the borings.
2. Place a PVC tip, 10 feet of well screen, and sufficient riser pipe to extend the well to at least 2 feet above the ground surfaced.
3. Provide an expandable, lockable, well cap at the top of the PVC well material.
4. Backfill around the well screen and to at least 2-feet above the top of the well screen with filter sand. Filter sand shall be placed in a manner to prevent bridging and provide uniform backfill around the screen.
5. Backfill with bentonite pellets to 2 feet above the top of the filter sand.
6. Backfill above the bentonite pellets with cuttings from the boring.

B. Protective Casing

1. Set the protective casing over the PVC well materials.
2. Casing shall extend at least 1.5 feet below the ground surface and be set in concrete placed around the exterior of the protective casing.
3. Top of PVC well materials shall be within 3 inches of the top of the protective casing.

3.04 SEALING BOREHOLE:

- A. Immediately after removing casing or augers, backfill hole without instrumentation with the native soils and thoroughly tamp the surface.
- B. For boreholes made through paved surfaces, patch the surface with equivalent material of a thickness equal to or greater than the adjacent existing pavement.
- C. The Contractor is responsible for settlement of all boreholes for a period of one month after completion of the contracted work. The Contractor will be required to bring sunken borehole to grade as directed by the Engineer.

3.05 ABANDONED HOLES:

- A. An abandoned hole is defined as any one of the following:
  1. A boring is started and for any reason not carried to the depth required by the Engineer.
  2. The casing is removed from a borehole or the hole is abandoned without the permission of the Engineer.

3. If Contractor fails to keep complete records of materials encountered.
  4. The Contractor fails to furnish the Engineer with the required samples and cores.
- B. Make an additional borehole at a location selected by the Engineer to replace each abandoned hole.
- C. No payment will be made for abandoned holes nor for any samples or cores obtained in abandoned holes.

END OF SECTION



SECTION 02 41 13.29

ABANDONMENT OF SEWERS AND DRAINS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers the abandonment of sewers and drains through various means including furnishing, handling and installation of all concrete and masonry plugs; removal and disposal of manholes, and filling existing pipes with controlled density fill, as shown on the Drawings and specified herein.
- B. The Contractor shall furnish all materials, tools, labor, and equipment to abandon existing sewers, combined sewers, and drains.

1.02 RELATED WORK:

- A. Section 03 05 00 FIELD CONCRETE
- B. Section 31 05 13.22, CONTROLLED DENSITY FILL

1.03 REFERENCES:

The following standards form a part of this specification, as referenced:

ASTM International (ASTM)

ASTM C32 Specifications for Sewer and Manhole Brick (Made from Clay or shale).

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

Plan for abandoning existing pipe, showing equipment, methods and materials. The plan shall be submitted to and reviewed by the Engineer before construction.

PART 2 - PRODUCTS

2.01 PLUGS:

- A. Plugs installed at the open ends of the pipe to be abandoned shall be 12-inch thick 3,000-psi cement concrete, or 8-inch thick brick masonry as directed. The pipes to be abandoned include all sewer, combined sewer, and drains as specified herein and as shown on the Drawings.

- B. Precast cement concrete plugs that are used shall meet the requirements for 3,000 psi concrete and shall be free of cracks and spalls. Brick masonry plugs shall be made of brick meeting the requirements of ASTM C32, for grade SS, hard brick.
- C. Mortar shall be composed of portland cement, hydrated lime, and sand, and the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as directed and may vary from 1:1/4 for dense hard-burned brick to 1:3/4 for softer brick. In general, mortar for grade SS brick shall be mixed in the volume proportions of 1:1/2:4-1/2; portland cement to hydrated lime to sand. The cement concrete plug shall be covered with non-shrink grout to prevent leakage at the plug.

2.02 PIPE FILL:

- A. Fill used for the abandonment of sewers, combined sewers, and drains as shown on the drawings shall consist of clean fill, or controlled density fill meeting the requirements included in Section 31 05 13.22 Controlled Density Fill.
- B. Any variance from the specified material shown on the plans or as specified herein for the abandonment of the pipeline shall be subject to the written approval of the Engineer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. PLUGS:

1. Existing sewers or drains shall be plugged with 3,000 psi concrete or with brick masonry, as directed by the Engineer. For non-circular pipes, the largest interior cross sectional dimension shall govern in determining size of abandonment.
2. Plugs shall be of adequate strength to withstand the full soil and groundwater pressure but not less than 5 psi.
3. Open ends of sewer and drain services less than 12-inches in diameter shall be plugged with the appropriate VC plugs or concrete plug as directed by the Engineer. Such plug shall be made watertight with an application around the plug of an approved watertight compound.
4. Masonry plugs shall be at least 8-inches thick and concrete plugs shall be at least 12-inches thick. Pipes entering a manhole or catch basin that are to be abandoned shall have a plug installed that is flush with the interior wall of the structure.

B. PIPE FILL:

1. Existing sewers or drains 12-inches and larger shall be abandoned and filled with clean fill, or controlled density fill, and plugged, as shown on the Drawings.
2. Existing sewers or drains smaller than 12-inches shall be plugged and abandoned but need not be filled with clean fill or any other material unless otherwise specified by the Engineer.
3. The method of filling the abandoned pipeline shall fill a minimum of 95 percent of the total annular volume of the pipe.

### 3.02 REMOVAL AND DISPOSAL OF MANHOLES

#### A. REMOVAL OF MANHOLES

1. Frames and covers will be removed and delivered to the place designated by the Owner.
2. After filling the pipes to be abandoned that are entering the manhole as specified above, the Contractor shall remove the cone section of a precast manhole or the top four feet of brick in a brick manhole.
3. The Contractor shall place and compact clean fill in the void left by the removal of the manhole.
4. The ground or paved surface shall be restored in accordance with the drawings.

#### B. DISPOSAL OF MANHOLES

1. The Contractor shall dispose of all manhole materials that are to be removed. Unless the Owner designates a site for receiving the removed materials, the Contractor shall dispose of the materials at a site of its own choosing.

END OF SECTION

## SECTION 02 41 13

### SELECTIVE SITE DEMOLITION

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK:

- A. Work under this Section shall consist of the careful removal, storage for reuse, transportation off-site, or demolition, of all structures and site features encountered or noted to be removed or abandoned to a minimum of three feet below finished grade, and the removal and disposal of all materials not called for to be reused or salvaged, in accordance with the contract drawings, these specifications, and Engineer's requirements. Provide all labor, equipment, materials and transportation necessary to complete the work.
- B. Items plan referenced to be removed and stored shall be carefully removed and stored on site in a manner and location designated by the Engineer for reinstallation later as shown on the plans or as indicated by the Engineer.
- C. Items plan referenced, or as indicated by the Engineer to be removed and disposed of shall be removed from the site and properly and legally disposed of by the Contractor.
- D. Items indicated on the contract drawings or in the specifications to be removed and salvaged, or other items required to be removed by the Engineer, shall be transported to a municipal storage facility, located within the **City** confines, and unloaded and stacked as required by the Engineer.
- E. Items indicated on the contract drawings or in the specification to be removed and reset shall be carefully removed and reset in the same location as existing according to the specification and details.
- F. The following scope describes the general work/demolition requirements of this Section.
  - 1. Cement concrete and bituminous concrete pavements.
  - 2. Curbing
  - 3. Cement spectator bleachers, play area and all related concrete footings complete.
  - 4. Chain link fencing and footings complete.
  - 5. Swings & play equipment

6. Wood guard rail
7. Boulders & wall stone
8. Other features as indicated on the drawings.

1.02 PROTECTION:

- A. The Contractor shall assume complete responsibility and liability for the safety and structural integrity of all work and utilities to remain during demolition.
- B. Provide safeguards including, but not limited to, warning signs, barricades, temporary fences, warning lights and other items required for protection of personnel and the general public during performance of all work.
- C. All features related to protection shall be maintained until that work has been completed to the point when such safeguards are no longer required.

1.03 SPECIAL REQUIREMENTS:

- A. The Contractor shall salvage items label to be demolished and transport these to the **Owner's City Yard** unless these are called for to be reused or required by the Engineer to be disposed of.
- B. Install erosion controls to protect adjacent areas from eroded materials likely to enter wetlands, resource areas, or drainage ways/systems, downstream of areas disturbed by work activities.
- C. Where items to be demolished are located within or adjacent to pavements to remain, the Contractor shall make provisions to protect that pavement to remain. Cut concrete pavement back to score line and cut bituminous concrete pavement back far enough so as not to allow disturbance to base course materials. Pavements damaged as a result of Contractor activities shall be replaced to the extent determined by the Engineer at no additional cost to the Owner.

1.04 REFERENCES:

- A. Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges – latest edition.

PART 2 - PRODUCTS

2.01 BACKFILL:

- A. The Contractor shall provide suitable backfill as specified under Section 31 23 00

of these Specifications, to fill voids left by removal or abandonment of site features, and shall provide all pipe cap ends, mortar, brick and other material needed to cap off or plug pipes of various sizes and kinds.

- B. Suitable materials shall be used as base course fill and topsoil to the depth as specified herein. Restore disturbed areas with similar materials blended to match the line and grades of adjacent surfaces.

#### 2.02 TEMPORARY FENCE:

- A. The work under these Items shall conform to the relevant provisions of section 644 of the MassDOT Standard Specifications.
- B. The work shall include temporary installation of chain link fence around the perimeter of the work limits where shown on the plans, and as required by the Engineer, and as Contractor sees fit to protect work.
- C. Temporary fence shall consist of 6 foot high chain link fence anchored into a base that is both stable and movable to allow access and adjustment as needed. Reclaimed existing fence fabric and materials may be used with the approval of the Engineer. The Contractor shall submit a shop drawing to the Engineer for approval prior to installation.

### PART 3 - EXECUTION

#### 3.01 SALVAGEABLE MATERIAL:

- A. Frames, grates and other salvageable material shall be carefully removed to minimize damage and stored for later reuse, transport, or removal from site.

#### 3.02 ABANDONED STRUCTURES:

- A. All inlets and outlets shall be plugged with at least eight (8) inches of brick and mortar masonry. Upper portions of masonry structures shall be removed to a depth of three feet. The bottoms of all structures shall be broken to allow drainage, and the structure shall be filled with suitable backfill material placed in six (6) inch layers and thoroughly compacted at each level.
- B. The Engineer shall review work related to abandoned structures before backfilling. Those items not reviewed before backfilling shall be uncovered and backfill procedures observed, at no expense to the Owner.

#### 3.03 ABANDONED PIPES OR CONDUITS:

- A. Plug previously abandoned drainpipes encountered with masonry brick at least eight (8) inches in thickness.
- B. Abandon discontinued water supplies that are encountered during the

execution of this contract in accordance with Owner requirements.

- C. Electrical conduits encountered and previously abandoned shall be capped or plugged.

END OF SECTION

## SECTION 02 41 19.16

### MINOR ELECTRICAL DEMOLITION

#### PART 1 - GENERAL

##### 1.1 SUMMARY:

- A. Section Includes:
  - 1. Removal of existing electrical service wiring.
  - 2. Disposal of materials.
  - 3. Storage of removed materials.
  - 4. Identification of utilities.
- B. Related Sections:
  - 1. Section 02 41 19 – SELECTIVE STRUCTURE DEMOLITION.
  - 2. Section 26 20 00.13 – ELECTRICAL WORK GENERAL PROVISION.

##### 1.2 CLOSEOUT SUBMITTALS:

- A. Section 01 78 00 – Project Closeout: Requirements for submittals.
- B. Project Record Documents: Record actual locations of capped utilities conduits and equipment abandoned in place.

##### 1.3 PRE-INSTALLATION MEETINGS:

- A. Convene minimum one week prior to commencing work of this section.

##### 1.4 SCHEDULING:

- A. Schedule work to coincide with new construction.
- B. Cease operations immediately when structure appears to be in danger and notify Engineer. Do not resume operations until directed.

##### 1.5 COORDINATION:

- A. Conduct demolition to minimize interference with adjacent building areas.
- B. Coordinate and sequence demolition so as not to cause shutdown of operation of existing processes or surrounding areas.
- C. Identify salvage items in cooperation with Owner.



## PART 2 - PRODUCTS

Not Used

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

- A. Verify wiring and equipment indicated to be demolished serve only abandoned facilities.
- B. Verify termination points for demolished services.

### 3.2 PREPARATION:

- A. Erect, and maintain temporary safeguards, including warning signs and lights, barricades, and similar measures, for protection of the public, Owner, Contractor's employees, and existing improvements to remain.

### 3.3 DEMOLITION:

- A. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Architect/Engineer before disturbing existing installation.
- B. Disconnect or shut off service to areas where electrical work is to be removed. Remove electrical fixtures, equipment, and related switches, outlets, conduit and wiring, which are not part of final project.
- C. Perform work on energized equipment or circuits with experienced and trained personnel.
- D. Cap abandoned empty conduit at both ends.

### 3.4 CLEANING:

- A. Remove demolished materials as work progresses. Legally dispose.
- B. Keep workplace neat.

END OF SECTION

SECTION 03 05 00

FIELD CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers concrete and all related items necessary to place and finish the concrete work.
- B. Concrete thrust, and anchor blocks, to be provided at all water main bends, tees, plugs and wyes and at other locations required by the Engineer shall be installed in accordance with the details shown on the drawings and as specified in this section.
- C. Concrete for curb backing and setting shall be installed in accordance with the details shown on the drawings and as specified in this section.
- D. Concrete for footings and site improvements is described in Section 03 30 00 – CAST-IN-PLACE CONCRETE.
- E. Concrete for pavements is described in Section 32 13 13 – CONCRETE PAVEMENT.

1.02 RELATED WORK:

- A. Section 03 30 00, CAST-IN-PLACE CONCRETE
- B. Section 31 00 00, EARTHWORK
- C. Section 32 13 13, CONCRETE PAVEMENT
- D. Section 32 16 00, CURBING
- E. Section 33 11 13.13, DUCTILE IRON PIPE AND FITTINGS
- F. Section 33 31 13.19, DUCTILE IRON GRAVITY PIPE AND FITTINGS FOR SEWERS

1.03 REFERENCES:

- A. The following standards form a part of this specification:

American Concrete Institute (ACI)

- |         |   |
|---------|---|
| ACI 304 | Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete. |
| ACI 305 | Recommended Practice for Hot Weather Concreting                                 |
| ACI 306 | Recommended Practice for Cold Weather Concreting                                |

ACI SP-66 ACI Detailing Manual

ACI 318 Building Code Requirements for Reinforced Concrete

ASTM International (ASTM)

ASTM A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM C33 Concrete Aggregates

ASTM C94 Ready-Mixed Concrete

ASTM C143 Test for Slump of Portland Cement Concrete

ASTM C150 Portland Cement

ASTM C260 Air Entraining Admixtures for Concrete

ASTM C494 Chemical Admixtures for Concrete

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23  
SUBMITTALS, SUBMIT THE FOLLOWING:

Statement of materials constituting the design of mixes for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the Contract.

PART 2 - PRODUCTS

2.01 CONCRETE:

- A. All underground placed concrete, reinforced or non-reinforced, shall have a 28 day compressive strength of 3,000 psi unless otherwise noted on the design drawings. A minimum of 5.5 sacks of cement per cubic yard and a maximum water cement ratio of 6.9 gallons per sack shall be used.
- B. Concrete shall conform to ASTM C94. The Contractor shall be responsible for the design of the concrete mixtures. Slump shall be a maximum of 4-inches and a minimum of 2-inches, determined in accordance with ASTM C143.
- C. Admixtures shall be as specified in subsection 2.05. No additional admixtures shall be used unless approved by the Engineer.
- D. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

2.02 REINFORCING:

Reinforcing as shown on the plans or as required by the Engineer, shall conform to ACI 318 and ASTM A615 and shall be detailed in accordance with ACI SP-66. All Steel reinforcing bars shall be grade 60.

2.03 CEMENT:

The cement shall be an approved brand of American manufactured Portland Cement, Type II conforming to the applicable requirements of ASTM C150.

2.04 AGGREGATES

- A. Except as otherwise noted, the aggregate shall conform to the requirements of ASTM C33.
- B. Maximum size aggregate shall be 3/4-inch.

2.05 ADMIXTURES:

- A. All concrete (unless otherwise directed) shall contain an air entraining agent. Air entrained concrete shall have air content by volume of 4 to 8 percent for 3/4-inch aggregate.
- B. Air entraining agent shall be in accordance with ASTM C260 and shall be Darex AEA, as manufactured by W.R. Grace & Company; Placewel (air entraining Type), as manufactured by Johns Manville; Sika AER as manufactured by Sika Chemical Company; or an approved equal product.
- C. Water reducing agent shall be WRDA, manufactured by W.R. Grace & Company; Placewel (non-air entraining Type), as manufactured by Johns Manville; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.
- D. Water reducing agent-retarder shall be "Daratard," manufactured by W.R. Grace & Company; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.

2.06 WATER:

- A. Water for concrete shall be potable, free of deleterious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.07 CONCRETE FORMS:

- A. Forms for exterior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Engineer.

- B. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 2-inches to finished face of concrete.
- C. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as EZ strip by L&M Construction Chemicals, Omaha, NB and "Magic Kote" by Symons Corp., Des Plaines, IL or approved equal.
- D. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete

### PART 3 - EXECUTION

#### 3.01 PREPARATION:

- A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or the material which would tend to reduce the bond.
- B. Earth, concrete, masonry, or other water permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed.
- C. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.

#### 3.02 THRUST AND ANCHOR BLOCKS:

- A. Minimum bearing areas for thrust blocks and dimensions of anchor blocks shall be as shown on the drawings.
- B. Concrete for thrust and anchor blocks shall be placed against undisturbed earth, and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints.

#### 3.03 FILL CONCRETE:

- A. Fill concrete shall be placed in those locations as indicated on the design drawings. Fill concrete shall consist of materials as previously specified, with a minimum 28-day compressive strength of 3000 psi.

- B. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before the grout has dried or set.
- C. Fill concrete shall be brought to lines and grades as shown on the design drawings.

#### 3.04 CONCRETE PLACING DURING COLD WEATHER:

- A. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when temperature is below 40°F, or is expected to fall to below 40°F, within 73 hours, and the concrete after placing shall be protected by covering, heat, or both.
- B. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval of the Engineer. All procedures shall be in accordance with the provisions of ACI 306.

#### 3.05 CONCRETE PLACING DURING HOT WEATHER:

- A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays, which will result in excessive mixing of the concrete after arrival on the job.
- B. During periods of excessively hot weather (90°F or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement, will not be acceptable, and will be rejected.

#### 3.06 FIELD QUALITY CONTROL:

- A. Concrete inspection and testing shall be performed by the Engineer or by an inspection laboratory, designated by the Engineer, engaged and paid for by the Owner. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

- B. At least 4 standard compression test cylinders shall be made and tested and 1 slump test from each day's placement of concrete. A minimum of four compression test cylinders shall be made and tested for each 100 cubic yards of each type and design strength of concrete placed. One cylinder shall be tested at 7 days, and two at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. If the average compressive strength of the two 28 day cylinders does not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days. If job experience indicates additional cylinder tests or other tests are required for proper control or determination of concrete quality, such tests shall be made.
  
- C. The Engineer shall have the right to reject concrete represented by low strength tests. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected shall be final.

END OF SECTION

SECTION 03 11 00  
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specifications covers the furnishing and installation of forms for cast-in-place concrete.

1.02 RELATED WORK:

- A. Section 01 45 23, STRUCTURAL TESTS AND INSPECTIONS
- B. Section 03 21 00, CONCRETE REINFORCEMENT
- C. Section 03 30 00, CAST-IN-PLACE CONCRETE

1.03 REFERENCES:

The following standards form a part of this specification:

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 301 Standard Specifications for Structural Concrete

ACI 347 Recommended Practices for Concrete Formwork

U.S. ARMY CORPS OF ENGINEERS (CE)

CE 03300 Cast-in-Place Concrete

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Engineer.
- B. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 2-inches to finished face of concrete.



- C. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as EZ strip by L&M Construction Chemicals, Omaha, NB and "Magic Kote" by Symons Corp., Des Plaines, IL or approved equal.
- D. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete.

### PART 3 - EXECUTION

#### 3.01 PREPARATION:

Surfaces of forms to be in contact with concrete shall be greased with nonstaining form release compound. Wetting will not be accepted as a substitute. Approval of the Engineer shall be obtained before use of coated materials or liners in lieu of form release compound, except as modified herein.

#### 3.02 CONSTRUCTION:

- A. For concrete surfaces which will be visible after completion of the structure, painted or unpainted, the type and the precise location of form ties, nails joints between form members, and any other features which will leave a visible trace in the finished concrete, will be subject to the approval of the Engineer.
- B. Formwork shall be so constructed, braced, or tied that the formed surfaces of the concrete will be perfectly true, smooth, and to the dimensions shown on the drawings. All forms used for circular sections shall be true arcs as indicated on the drawings. Short chords will not be acceptable. Form line shall present an uninterrupted surface conforming to radii indicated on the drawings.
- C. Forms shall be sufficiently tight to prevent leakage of mortar, and when necessary shall have temporary openings as required for thorough cleaning, and as required for introduction of concrete to avoid excessive free fall. Panels damaged in stripping or otherwise shall not be reused.
- D. Unless otherwise noted on the design drawings, forms shall be filleted and chamfered at all sharp corners, and exposed edges with a 3/4-inch chamfer. Chamfer shall not be used where masonry or other material will subsequently be installed flush with one of the adjacent surfaces of the concrete. Where a wash or slope is indicated on the drawings no additional chamfer is required.

#### 3.03 REMOVAL OF FORMS

- A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent of the ultimate strength prescribed by the design and not before reaching the following number of day-degrees [whichever is the longer]:

| <u>Forms for</u>            | <u>Day-Degree*</u> |
|-----------------------------|--------------------|
| Beams and Slabs             | 500                |
| Walls and vertical surfaces | 200                |

\* Day-Degree: Total number of days times average daily air temperature at surface of concrete. For example, 5 days at a daily weighted average temperature of 60 deg F equals 300 day-degrees. Temperatures below 50 deg F are not to be considered in determining Day-Degree.

- B. Where beams, girder, columns, walls and similar vertical forms are adequately supported on shores, the side forms may be removed after 24 hours of cumulative curing time provided the side forms support no loads other than the lateral pressure of the plastic concrete. Cumulative curing time represents the sum of time intervals, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 deg. F in accordance with American Concrete Institute standards.
- C. Shoring shall not be removed until the concrete has attained at least 70 percent of the specified strength and sufficient strength to support safely its own weight and the construction live loads upon it.
- D. Forms shall be removed in such a manner as not to impair safety and serviceability of the structure. Concrete exposed by form removal shall have sufficient strength not to be damaged by the removal operation.

END OF SECTION

## SECTION 03 21 00

### CONCRETE REINFORCEMENT

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This section of the specification covers the furnishing and installation of reinforcement for cast-in-place concrete.

##### 1.02 RELATED WORK:

- A. Section 01 45 23, STRUCTURAL TESTS AND INSPECTIONS
- B. Section 03 11 00, CONCRETE FORMWORK
- C. Section 03 30 00, CAST-IN-PLACE CONCRETE

##### 1.03 SYSTEM DESCRIPTION:

Materials and construction shall conform to ACI 318 and ACI 350 unless otherwise noted on the design drawings or modified herein.

##### 1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. The Contractor shall furnish the Engineer with complete checked, reinforcing steel shop drawings and bar lists. Shop drawing shall include the grade of steel used as well as splice lengths.
- B. Mill test reports shall accompany drawings. Fabrication shall not commence until the drawings and mill test reports have been released by the Engineer.
- C. When fiber reinforcement is used, the Contractor shall submit manufacturer's data confirming that material meets the specification.

##### 1.05 REFERENCES:

- A. The following standards form a part of these specifications:

American Concrete Institute (ACI)

ACI 318 Building Code Requirements for Concrete

ACI 347 Recommended Practice for Concrete Formwork

ACI 350 Environmental Engineering Concrete Structures

ACI SP-66 ACI Detailing Manual

ASTM International (ASTM)

- ASTM A185 Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement
- ASTM A497 Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement
- ASTM A615 Deformed Billet-Steel Bars for Concrete Reinforcement
- ASTM A775 Epoxy-coated Reinforcing Steel Bars
- ASTM A884 Epoxy-coated Welded Wire Fabric

American Welding Society (AWS)

- AWS 12.1 Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Steel reinforcing bars shall conform to ASTM A615, Grade 60, and A775 if epoxy-coated bars are specified.
- B. Welded steel wire fabric shall conform to ASTM A185 or ASTM A497 and ASTM A884 if epoxy-coated fabric is specified. Gauge and spacing of wires shall be as indicated on the drawings.
- C. Reinforcing steel shall be detailed in accordance with ACI SP-66 modified as applicable to conform to ACI 350.
- D. Reinforcement shall be accurately formed to the dimensions indicated on the drawings. Bars shall be shipped to the site with bars of the same size and shape, fastened in bundles with securely wired-on metal identification tags listing both size and mark.
- E. Any bar showing cracks after bending shall be discarded.
- F. Steel failing to meet the requirements of this specification or the drawings will be rejected and shall be removed from the site immediately.

## PART 3 - EXECUTION

### 3.01 STEEL INSTALLATION:

- A. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt, and other coatings (including ice), that reduce or destroy bond. When there is a delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned as necessary.
- B. After forms have been oiled, but before concrete is placed, all steel shall be securely wired in the exact position called for and shall be maintained in that position until all concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Engineer.
- C. Concrete blocks having a minimum bearing area of 2-inches by 2-inches and equal in quality to that specified for the slab, shall be used for supporting reinforcing bars for slabs on grade. Wood blocks, stones, brick chips, etc., shall not be used to support reinforcement.
- D. Metal supports shall be of types that will not penetrate the surface of formwork or slab, and which will not show through or stain surfaces that are to be exposed to view, painted or unpainted.
- E. Welding of reinforcing bars will be permitted only where permission of the Engineer has been obtained in advance. Such welding shall be performed only under conditions established by the Engineer, and in accordance with AWS 12.1.
- F. Reinforcement, which is to be exposed for a considerable length of time after having been placed, shall be painted with a heavy coat of cement grout, if required by the Engineer.

END OF SECTION

Document5

## SECTION 03 30 00

### CAST-IN-PLACE CONCRETE

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This Section covers all concrete and all related items necessary to place and finish the concrete work.

##### 1.02 RELATED WORK:

- A. Section 01 45 23, STRUCTURAL TESTS AND INSPECTIONS
- B. Section 03 05 00, FIELD CONCRETE
- C. Section 03 11 00, CONCRETE FORMWORK
- D. Section 03 21 00, CONCRETE REINFORCEMENT
- E. Section 22 00 00, PLUMBING
- F. Section 31 00 00, EARTHWORK
- G. Section 32 13 13, CONCRETE PAVEMENT
- H. Items furnished and installed under this section include, but not limited to:
  - a. Synthetic Turf Nailer Curb.
  - b. Concrete mow curb.
  - c. Concrete Stairs.
  - d. Concrete footings for site improvements
- I. Items furnished under other Sections and installed under this Section include, but are not limited to:
  - a. Items embedded in concrete, including anchors, sleeves, floor drains, castings, frames for hatches, angles, nosings, and other miscellaneous metals.

##### 1.03 REFERENCES:

- A. The following standards form a part of these specifications:

#### American Concrete Institute (ACI)

- ACI 301 Structural Concrete for Buildings
- ACI 302 Recommended Practice for Concrete Floor and Slab Construction
- ACI 304 Recommended Practice for Measuring, Mixing, Transporting, and Replacing Concrete
- ACI 305 Recommended Practice for Hot Weather Concreting
- ACI 306 Recommended Practice for Cold Weather Concreting

- ACI 318 Building Code Requirements for Reinforced Concrete
- ACI 347 Recommended Practice for Concrete Formwork
- ACI 350 Code Requirements for Environmental Engineering Concrete Structures

ASTM International (ASTM)

- ASTM C33 Concrete Aggregates
- ASTM C39 Compressive Strength of Cylindrical Concrete Specimens
- ASTM C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- ASTM C87 Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
- ASTM C94 Ready-Mixed Concrete
- ASTM C143 Standard Method for Slumps of Portland Cement Concrete
- ASTM C150 Portland Cement
- ASTM C171 Sheet Materials for Curing Concrete
- ASTM C231 Air Content of Freshly Mixed Concrete by the Pressure Method
- ASTM C260 Air-Entraining Admixtures for Concrete
- ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete
- ASTM C494 Chemical Admixtures for Concrete
- ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- ASTM D1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Shop drawings of the materials specified herein.

- B. Statement of materials constituting the design of mixes which satisfy the specified strength for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the contract.
- C. Provide one copy of the "Certificate of Delivery" for each load of concrete as it arrives on the site, under the provisions of ASTM C94.

PART 2 - PRODUCTS

2.01 CONCRETE:

- A. Concrete conforming to the requirements listed below shall be used where indicated on the drawings. Unless otherwise indicated, concrete used as fill under foundations, and elsewhere approved by the Engineer, shall be the 3,000 psi mix.

TABLE

| Minimum Comp.<br>Strength at 28 days (psi) | Maximum Water/Cement<br>ratio (gallons per bag of<br>cement)* | Cement Factor: 94 lb.<br>Bags per cubic yard<br>minimum** |
|--|---|---|
| 3000                                       | 0.59 (6.9)  | 5.5   |
| 4000                                       | 0.48 (5.6)  | 6.5   |
| 5000                                       | 0.40 (4.7)  | 7.4   |

\* Based on air-entrained concrete. If non-air-entrained concrete is called for, the listed maximum water/cement ratios may be increased slightly, as approved by the Engineer. The water is the total water in the mix, including free water on the aggregate.

\*\* These are minimum amounts; increase as necessary to meet mix requirements.

- B. Cast-in-place concrete for footings and site improvements, shall be air-entrained concrete with a minimum 28-day compressive strength of 4,000 pounds per square inch. For vertical exposed elements, a minimum 28-day compressive strength of 5,000 pounds per square inch. Concrete shall be air-entrained. Maximum aggregate size shall be ¾ inch. Thickness of concrete shall be as noted on the Contract Documents.
- C. Concrete shall conform to ASTM C94. One copy of the Certificate of Delivery required by ASTM C94 shall be delivered to the Engineer immediately upon arrival of each load of concrete at the site. The Contractor shall be responsible for the design of the concrete mixtures.
- D. Standard compression tests of all proposed mixes shall be made by the testing laboratory or other satisfactory evidence shall be presented that the design mixes will attain the minimum strengths listed on the design drawings or called for herein, within the



limitations of the ACI Code. No concrete shall be delivered to the job site until the Engineer has approved the design mixes.

- E. All concrete (unless otherwise directed) shall contain an air-entraining agent. Air entrained concrete shall have an air content by volume of 4 to 8 percent for 3/4-inch aggregate. The air content shall be the responsibility of the testing laboratory and in accordance with ASTM C231.
- F. All concrete shall contain a mid-range water reducer to minimize cement and water content of the mix, at the specified slump, in accordance with ASTM C494.
- G. Slump for all concrete shall be from 3-inch to 5-inch, except for concrete using a superplasticizer, when the maximum slump shall be 8-inches. Any concrete having a slump greater than 5-inches (8-inches with superplasticizer) shall be promptly removed from the site.
- H. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixture other than those specified shall be used in concrete without the specific written permission of the Engineer in each case.
- I. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

#### 2.02 CEMENT:

- A. The cement shall be an approved brand of American manufactured Portland Cement, Type IIA conforming to ASTM C150. The brand name and type of cement proposed for use shall be submitted to the Engineer for approval immediately following award of

contract. Only one color of cement, all of the same manufacture, shall be used for the work.

- B. When the use of high-early-strength Portland cement (Type IIIA) is permitted by the Engineer the same strength requirements shall apply, but the indicated strengths shall be attained in 7 days instead of 28 days.

#### 2.03 ADMIXTURES:

- A. Air entraining agent shall be in accordance with ASTM C260.
- B. Water reducing agent shall be a mid-range water reducer meeting ASTM C494, Type A.
- C. Water reducing agent-retarder shall be in accordance with ASTM C494, Type D.
- D. Superplasticizer agent shall be in accordance with ASTM C494, Type F or Type G and contain no more than 0.1% chloride ions. Product may be plant added or field added based on the best application considering distance, temperature and time.

#### 2.04 AGGREGATES:

- A. Except as otherwise noted, the aggregate shall conform to the requirements of ASTM C33.
- B. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33.
- C. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33.
- D. The following designated sizes of aggregate shall be the maximum employed in concrete.
  - a. 3/4-inch for reinforced and unreinforced sections less than 18-inch thickness.
  - b. For reinforced sections over 18-inch in thickness, aggregate as specified by the Engineer.

#### 2.05 WATER:

Water for concrete shall be potable, free from injurious amounts of oil, acid, alkali, organic matter and other deleterious substances.

#### 2.06 GROUT:

Grout shall be mixed in the proportions of one part Portland Cement to 2 parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Aggregate for grout shall conform to the requirements of the reference specification for concrete. Prior approval of the Engineer shall be

obtained for the use of proprietary grouts, and the instructions of the Engineer shall be followed in their use.

2.07 CURING MATERIALS:

- A. Curing compound shall be a curing/hardener compound such as Acurion by AntiHydro, Sikaguard Cure/Hard by Sika, Super Diamond Clear by Euclid or approved equal.
- B. Curing paper shall be a fiber-reinforced laminated Kraft bituminous product conforming to the requirements of ASTM C171.

2.08 JOINT FILLER:

- 1. Preformed joint filler strip shall conform to ASTM D1751 or D1752, having a thickness as indicated on the drawings.
- 2. Fillers shall be provided in pieces of the full thickness required. Use of multiple layers of thin pieces to make-up the full thickness will not be permitted.

2.09 JOINT SEALANT:

Joint sealant for construction and control joints shall be a two-part polysulfide base sealant conforming to Thiokol's Building Trade Performance Specification, Class A (self-leveling), Type II (hardness: 35-45 Shore A).

2.10 PENETRATING CLEAR SEALER:

- 1. Penetrating clear sealer for exterior concrete shall be "MasterProtect H 1000" Penetrating Clear Sealer as manufactured by BASF, or approved equal from Euclid Chemical or Sika Corporation. Clear breathable, high-performance, 100 percent silane, water repellent sealer for protecting horizontal and vertical concrete

surfaces. Penetrates deeply, sealing out water, chloride ions, and acids, preventing damage from freeze/thaw cycles.

### PART 3 - EXECUTION

#### 3.01 GENERAL:

Under no circumstances shall concrete that has set or partially set before placing be used; and no retempering of concrete or grout will be permitted.

#### 3.02 PREPARATION:

- A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or other material which would tend to reduce the bond.
- B. Unless otherwise indicated, a moisture barrier shall be used under all slabs placed on the ground in accordance with ACI 302.1R. The moisture barrier shall be fungi-resistant and shall have a vapor permeance rating not exceeding 0.01 perms (Perms [grains/ft<sup>2</sup>\*hr.\*in. Hg]) per ASTM F1249 or ASTM E96) and 10 mils thickness (49 lbs/MSF). The moisture barrier shall be a high-performance underslab vapor retarder made from polyethylene resins that exceed ASTM E1745, Class A. Sheets shall be lapped 6-inches at joints and sealed with 2-inch wide tape or as recommended by the manufacturer. The vapor barrier should have all laps, seams, penetrations and terminations sealed and should carry across footings.
- C. When no moisture barrier is used, the earth, concrete, masonry, or other water-permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.
- D. When joining fresh concrete to concrete which has attained full set, the latter shall be cleaned by chipping and washing off all dirt and scum and laitance. It then shall be moistened prior to placing new concrete.
- E. Concrete surfaces that act as a seat for structural members (other than those resting on grout) shall be troweled to an extremely flat and level surface. If necessary, such surfaces shall be ground off to achieve the required flatness and level.
- F. Fill concrete on top of concrete shall be placed in the locations indicated on the drawings or designated by the Engineer. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The

concrete fill shall be placed immediately, before the grout has dried or set. Fill concrete shall be brought to the lines and grades shown on the drawings or approved by the Engineer.

- G. Concrete for thrust and anchor blocks shall be placed against undisturbed earth and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints. Minimum bearing areas and dimensions shall be as shown on the drawings.

### 3.03 MIXING:

- A. Concrete shall be ready-mixed, or transit-mixed, as produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Adding water in controlled amounts during the mixing cycle shall be done only with the express approval of, and in the presence of the Engineer.
- B. Ready-mix or transit-mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities for the respective conditions as stated on the nameplate. Discharge at the site shall be within 1-1/2 hours after cement was first introduced into the mix. Central mixed concrete shall be plant-mixed a minimum of 1-1/2 minutes per batch and then shall be truck-mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the pre-mixed concrete is placed in the truck and shall continue without interruption until discharge. Transit-mixed concrete shall be mixed at mixing speed for at least 10 minutes immediately after charging the truck, followed by agitation without interruption until discharged.
- C. All central plant and rolling stock equipment and methods shall conform to the latest Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready-Mixed Concrete Association, as well as ACI 304 and ASTM C94.
- D. Attention is called to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

### 3.04 INSTALLATION/APPLICATION/ERECTION:

- A. Placing
  - 1. No concrete shall be placed by pumping methods without the prior written approval of the Engineer. Should the Contractor be allowed to place concrete by pumping

methods, procedures, mix design of concrete, and all other precautions shall be in accordance with ACI 304.2R and as approved by the Engineer.

2. Concrete shall be placed in alternate areas, as defined by the construction and control joints indicated on the design drawings. A minimum of 3 days shall elapse between placement of adjacent sections.
3. Segregation of the concrete shall be prevented during handling; should any segregation occur, the concrete shall be remixed before it is placed. Concrete shall be placed in the forms in horizontal layers not over 1 to 2 feet thick. Concrete shall not be allowed to drop freely more than 4 feet. If the free drop to the point of placement must exceed 4 feet, the Contractor shall obtain the approval of the Engineer for the proposed method of depositing the concrete. The concrete shall not be required to flow over distances greater than 3 feet in any direction in the forms or on the ground, unless otherwise permitted by the Engineer.
4. Unless otherwise noted, the work begun on any day shall be completed in daylight of the same day.
5. "Cold Joints" are to be avoided, but if they occur, they are to be treated as bonded construction joints.
6. Chutes for conveying concrete shall be of U-shaped design and sized to insure a continuous flow of concrete. Flat (coal) chutes shall not be employed. Chutes shall be metal or metal-lined, and each section shall have approximately the same slope. The slope shall not be less than 25 nor more than 45 degrees and shall be such as to prevent segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than 5 feet above the surface of the concrete in the forms, a spout shall be used, and the lower end maintained as near the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. Chutes shall be thoroughly cleaned before and after each run, and the debris and any water shall be discharged outside the forms. Concrete shall not be allowed to flow horizontally more than 5 feet.
7. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Internal type mechanical vibrators shall be employed to produce the required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spade puddling adjacent to forms to remove included bubbles and honeycomb. This is essential for the top lifts of walls. All vibrators shall travel at least 10,000 rpm and be of adequate capacity. At least one

vibrator shall be used for every 10 cubic yards of concrete per hour. In addition, one spare vibrator in operating condition shall be on the site.

8. Concrete slabs on the ground shall be well-tamped into place and foundation material shall be wet, tamped, and rolled until thoroughly compacted prior to placing concrete.
9. Concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the drawings or approved by the Engineer.
10. Chutes, hoppers, spouts, adjacent work, etc., shall be thoroughly cleaned before and after each run, and the water and debris shall not be discharged inside the form.

#### B. Concrete Placing During Cold Weather

1. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40°F, or is expected to fall to below 40°F, within 72 hours, and the concrete after placing shall be protected by covering, heat, or both. No accelerant shall be used to prevent freezing.
2. The temperature of concrete surfaces shall not be permitted to drop below 50°F. for at least 7 days after placement of the concrete.
3. All details of the Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Engineer. All procedures shall be in accordance with the provisions of ACI 306.

#### C. Concrete Placing During Hot Weather

1. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays that will result in excessive mixing of the concrete after arrival on the job.
2. During periods of excessively hot weather (90°F, or above) ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement will not be acceptable, and will be rejected.
3. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.)

and relative humidity. The record shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

D. Pipes And Embedded Metals

1. Special care shall be taken to bring the concrete into solid contact with pipes and iron work embedded in the walls and floors, particularly underneath and around all pipes where a head of water exists, making watertight joints.
2. In general, such embedded items are not shown on the structural design drawings. Design drawings of the other trades shall be consulted for their location and details.
3. Anchor bolt location, size and details shall be verified with the equipment manufacturer's certified drawings before installation.
4. Anchor bolts, reglets, sleeves, edge angles and similar embedded items will be provided, delivered to the site under other Sections of the specification, for installation under this Section.
5. Where edge angles, etc., have nuts welded on to receive machine screws, the threads of the nuts shall be protected from concrete, and the concrete shall be excluded from the space to be occupied by the screw, by the use of wood plugs or other effective means.
6. Inserts required for hanging mechanical and electrical items shall be provided and installed in the forms under the mechanical and electrical sections of the specification.
7. Should the Contractor be allowed to leave openings in the concrete for pipes or ironwork, to await the arrival of items that would delay the prosecution of the work, the openings shall be subject to the approval of the Engineer. Appropriate construction joints shall be provided. In filling any such openings with concrete, a mixture of 1: 1-1/2 : 3 shall be used and a watertight bond shall be secured between the old and new concrete.
8. In bolting miscellaneous items to concrete after the concrete has set, expansion bolts of an approved pattern and type shall be used. The Contractor shall submit to



the Engineer, for approval, the types of expansion bolts. Expansion bolts shall not be used until they are approved.

E. Curing

1. Concrete curing shall be performed as specified in ACI 301 and as stated herein. All curing procedures shall have prior approval of the Engineer.
2. Curing procedure shall be continued for at least 7 days.
  - a. Moisture loss from surface placed against metal or wood forms shall be minimized by keeping forms wet until removal.
  - b. Curing shall be continued for at least 7 days. When forms are removed during the curing period, surfaces shall be cured by spraying or by the use of a curing compound as previously specified.
  - c. Surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary, 1/2-inch thick plywood sheets shall be used to protect the exposed surface.

F. Bracing And Supports

1. All concrete members shall be adequately and safely supported and braced until the permanent supports and braces are installed.
2. Backfilling against exterior walls shall not be done until supporting slabs are in place and have attained 70 percent of design strength, otherwise walls shall be braced against earth lateral pressure, using a system approved by the Engineer.
3. Backfilling against retaining walls shall not commence until the wall concrete has reached its 28-day strength.

G. Removing Forms and Supports

1. Removal of forms shall take place in accordance with ACI 347, Section 3.6. Except as otherwise specifically authorized by the Engineer, forms shall not be removed until the concrete has aged for the following number of day-degrees or attained 50 percent strength. (Day-degrees equals the total number of days times the average

daily air temperature at the surface of concrete. For example, 5 days at a daily average temperature of 60°F. equals 300 day-degrees.)

| <u>Location</u>             | <u>Day-Degrees</u> |
|-----------------------------|--------------------|
| Beams and Slabs             | 500                |
| Walls and Vertical Surfaces | 200                |

2. Shores under beams and slabs shall not be removed until the concrete has attained at least 70 percent of the specified cylinder strength and also sufficient strength to support safely its own weight and the construction loads upon it.

#### H. Patching

1. Defective concrete and honeycombed areas as determined by the Engineer shall be chipped down reasonably square and at least one-inch deep to sound concrete by means of hand chisels or pneumatic chipping hammers. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly imbedded in the parent concrete, subject to Engineer's final inspection. If honeycomb exists around reinforcement, chip to provide a clear space at least 1-inch wide all around the steel. For areas less than 1-1/2 inches deep, the patch may be made following the procedure for filling form tie holes, described in the subsection below, using adequately dry (non-trowelable) mixtures to avoid sagging. Thicker repairs will require build-up in 1-inch layers on successive days. Unless otherwise indicated, thicker repairs shall be made with Vertipatch mortar mixture blended with Acryl-Set, both by Master Builders, Inc., Cleveland, Ohio, or approved equal.
2. For concrete areas exposed to serious abrasion and/or impact forces, the Engineer may order the use of grout with a non-shrink metallic aggregate (Embeco by Master Builders, Inc.; Ironite by Fox Industries, Madison, IL; or approved equal) as an additive in the proportions listed below:

| Material        | Small Patches |         | Large Formed Patches |         |
|-----------------|---------------|---------|----------------------|---------|
|                 | Volumes       | Weights | Volumes              | Weights |
| Cement          | 1.0           | 1.0     | 1.0                  | 1.0     |
| Metal Aggregate | 0.15          | 0.25    | 0.2                  | 0.33    |
| Sand            | 1.5           | 1.5     | 1.5                  | 1.0     |
| Pea Gravel      | --            | --      | 1.5                  | 1.5     |

#### I. Finishing Of Formed Surfaces

1. All concrete that is to be left exposed to view shall be scraped to remove projecting imperfections left by voids in the forms.
2. In addition to scraping, exterior exposed concrete shall be covered with a cement-base plaster mix. The mix shall consist of Thoroseal Plastic Mix and Acryl

60, as manufactured by Standard Drywall Products, Miami, FL, or approved equal. It shall be mixed and applied in accordance with the manufacturer's recommendations.

3. To permit satisfactory finishing, forms shall be removed from the vertical faces of the concrete as early as is possible without damaging the surface. Immediately after stripping forms, any fins or projections left by the forms shall be chipped off, and the surfaces rubbed smooth.
5. Form tie holes and other voids and faults shall be patched. Voids shall be cleaned out, roughened, thoroughly wetted, coated with neat cement paste, and filled with mortar of cement and sand in the same proportions, materials, and color as used in the concrete. The 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.
6. Rubbing shall be performed while the surface is wet using a carborundum or cement sand brick, to achieve a smooth uniform, even textured finish. Patched and chipped areas shall be blended to match as closely as possible the appearance of the rest of the surface. No cement wash or plastering will be permitted, and no mortar shall be used except as required above.
7. Where finishing is performed before the end of the curing period, concrete shall under no circumstances be permitted to dry out and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.
8. Concrete for cast-in-place site improvements that have exposed surfaces, shall have a smooth finish. Top horizontal surface shall receive a light broom finish, top and vertical edges shall be chamfered and vertical exposed surfaces shall be rubbed with a carborundum stone to provide a hand smooth surface. Finished surface to be approved by Landscape Architect.
9. Control Joints in walls and stairs shall be saw cut joints, sawn by using a diamond blade concrete power saw. To prevent random cracking, control joints shall be cut as soon as the concrete is hard enough that the edges abutting the cut do not chip from the saw blade. Sawn joints shall be true to layout indicated in the Contract Drawings or as described in the Specifications:
  - a. Control joint depth shall be a minimum 25 percent of slab depth or  $\frac{3}{4}$ " in walls.
  - b. At walls and stairs where sawn joints are shown on the drawings, they shall continue on both exposed horizontal and vertical surfaces down to finish grade.
10. Application of Penetrating Sealer. Apply 2 coats of the approved penetrating sealer to all Exposed Exterior Cast-In-Place Concrete including, stairs and walls between 28 to 42 days after installation in accordance with the manufacturer's recommendations. All surfaces exposed above finish grade shall be uniformly

coated. Sealed surfaces shall be protected from rain for a minimum of 12 hours. Access to sealed surfaces shall be prohibited with effective barriers until surfaces are completely dry.

J. Testing

1. The Contractor shall provide all field testing and inspection services and shall pay for all such services. The Engineer shall approve the testing laboratory and shall inform the Contractor when samples are to be taken for testing. The Contractor shall forward all test results to the Engineer as soon as they are available.
  - a. The Testing Laboratory shall conform to the requirements of ASTM E-329 as modified in **780 CMR R1 in the MA State Building Code**. The State Board of Building Regulations and Standards shall license them.
2. At least one slump test shall be performed from each truckload of concrete. The sample for slump shall be taken from the middle third of a truckload. Air content tests shall be made at the discretion of the Engineer. If the measured slump or air content falls outside the specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed the requirements of the specification and shall be immediately removed from the jobsite to be discarded.
3. The Contractor shall advise the Engineer of its readiness to proceed with concrete placement at least one working day prior to each placement. The Engineer will inspect the preparations for concrete, including the preparation of previously placed concrete, the reinforcing, and the alignment and tightness of formwork. No placement shall be made without the prior approval of the Engineer.
4. A minimum of four standard compression test cylinders shall be made and tested for **each 100 cubic yards or fraction thereof** for each type and design strength of concrete from each day's placement of concrete. One cylinder shall be tested at 7 days and two cylinders at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. The Engineer reserves the right to require test cylinders to be made for each truckload of concrete if the nature of the project or project experience indicates such additional tests are required for proper control of concrete quality; **such tests will be at the Owner's expense.**
5. The strength level shall be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength  $f'_c$ ,

and no individual strength test (average of two cylinders) result falls below the specified strength  $f'_c$  by more than 500 psi.

6. In the event the average compressive strength of the two 28 day cylinders do not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days.

#### K. Failure To Meet Requirements

1. The Engineer shall have the right to reject concrete represented by low strength tests or to agree to further testing of the concrete. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected or additional tests shall be conducted shall be final. All direct and indirect costs associated with further curing and testing of the concrete shall be at the Contractor's expense. All costs associated with removing rejected concrete, placing new concrete, and conducting tests on new concrete shall be at the Contractor's expense.
2. If the Engineer agrees to consider further curing and/or testing of the concrete before making a final decision, the Contractor shall submit a detailed plan to the Engineer, including proposed criteria for acceptance of the concrete. The plan may include additional curing of the concrete, drilling and testing of cores, load testing of the structure, or a combination.
3. If additional curing is permitted before further inspection and testing, the Contractor shall provide any necessary materials and labor to further cure the suspect concrete.
4. If drilling and testing of cores is permitted, the Contractor shall be responsible for obtaining the cores, including provision of ladders, scaffolding, and such incidental equipment as may be required. If additional curing is permitted, cores shall be drilled after the curing period, and shall be in accordance with ASTM Methods C39 and C42. The Contractor shall repair all core holes to the satisfaction of the Engineer.
5. The burden of proof, including, but not limited to the work of cutting and testing the cores, inspection, evaluation, engineering, repair of the holes, or removal and replacement of the concrete in question, and all associated costs therefor, shall be at the expense of the Contractor.
6. If load testing of the concrete is permitted, and if not otherwise indicated, slabs or beams under load test shall be loaded with their own weights plus a superimposed load of 2 times the design live load. The load shall be applied uniformly over the portion being tested in the approved manner and left in position for 24 hours. The

structure shall be considered satisfactory if deflection "D" in feet, at end of 24-hour period, does not exceed the following value:

$$D \text{ equals } 0.001 (L \times L)/t$$

in which "L" is span in feet, "t" is depth of slab, or beam in inches. If deflection exceeds "D" in the above formula, the concrete shall be considered faulty unless within 24 hours after removal of the load, the slab, or beam under test recovers at least 75 percent of the observed deflection.

7. If the suspect concrete still fails to meet specification requirements, the Engineer shall have the right to reject the concrete, have it removed and replaced, in accordance with paragraph 5 above, or to require mechanical strengthening of the concrete to satisfy project requirements. The Contractor shall submit a removal and replacement plan for review by the Engineer.

L. Acceptance Standards.

1. The following acceptance standards shall be applied to this Contract. Any portion of the concrete that does not meet these required acceptance standards shall be removed at the direction of the Owner's Representative. Saw cut pavement at nearest adjacent tooled joint, remove concrete and discard off site in a legal manner and replace with new concrete pavement meeting the requirements of this Section.
  - a. Concrete surfaces shall be free of all cracking.
  - b. Concrete surfaces shall not pond water.
  - c. Reinforcing shall not penetrate the surfaces or sides of the concrete.
  - d. Sawcut joints and all expansion joints shall be straight, true, uniform in width and free from twists, bends, kinks and misalignments.
  - e. Concrete surfaces shall be free of all stains, including those created during the course of the construction by the Contractor, caused by natural events, or caused by vandalism.
  - f. Pours not conforming to the Contract Documents.
  - g. All forms shall be removed from the site.
  - h. All concrete washout and debris from the placement and preparation of the concrete, shall be removed from the site.

END OF SECTION

## **04 40 00: DRY-PLACED BOULDERS**

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. The General Documents, as listed in the Table of Contents, and applicable parts of Division 1, General Requirements shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

#### 1.02 SCOPE OF WORK

- A. The work of this Section shall consist of sourcing, transporting and placing granite boulders as shown on the Drawings and as directed by the Owner's Representative. The work includes, but is not limited to, the following boulder types:
  - 1. Rectangular Boulders

#### 1.03 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
  - 1. Section 31 23 00, EXCAVATION BORROW AND BACKFILL

#### 1.04 EXAMINATION OF CONDITIONS

- A. The Contractor shall fully inform himself of existing conditions of the site before submitting his bid, and shall be fully responsible for carrying out all site work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed because actual conditions inconsistent with those assumed.
- 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, but the Contractor shall have examined them for himself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found therein.

#### 1.05 SCHEDULING

- A. The Contractor shall submit to the Owner's Representative, for approval by the Owner, a progress schedule for all work as specified herein.

#### 1.06 QUALITY ASSURANCE

- A. Materials and methods of construction shall comply with the following standards:
  - 1. ASTM: American Society for Testing and Materials
  - 2. AASHTO - American Association of State Highway and Transportation Officials (tests or specifications). AASHTO or AASHO
  - 3. Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges.
- 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: After staking out the work, and before beginning final construction, obtain the Owner's Representative's approval for layout. Contractor shall make adjustments as determined by the Owner's Representative. Owner's Representative may make adjustments to layout as is required to meet existing and proposed conditions without additional cost to the contract price.

#### 1.07 SUBMITTALS

- A. Samples of all new materials proposed for the project shall be submitted to the Owner's Representative for review. Size of the samples shall be as approved by the Owner's Representative.

### PART 2 - MATERIALS

#### 2.01 BOULDERS

- A. Approximately two (2) weeks prior to anticipated transport, the Contractor shall notify the Owner's Representative to field select each boulder to be reused. The Contractor shall coordinate with the Owner's Representative such that she/he is present while blocks are loaded onto trucks. Granite boulders shall be of an approved size and shape with dimensions as noted below, in the amounts shown on the drawings:
  - 1. Rectangular boulders dimensions shall be approximately 24-36-inches high by 24-36-inches wide by 60-72-inches long to be used as informal seating elements. These rectangular boulders are anticipated to be from reclaimed sources. Newly fabricated boulders are acceptable.
  - 2. Boulders shall be of a roughly rectangular or block shape.
  - 3. Rectangular boulders shall be of granite.



- B. The Contractor should expect to handle each stone a minimum of three times: 1) to move from current location into classification piles, 2) to mock up in final location to ensure fit, and 3) to install in final location. In most cases it is expected that steps two and three are combined and fitting can be done in place, but the Contractor must be aware the project calls for dealing with boulders that will need to be carefully placed for best fit.
  
- C. The Contractor shall notify the Owner's Representative when site preparation is complete. Spacing and location of the boulders shall be as shown on the plans or as required by the Owner's Representative. Preliminary placement of boulders shall be "dry" (without mortar). The Contractor shall adjust the boulder placement as required by the Owner's Representative. After the arrangement of boulders is approved by the Owner's Representative, the Contractor shall set the boulders into grade on a compacted gravel base as necessary to set the boulders in a stable position and to prevent future removal or displacement of the boulders.
  
- D. All existing rectangular boulders located shall be pressure-washed prior to installation. The Contractor shall pressure-wash all boulders again at the end of the Contract work, just prior to project completion. All boulders shall be cleaned free from marks or scars caused by construction equipment.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. The Contractor is also responsible for retrieving, loading, and hauling stockpiled granite blocks and installing them in their final location in accordance with the Contract Drawings.
  
- 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.

**- END OF SECTION 04 44 00 –  
DRY-PLACE BOULDERS**

## SECTION 05 12 33

### STRUCTURAL STEEL

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. The work of this Section consists of providing all labor, materials, and equipment required to furnish, fabricate, and erect the work of this Section including but not limited to:
1. Providing leveling plates, bearing plates, anchor bolts, beams, baseplates, bracing and connections, angles, channels, stiffeners, separator plates, clips, supports for steel deck at columns, openings, connections, welding filler material and electrodes, connection bolts, erection bolts, and any other structural steel called for on the Drawings.
  2. Items of structural steel required to be built into concrete or masonry, as indicated or specified, shall be furnished to the respective trades at the proper time with complete instructions and template to facilitate inspection.
  3. Design of bolted/welded connections.
  4. Furnishing and installation of non-shrink grout under leveling and base plates.
  5. Unless specifically excluded, providing all other items for structural steel work indicated on the Drawings, specified, or obviously needed to make the work of this Section complete.
  6. All steel items shown or indicated on the Structural Drawings.
  7. Furnishing any temporary bracing necessary for support and alignment of the work, and shop painting as herein specified.
  8. Structural steel shall consist of all material as defined in Section 2, "Definition of Structural Steel," of the AISC Code, and accessory material called for, or reasonably implied by the drawings.

##### 1.02 RELATED WORK:

- A. Section 01 45 23 – STRUCTURAL TESTS AND INSPECTIONS
- B. Section 03 30 00 - CAST-IN-PLACE CONCRETE
- C. Section 05 21 00 – STEEL BAR JOISTS
- D. Section 05 31 23 - STEEL DECK
- E. Section 05 50 00 - MISCELLANEOUS METALS

F. Section 09 90 00 – PAINTING

1.03 REFERENCES:

A. The following standards from a part of these specifications as referenced:

1. American Institute of Steel Construction (AISC)
  - a. Code of Standard Practice for Steel Buildings and Bridges
  - b. Specification for Structural Steel for Buildings
  - c. Manual of Steel Construction
  - d. Specification for Structural Joints Using ASTM A325 or A490 Bolts
2. ASTM International (ASTM)
  - a. ASTM A36 Structural Steel
  - b. ASTM A307 Carbon Steel Externally and Internally Threaded Standard Fasteners
  - c. ASTM A325 High Strength Bolts for Structural Steel Joints
  - d. ASTM A490 Heat-treated Steel Structural Bolts, 150 ksi Min. Tensile Strength
  - e. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing
  - f. ASTM A563 Carbon and Alloy Steel Nuts
  - g. ASTM F436 Hardened Steel Washers
  - h. ASTM A992 Standard Specifications for Structural Steel Shapes
3. American Welding Society (AWS)
  - a. AWS D1.1 Structural Welding Code Steel
4. Steel Structures Painting Council (SSPC)
  - a. SSPC-SP 6 Commercial Blast Cleaning
  - b. SSPC-PA 2, Shop, Field and Maintenance Painting
5. Massachusetts State Building Code, Latest Edition.

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Product Data: Provide manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

2. High-strength bolts (each type), including certified copies of mill reports for nuts and washers; include direct tension indicators if used.
  3. Structural steel primer paint.
  4. Touch-up paint for galvanized steel.
  5. Grout.
  6. Headed Stud Anchors.
  7. Adhesive/Expansion Anchors
- B. As-built Survey: Submit to the Engineer an as-built survey showing the locations of the anchor bolts prior to installation of leveling and bearing plates. This submittal is for information and file record.
- C. Standard Shop Details and Connection Design Calculations: Submit to the Engineer prior to submitting detailed shop drawings, design calculations and details for connections not shown on the Drawings. Calculations shall be prepared, signed, and sealed by a registered professional engineer. Calculations and drawings are subject to review by the Engineer. The Engineer reserves the right to require revisions to this work at no additional cost to the Owner.
- D. Checked shop drawings shall be submitted to the Engineer for review and approval. Fabrication shall not begin until the Engineer has approved the shop drawings.
- E. Shop drawings shall include detail drawings, erection drawings, certifications, schedules, and all other information necessary for the fabrication and erection of component parts of the structure. The shop drawings shall be checked and properly coordinated with other parts of the construction. The following shall be included in the shop drawings:
1. Type of steel for each member, location and identification mark of each member, dimensions, size and weight of members, location and size of cuts, copes, slots, holes and openings required by other trades, type and location of shop and field connections, type, size, and extent of all welds, joint welding procedures, welding sequence, and painting requirements.
  2. All requirements such as temporary members required for erection, including connections.
  3. Use standard welding symbols of the American Welding Society.
- F. Except as otherwise noted, the approval of shop drawings will be for size and arrangement of primary and secondary components and strength of connections. Any error in dimensions shown on the shop drawings shall be the responsibility of the Contractor.
- G. Submit manufacturer's certification of bolts, nuts, and filler metal for welding.

1.05 QUALITY ASSURANCE:

A. Testing and Inspection

1. Refer to Section 01 45 23 for Structural Testing and Inspections. Comply with the additional requirements specified in Section 01 45 23, Structural Tests and Inspections.
2. The inspection and testing services provided by the Independent Testing Agency do not relieve the Contractor, the steel fabricator and erector from the responsibility to provide supervision, testing, inspection, and quality control in order to assure conformance with these specifications.

B. The Contractor must utilize the services of a Professional Structural Engineer licensed in the State of **Massachusetts** to design, sign, and seal calculations and drawings for the following:

1. Connection designs indicated on the Drawings to be designed by the Contractor.
2. Weld repairs.
3. Welded and bolted connection repairs.
4. Revisions required because of erection misalignment, fabrication defects, damage from construction activities.

C. The Contractor is responsible for fit up and installation of all steel work and shall field verify all dimensions and conditions.

D. The fabricator shall possess a valid certificate, category I Conventional Steel Building Structures as issued through the AISC Quality Certification Program or shall have a detailed Quality Control Plan subject to audit as indicated in Section 01450.

E. Welder, Tacker and Welding Operator Qualifications: Use welders, tackers and welding operators who are currently qualified by tests as prescribed in the Structural Welding Code, AWS D1.1 of the American Welding Society to perform type of work required. Headed stud welding operators shall also be qualified in accordance with AWS D1.1.

F. Welded connections shall be designed and detailed utilizing AWS prequalified joints.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Store steel on platforms, skids, blocking or other supports to prevent dirt and debris contact. Protect from exposure to conditions that produce rust.

- B. Handle steel so no parts are bent, broken or otherwise damaged and avoid damage to other material and work. Store beams with webs vertical. Exercise care to avoid scraping and overstressing the steelwork.
- C. Ship small parts, such as bolts, nuts, washers, pins, fillers, and small connecting plates and anchors, in boxes, crates, or barrels. Pack separately each length and diameter of bolt and each size of nut and washer. Plainly mark an itemized list and description of the contents on the outside of each container.

## PART 2 - PRODUCTS

### 2.01 STRUCTURAL STEEL MATERIALS:

- A. Rolled steel wide-flange shapes: ASTM A992.
- B. Steel channels, angles, plates and bars: ASTM A36.
- C. Structural Steel Tubing: ASTM A500 Grade B.

### 2.02 BOLTS, CONNECTORS, AND ANCHORS:

- A. High-Strength Structural Steel Bolts, Nuts and Washers:
  - 1. Bolts: ASTM A325.
  - 2. Nuts: ASTM A563.
  - 3. Washers: ASTM F436.
  - 4. Where steel is indicated on the Drawings to be galvanized, bolts, nuts and washers shall be hot dip galvanized in accordance with ASTM A153.
  - 5. Refer to the Drawings for bolt head style requirements.
- B. Anchor Bolts: ASTM F1554. Grade 36, unless noted otherwise. Headed type unless otherwise noted. Provide suitable nuts in accordance with ASTM F1554 and ASTM A563 and washers in accordance with ASTM F436.
- C. Beveled Washers: Square, smooth and sloped to make contact surface of bolt head and nut parallel.
- D. Headed Stud Anchors: Embedment anchors shall be headed anchors with fluxed ends or approved equal. Stud size as indicated on the Drawings. Studs shall be automatically end welded with suitable equipment in the shop or field on spacing's indicated on the Drawings. All welds shall be made in accordance with the stud manufacturer's requirements. Field installed anchors shall be classified as Structural Steel.

1. Mechanical Properties of Headed Anchors. Low Carbon Steel complying with ASTM A108 Physical Properties:
  - a. Tensile (Minimum) 60,000 PSI (60KSI)
  - b. Yield (Minimum) 50,000 PSI (50KSI) (0.2% Offset)
  - c. Elongation (Minimum) 20% in 2-inches.
- E. Adhesive Anchor Bolt Anchoring Systems: Composed of an anchor rod, nut, washer and an anchor rod adhesive cartridge.
  1. Anchor Rod Assembly: Chamfered end, all thread steel anchor rod with nut and washer. Size and load capacity as indicated on the Drawings.
  2. Adhesive Cartridge: Sealed capsule containing premeasured amounts of (resin, quartz sand aggregate, and a hardener contained in a separate vial within the capsule. Capsule ingredients activated by the insertion procedure of the anchor rod assembly.
  3. Acceptable Manufacturers:
    - a. Hilti Fastening Systems; HVA Adhesive System.
    - b. Powers Fastening, Inc.; Rawl Fastening Systems.
    - c. Or Approved Equal.
- F. Welding Electrodes: E70XX in accordance with AWS D1.1. Refer to the Drawings for special requirements at moment connections.

#### 2.03 GROUT:

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

#### 2.04 SHOP PRIMER PAINT:

- A. Products to be used shall meet the regulations of jurisdiction for Volatile Organic Compounds (VOC) emissions.
- B. Exterior Exposed Steel, Not Galvanized: Zinc-rich epoxy primer followed by an intermediate coat of epoxy paint.
- C. Other Steel, Not Galvanized: Zinc-rich epoxy primer.
- D. Shop primer paint shall be compatible with the specified finish paint system. Finish paints shall be in accordance with Section 09 90 00.

#### 2.05 HOT-DIPPED GALVANIZING:

- A. Hot-dip galvanized steel fabrications so designated herein and on the drawings and after fabrication in compliance with ASTM A 123.
- B. Hot-dip galvanized iron and steel hardware shall be in accordance with ASTM A 153.

### PART 3 - EXECUTION

#### 3.01 FABRICATION:

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in the shop to the greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.
  - 1. Provide camber in structural members where indicated.
  - 2. Do not splice steel members unless given written approval by the Engineer.
  - 3. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
  - 4. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on the final shop drawings.
- C. Cut, drill, and punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- D. Welding:
  - 1. Provide quality control and qualification of welders and welding procedures and operations as specified under "Testing and Inspection" in this Section.
  - 2. Shop Welded Process: Use shielded metal-arc, submerged arc, gas metal-arc, and flux cored-arc, or other process as approved by the Engineer.
  - 3. Groove Welds: Provide complete penetration unless otherwise noted on the Drawings.
  - 4. Fillet Welds: Where weld symbol is not shown or welds are not dimensioned, provide continuous fillet welds all around and on both sides as appropriate. Minimum dimension shall be as indicated in AISC Specification.
  - 5. Base metal shall be checked by Contractor to insure absence of laminations or other defects. Welds shall be sound throughout and have no cracks.



6. Where structural joints are required to be welded, details of joints, technique of welding employed, appearance and quality of welds made, and methods used in correcting defective work shall conform to applicable requirements noted under References in this Section.
7. Prepare joint welding procedures and program of welding sequence (for each component and for welding jointing components to each other) and submit to Engineer for approval before any welding is done. After approval, welding procedures and sequences shall be followed without deviation unless specific approval for change is obtained from the Engineer. Engineer may require requalification's of these welding procedures by tests prescribed in AWS "Standard Qualification Procedures".
8. Each welder working on the project shall be assigned an identification symbol or mark. Each welder shall mark or stamp their identification symbol to each weldment completed, whether in shop or field.
9. Corrective Work: Structural steel elements having fabrication errors and/or which do not satisfy tolerance limits shall not be incorporated in finished work. Such elements may be corrected if permitted by the Engineer and/or Testing Agency. Submit to the Engineer drawings showing details of proposed corrective work. These drawings shall be approved by the Engineer prior to performing corrective work. Corrective work shall be performed in accordance with requirements of Contract Documents. Corrective work and any retesting which may be required shall be at the Contractor's expense.
10. Members scheduled to be fireproofed shall have surfaces prepared as required by the fireproofing material manufacturer.

### 3.02 SHOP PRIMER PAINTING:

#### A. General: Shop paint all structural steel, except as noted below:

1. Do not paint members which are to be galvanized.
2. Do not paint surfaces within two inches of any field weld (including shear connectors) or high strength bolted friction type connection.
3. Do not paint surfaces to be high-strength bolted with slip-critical connections, unless the paint is specifically compatible with slip-critical connections.
4. When members are to be partly embedded in concrete or mortar in the finished work, paint only the exposed portions and initial 2-inches of embedded areas. Do not paint members which will be entirely embedded in concrete or mortar in the finished work.
5. Do not paint surfaces to receive metal deck and/or shear connectors fastened by welding.
6. Do not paint surfaces to receive sprayed-on fireproofing.

- B. Surface Preparation: At a minimum, clean steel in accordance with Steel Structures Painting Council (SSPC) as follows; except clean to more stringent surface preparation standard if required by primer manufacturer:
  - 1. Steel to be primed with zinc-rich primer: Commercial Blast Clean (SSPC-SP6).
  - 2. Comply with AISC requirements for slip-critical connections.
- C. Painting
  - 1. Immediately after surface preparation apply shop primer paint in accordance with manufacturer's recommendations.
  - 2. Apply shop paint in accordance with SSPC-PA-2.
  - 3. The minimum dry film thickness of shop paint shall be 4.0 mils.
  - 4. Comply with AISC requirements for slip-critical connections.
  - 5. Complete shop painting operations on completed shop welded connections after the connections have passed the specified structural tests and inspections.
  - 6. Apply two coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

### 3.03 GALVANIZING:

- A. General: Hot-dip galvanize all steel exposed to weather or corrosive environments and as indicated on the drawings.
- B. Hot-dip galvanized steel shall be inspected for compliance with ASTM A 123 and shall be marked with a stamp that indicates the name of the galvanizer, the ASTM number, and the ounces of zinc per square foot of surface. A notarized Certificate of Compliance with all of the above shall be required from the galvanizer.
- C. Hot-dip galvanized hardware shall comply with ASTM A 153.
- D. Provide thickness of galvanizing specified in referenced standards.
- E. Fill vent holes and grind smooth after galvanizing.
- F. All hot-dip galvanized steel shall be safeguarded against embrittlement in conformance with ASTM A-143.
- G. Finish color, if required, will be specified by the Engineer.

### 3.04 ERECTION:

- A. Erect structural steel in accordance with the Drawings, the approved submittal documents, pertinent regulations, the referenced AISC standards and these Specifications.
  - 1. Allow concrete foundations to reach a minimum of 14-day curing time before torqueing of anchor bolts.
  - 2. Prior to installation of metal decking, clean the unpainted top flanges of structural steel members to be free of heavy rust, mill scale, dirt or such other substances detrimental to welding.
  - 3. Comply with 29 CFR Part 1926 - Safety Standards for Steel Erection.
- B. Surveys: Employ a licensed Land Surveyor or licensed engineer for accurate erection of structural steel. Check elevations on concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Engineer. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with Engineer.
- C. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
- D. Setting base and bearing plates: clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surfaces of leveling and bearing plates.
  - 1. Set loose and attached leveling plates and bearing plates for structural members on steel wedges, shims, leveling devices, or as shown on the Drawings.
  - 2. Grout under the plates after they have been positioned, plumbed and leveled. Do not remove wedges or shims but, if protruding, cut off flush with top or edges of base plates, or both prior to packing with grout.
  - 3. Pack grout solidly between bearing surfaces and bases or plates to ensure no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
  - 4. For proprietary grout materials, comply with manufacturer's instructions.
- E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of the complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will

be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within specified AISC tolerances.
  2. Establish required leveling and plumbing references with respect to expected mean service operating temperature inside the building. Make allowances for the difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- F. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges".
- G. Splice members only where indicated and accepted on shop drawings.
- H. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

### 3.05 FIELD CONNECTIONS:

- A. General: Beams shall have framed connections using  $\frac{3}{4}$ -inch diameter, minimum, high strength bolts in accordance with the requirements of AISC "Manual of Steel Construction" and Contract Drawings.
- B. High-Strength Bolts: Install high-strength steel-bolts in accordance with RCSC's "Specifications for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened unless indicated otherwise on the drawings or where pretension or slip critical joints are recommended or required by RCSC or AISC.
  2. Do not enlarge holes in members by burning or by using drift pins. Ram holes that must be enlarged to admit bolts.
- C. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
- D. Adhesive Anchor Bolt Anchoring System Installation:

1. General: Install adhesive anchors in strict accordance with manufacturer's instructions and in accordance with the following.
2. Drilling Holes: Use rotary hammer-type drill and make drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed,
  - a. Prior to setting cartridge and anchor rod clean drilled holes free of loose material by vacuum process, finishing with a blast of compressed air and cover hole until actual use.
3. Anchor Rod Installation: Following cartridge installation in prepared drill holes, set anchor rod to the required depth. Set anchor rods truly perpendicular (normal) to the base plate of item being anchored.

E. Headed Stud Anchors:

1. Welding Specifications: All materials shall be clean, dry and free of paint, rust, oil or other contaminants. Test welding should be done in the same position being used for production. Test welds, after cooling, should be bent by hammer 45° from the vertical position without failure. The non-failure of two studs indicates that the weld setup is satisfactory and production welding may be started.
2. Inspection Requirements: After welding, the ceramic ferrule should be removed from each stud and the weld fillet visually inspected. A fillet of less than 360° is cause for further inspection. Such studs should be hammer tested, bending the stud 15° from the vertical toward the closest end of the embedment plate or steel member. Bending without failure indicates a satisfactory weld. Bent studs may be left bent unless stud projects into concrete cover or obstructs other materials. All bending and straightening when required shall be done without heating before completion of the production stud welding operation.
3. Do not weld studs to steel plates or members with temperatures below 32° F. Welding shall not be done when the steel surface is wet or exposed to rain or snow.
4. The Engineer reserves the right to require the Contractor to repair any welds, which are not a complete 360°, weld at no additional cost. The Engineer also reserves the right to require replacement of studs and the repair of the base metal at no additional cost. Any additional testing and inspection required will be at no additional cost to the Owner.

3.06 FIELD QUALITY CONTROL:

- A. Testing Agency: Owner will engage a qualified independent testing and inspection agency to inspect field welds and high-strength bolted connections.
  - 1. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations there from.
  - 2. Provide access for a testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
  - 3. A testing agency may inspect structural steel at plant before shipment.
- B. Bolted Connections: Field and shop-bolted connections will be inspected according to RSCS's "Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- C. Welded Connections: Inspect and test during erection of structural steel as follows:
  - 1. Review welder's certifications and certify welders if required. Conduct inspections and tests as required. Record types and locations of defects found in the work. Record work required and performed to correct deficiencies.
  - 2. All field welds will be visually inspected according to AWS D1.1.
  - 3. Test all full penetration welds using ultrasonic inspection methods in accordance with ASTM E164.
  - 4. Perform magnetic particle inspection in accordance with ASTM E709 on at least 20% of fillet welds. Magnetic particle inspection shall be performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
- D. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.

### 3.07 FIELD TOUCH-UP PAINTING OF SHOP PRIMER PAINTED STEEL AND GALVANIZED STEEL:

- A. General: Immediately after erection, clean field welds, bolted connections, and other surfaces required to be painted. Apply paint to areas required to be painted using the same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness specified in Part 2 of this Section for the shop-applied coat.
- B. Touch-up paint welded connections after the connections have passed the specified structural tests and inspections.

- C. Do not paint when ambient temperature is below 40 degrees F, or when conditions differ from paint manufacturer's recommendations, as approved by the Engineer.
- D. Touch up damaged galvanizing with zinc-rich paint in accordance with ASTM A 780 and manufacturer's written instructions.

END OF SECTION

SECTION 05 50 00  
MISCELLANEOUS METALS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section of the specification covers all miscellaneous metal items required for the work, except as specified elsewhere.
- B. All miscellaneous metalwork shall be fabricated as detailed or approved and shall be installed complete with all necessary anchors, anchor bolts, eye bolts, guides, bolts and other accessories.
- C. In general, site and shop fabricated items are included under this section, and factory fabricated items excluded. This section includes but is not limited to: lintels, louvers, stairs, railings and posts, grating, hatches, frames and covers, loose metal frames, nosings, edgings, ladders, vents, protective grilles and frames, and all other site or shop fabricated metal items not provided under Section 05 12 33, STRUCTURAL STEEL, or otherwise excluded.

1.02 RELATED WORK:

- A. Section 03 30 00, CAST-IN-PLACE CONCRETE
- B. Section 04 01 00, MASONRY
- C. Section 05 12 33, STRUCTURAL STEEL
- D. Section 09 90 00, PAINTING

1.03 QUALITY ASSURANCE:

- A. The drawings show the character and extent of the work required, but do not attempt to show all methods, materials, and details of construction, fastening, etc. Supplementary parts customarily necessary to complete an item, though such parts are not definitely shown or specified, shall be included as part of the item.
- B. Details of construction of the various items shall be submitted on the shop drawings. High quality construction with a neat, finished, and workmanlike appearance will be required.
- C. The size and spacing of screws, connectors, anchors, and similar items, and the size and dimensions of metal items stated herein shall apply in general; specific sizes and spacing of fasteners and dimensions of metal items listed on the drawings shall take precedence.



- D. Items supplied hereunder which are required to be built into concrete, masonry, etc., shall be delivered to the site at locations as required by the Owner or Engineer, and as required by the overall construction schedule.
- E. Manufacturers of other products comparable in quality and type to those specified will be acceptable if satisfactory data on past performance and other required information is furnished by the Contractor, and if approved by the Engineer.
- F. Color galvanized system shall be guaranteed by manufacturer for 20 years.
- G. Contractor shall submit an affidavit to Engineer that materials used are protected from or will not be subject to galvanic action.

1.04 REFERENCES:

- A. The following standards from a part of these specifications, and indicate the minimum standards required:

American Institute of Steel Construction (AISC)

AISC      Specification for Structural Steel Buildings

ASTM International (ASTM)

|      |      |   |
|------|------|---|
| ASTM | A36  | Structural Steel  |
| ASTM | A53  | Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless   |
| ASTM | A123 | Zinc (Hot-Dip-Galvanized) Coatings on Iron and Steel Products   |
| ASTM | A153 | Zinc Coating (Hot-Dip) on Iron and Steel Hardware   |
| ASTM | A239 | Test for Uniformity of Coating by the Preece Test (Copper Sulfate Dip) on Zinc-Coated (Galvanized) Iron or Steel Articles |
| ASTM | A307 | Carbon Steel Externally and Internally Threaded Standard Fasteners  |
| ASTM | A366 | Steel, Carbon, Cold-Rolled Sheet, Commercial Quality  |
| ASTM | A525 | Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements  |
| ASTM | A569 | Steel Carbon (0.15 Maximum Percent) Hot-Rolled Sheet and Strip, Commercial Quality  |
| ASTM | B221 | Aluminum-Alloy Extruded Bars, Rods, Shapes and Tubes  |

ASTM B308 Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded

ASTM C478 Precast Reinforced Concrete Manhole Sections

American Welding Society (AWS)

AWS D1.1 Structural Welding Code Steel

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Before fabricating or assembling any aluminum or stainless steel items, samples indicating full range of finish, color, and texture to be supplied shall be submitted to the Engineer for review.
- B. Shop drawings for all metalwork included in this section shall be submitted to the Engineer for review.
- C. The shop drawings shall be complete and checked, showing sizes, layout, method of assembly, fastenings, anchorage or connection with other work, finish, and coatings, etc. Shop drawings for aluminum work shall indicate alloys, temper and finish to be used.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. STEEL:

- 1. Materials, fabrication, and erection of miscellaneous steel sections shall conform to the applicable requirements of the AISC Specification.
- 2. Steel shapes, plates and bars shall conform to ASTM A36.
- 3. Sheet steel shall be cold-rolled or hot-rolled carbon sheet steel conforming to ASTM A366 or ASTM A569 as appropriate.
- 4. Steel pipe shall conform to ASTM A53.
- 5. Stainless steel shall be Type 304 unless otherwise indicated or specified.

B. ALUMINUM:

- 1. Aluminum shall be fabricated of plates, rolled or extruded shapes, sheets or castings conforming to the specific aluminum alloy and temper designation of the Aluminum Association as specified for the item.

2. Aluminum work shall be fabricated in a shop where the quality of work is of the highest standard for work of this type. All work shall be executed by mechanics skilled in the fabrication of aluminum and shall be true to detail with sharp clean profiles, fitted with proper joints and intersections, and with finishes as specified.
3. The Contractor shall furnish the Engineer with mill certificates and a signed statement from the fabricator that all aluminum work furnished is of the proper alloys as specified.

C. FASTENERS:

1. Metalwork shall be complete, with all bolts, anchors, plates, washers, clamps, screws, studs and other such devices for proper securing and anchoring. Where positions of anchorages can be predetermined, they shall be shop-installed on the item; otherwise, the material or equipment to be fastened shall be expansion bolted, toggle bolted, screwed, or otherwise fastened as shown on the drawings or called for herein.
2. Bolts and nuts for general anchorage and for miscellaneous ferrous metal assemblies and fasteners shall be galvanized, unfinished bolts conforming to ASTM A307 unless otherwise noted on the drawings.
3. Expansion bolts for use in concrete and masonry shall be of one manufacturer and shall be approved. Bolts shall be Kwik Bolt concrete anchors manufactured by Hilti Corp.; Trubolt+ manufactured by Red Head Concrete Anchoring Specialists; Wej-it manufactured by Wej-it Fastening Systems; or an approved equal product.
4. The centerline of expansion shields shall not be closer than 3-inches to the edge of any concrete or masonry in which they are placed.
5. Material for fasteners shall match or be galvanically compatible with the materials fastened. Washers, nuts and other accessories shall match the bolts.
6. Where the specific type, material, size and spacing of fasteners has not been called for on the drawings or in specifications, the fasteners proposed by the Contractor shall be reviewed by the Engineer. If, in the opinion of the Engineer, they are not in accordance with good safety practices, the contractor shall revise and resubmit appropriate fasteners.

D. ALUMINUM TUBES, ANGLES, CHANNELS, AND CLOSURE PLATES:

1. All aluminum tubes, structural shapes such as angles, channels, beams, etc., closure plates, and other aluminum items not usually furnished as integral parts of a system (stairs, hatches, etc.) shall conform to this specification. They shall be formed of aluminum alloy at least equal to 6063-T5, minimum yield strength 16 ksi and minimum tensile strength of 22 ksi.
2. The sizes and thickness of materials shall be designated on the drawings or as required for adequate structural strength.
3. All items shall be accurately machined, filed and fitted, and rigidly connected at all joints, corners and miters. All burrs or rough edges shall be removed. Exposed surfaces shall be free from tool marks, scratches, or blemishes that would materially affect their appearance.
4. All items shall be installed plumb, level, and true and accurately fit with the existing building construction and/or the system (curtain wall, etc.) for which they are intended.
5. Fasteners shall be of 300 series stainless steel for fastening aluminum to aluminum or aluminum to steel. Bolts and expansion anchors used to fasten aluminum to masonry shall also be 300 series stainless steel.

E. STEEL GRATING:

1. Steel grating shall be rectangular pattern grating made in accordance with industry standards. The grating shall be made from structural carbon steel conforming to ASTM A36 and shall be galvanized. The bars shall be welded together prior to galvanizing and the completed grating shall be free from imperfections or irregularities, which would cause warping or camber when the grating is in use.
2. Loading and structural requirements shall be checked by the grating manufacturer to determine its stability. Unless otherwise indicated, the grating shall be designed for a live load of 250 pounds per square foot.
3. The steel grating shall have positive anchorage when in place, such as bolting, or clipping.

F. STEEL OR ALUMINUM HATCHES/FLOOR DOORS, FRAMES AND COVERS:

1. Exterior hatches/floor doors, frames and covers shall be fabricated from steel materials. Interior hatches/floor doors, frames and covers shall be fabricated from aluminum materials.
  - a. Handrails shall be provided around roof and floor hatches in accordance with OSHA requirement 1910.23(e), as manufactured by TriStar, Santa Ana, CA; Nesea Corp., Mt. Laurel, NJ or approved equal.
  - b. Fall through prevention system webbing consisting of Dupont Type 728 high tenacity system shall be provided for all access hatches and shall be “The Hatch Net 120” as manufactured by Safe Approach, Inc. of Auburn, ME or approved equal. Webbing shall be secured to access hatches as per manufacturer’s specifications.
2. Steel or aluminum floor hatches/floor doors, covers and frames shall be 1/4-inch steel or extruded aluminum with built-in neoprene cushion and connectors bolted or welded to the exterior.
3. Door leaf shall be 1/4-inch steel or aluminum checkered plate reinforced with steel or aluminum stiffeners as required.
4. Hinges shall be heavy bronze or stainless steel pintle hinges, compression spring operators enclosed in telescopic tubes, with positive snap latch with turn handles.
5. The doors shall open to 90 degrees and lock automatically in that position.
6. A vinyl grip handle shall be provided to release and close the cover with one hand. A removable key wrench shall be provided.
7. Doors shall be built to withstand a minimum live load of 250 pounds per square foot and be equipped with a snap lock and removable wrench lift handle.
8. Hardware shall be cadmium plated or stainless steel and factory finish shall be a prime coat of red oxide applied to steel doors and frames, or aluminum mill finish with bituminous coating shall be applied to the exterior of the aluminum frames or stainless steel for corrosive or explosive atmosphere areas.
9. Hatches shall be fabricated in accordance with the details shown on the drawings. Hatch covers and frames shall be manufactured by Bilco Co., New Haven, Connecticut; Inryco/Milnor, Lima, Ohio; U.S.F. Fabrication, Hialeah, Florida; or an approved equal.
10. Hatches shall be equipped with a channel and drain type frame to prevent penetration of raw water into the system.

11. The manufacturers shall guarantee against defects in material or workmanship for a period of five years from the date of Owner's acceptance.

G. CLEARWELL AND HOLDING TANK STEPS:

1. Clearwell and holding tank steps shall conform to ASTM C478 and shall be fabricated of either extruded aluminum or steel-reinforced plastic.
2. A spring-balanced, extending safety post shall be installed in the entrances to the tanks. The safety post shall be Model 2 (hot dip galvanized) LadderUP as manufactured by the Bilco Company, New Haven, Connecticut, or approved equal. The post shall have adjustable mounting brackets to fit manhole step rung spacing, and reversible clamp brackets to fit  $\frac{3}{4}$ -inch to 1- $\frac{3}{4}$ -inch rungs. The tubular post shall be manufactured of high strength steel and shall lock automatically when fully extended. Upward and downward movement of the safety post shall be controlled by a special alloy spring balancing mechanism intended for use in highly corrosive atmospheres. Finish shall be special hot-dip galvanized with black enamel.

H. ALUMINUM HANDRAILS, RAILINGS AND POSTS:

1. Fixed handrails, railings and posts shall be in accordance with OSHA and the **Commonwealth of Massachusetts** standards and be capable of withstanding a load of 200 pounds applied at any point, in any direction on the top rail. Unless otherwise indicated on the drawings, pipe rails and posts shall be 1- $\frac{1}{2}$ -inch ID Schedule 80, 6061-T6 aluminum alloy pipe. Interior reinforcement shall be provided in posts and/or rails as required to resist the 200-pound load.
2. Bends in pipe shall be machine-bent or made with manufactured elbows. Rail ends which are not continuous with posts or bolted to the wall shall have self-returns to solid walls or shall have rounded end caps where there is no adjacent wall.
3. Except as otherwise indicated on the drawings, maximum post spacing shall be 5 feet. Arrangement and spacing of secondary rails, balusters, etc., shall be as shown on the drawings.
4. Unless otherwise indicated, railings shall be set in wrought iron or galvanized steel pipe sleeves set 6-inches into concrete and anchored with molten lead completely filling space between sleeve and post. Lead wool may be used if it is so thoroughly rammed into place that rail is rigidly held, and no air spaces remain. The lead shall extend  $\frac{1}{8}$ -inch above the top of sleeve at the rail post and shall be pitched down to the top of the sleeve. Sleeve shall be flush with the top of the surrounding concrete and shall be cut at a level to exactly match the slope of stair stringers and other sloping surfaces.

5. Removable railing shall be Schedule 80, 6061-T6 aluminum alloy pipe with attached aluminum kick plate. Interior reinforcement shall be provided in posts and/or rails as required to resist the 200-pound load.
6. Removable railings shall be provided with removable caps for the pipe sleeves and provisions on the railings section to store the caps when not in use.
7. Submit certification by a professional engineer licensed in the state where the project is located, stating load capacity.

I. STEEL RAILINGS:

1. Steel railings shall be in accordance with OSHA and the Commonwealth of Massachusetts standards and be capable of withstanding a load of 200 pounds applied at any point, in any direction on the top rail. Unless otherwise indicated on the drawings, pipe rail posts shall be 1-1/2-inch ID Schedule 80 black welded steel pipe conforming to ASTM A53, color galvanized with an epoxy primer and finish coat. Interior reinforcement shall be provided in posts and/or rails as required to resist the 200-pound load.
2. Bends in pipe shall be made with manufactured elbows. Rail ends which are not continuous with posts or bolted to the wall shall have self-return to solid walls or shall have rounded end caps where there is no adjacent wall. Posts shall be approximately 5 feet on centers, or as noted on the drawings.
3. Connections shall be welded, with welds ground smooth. Railings shall be fabricated in panels, which are as long as can be conveniently handled, to eliminate as much field welding as possible.
4. Exterior removable railing shall be set in 2-inch I.D. galvanized pipe sleeves set per J.5 above and fastened at ends as shown on the drawings.
5. Submit certification by a professional engineer licensed in the state where the project is located, stating load capacity.

J. ALUMINUM NOSINGS, EDGINGS, AND TREADS CAST IN CONCRETE:

1. Cast aluminum nosings to be embedded in concrete steps or landings, which are joined by aluminum stairs, shall match the cast abrasive nosing on the stairs. The nosings shall be angle backed and contain sufficient anchors for concrete embedment.
2. Aluminum nosings for stairs, which are made completely of concrete, shall be as manufactured by Wooster Products Inc., or an approved equal. Nosings shall be provided in single pieces of full length required; no spliced or jointed pieces shall be used. Nosings shall have metal anchors spaced at not over 15-inches o.c., with

an anchor at not more than 4-inches from each end. Nosings shall be 6-inches shorter than the tread, notched as required to clear post sleeves, etc. Nosings shall be centered on the centerline of the flights. Each tread and each stair landing shall have a nosing. Nosings shall be an abrasive cast aluminum Type 250 - 2-1/2-inch x 2-1/2-inch x 1/2-inch thick curb bar as manufactured by Wooster Products Inc., Wooster, OH, or an approved equal.

3. Cast aluminum nosings to be installed in concrete curbs or other areas designated on the drawings shall be the same as the curb bar specified above.
4. Aluminum edge angles to be installed in areas shown on the drawings such as pits, sumps, wells, etc., shall be fabricated of 6061-T6 alloy.

K. STEEL EDGE ANGLES, CURBS, PLATES:

Steel angle nosings, guards, and frames shall have steel strap anchors for embedment in concrete.

L. BRICK VENTS:

1. The brick vents shall be cast aluminum sized as shown on the drawings, as manufactured by Construction Specialties, Inc.; Arrow United Dampers; Hohmann & Barnard, Inc., or an approved equal. The brick vent shall be furnished with 8 x 8 mesh, 0.020-inch diameter aluminum wire screening, preformed and fitted behind the louver. The vent shall be provided with 0.040-inch thick sheet aluminum duct extension from the back of the vent to the metal duct.

PART 3 - EXECUTION

3.01 GALVANIZING:

A. Hot-Dip Galvanizing:

1. Provide a coating for iron and steel fabrication applied by the hot-dip process. The galvanizing bath shall contain .05-.09% nickel. Immediately before galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The use of the wet kettle process is prohibited. Comply with ASTM A-123 for fabricated products and ASTM A-153 for hardware. Provide thickness of galvanizing specified in referenced standards. Provide coating by Duncan galvanizing or approved equal.

B. Factory-Applied Primer Over Hot-Dip Galvanizing:

1. Provide a factory-applied polyamide epoxy coating primer, 2.0 mils dry film thickness minimum. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental



regulations or mechanically abrade to create a uniform surface profile of 1.0 – 2.0 mils, and as recommended by coating manufacturer. Provide primer coating by Duncan Galvanizing, Tnemec Co. or approved equal.

- C. Factory – Or Field-Applied Architectural Finish Over Primer and Hot-Dip Galvanizing:
  - 1. Provide a factory- or field-applied polyurethane color coating, 2.5 mils dry film thickness minimum. Apply coating at the galvanizer's plant or coating shop, immediately after application of the prime coat, in a controlled environment meeting applicable regulations, and as recommended by the coating manufacturer. Provide finish coating by Duncan Galvanizing, Tnemec Co. or approved equal.
- D. Items noted as "color galvanized" shall have an architecturally compatible factory finish formulated to be applied over galvanized members, suitable for use in harsh environments, and applied by the galvanizer at the factory or coating shop.
- E. The Contractor shall be responsible for determining if any fabricated items are not suitable to be hot-dip galvanized and shall notify the Engineer in writing.
- F. Surfaces of metal to be galvanized shall be free from all dirt, grease, rust and moisture. Burrs and sharp projections shall be removed from edges, holes, etc., before galvanizing. Fabricated items shall be galvanized after fabrication.

### 3.02 WELDING OF STEEL:

Welding of steel shall be done in accordance with the AWS Code. Welds shall be continuous along the entire line of contact, except where plug or tack welding is noted. Exposed welds shall be ground smooth.

### 3.03 WELDING OF ALUMINUM:

Welding of aluminum shall be done in accordance with the AWS "Welding Aluminum" as reprinted from the Welding Handbook. Aluminum shall be fusion welded by the inert gas-shielded-arc method. Where appearance is not a factor and anodizing is not required, alloy 4043 rods may be used. For appearance match, rods shall be of an alloy similar to the alloy being welded.

### 3.04 FABRICATION AND ERECTION:

- A. Metalwork shall be complete with all necessary bolts, nuts, washers, anchors, plates, fastenings, and other fittings. To the extent possible, holes for attachment of blocking, clip angles, etc. shall be shop punched. Where shop punching is impracticable, holes shall be field drilled. Burned holes will not be permitted.
- B. Material shall be straight, accurately fabricated with joints neatly framed, square, and well-riveted, bolted, or welded.

- C. Metalwork to receive hardware shall have all cutouts and attachments accurately made using the hardware itself or templates where necessary.
- D. Metalwork shall be accurately set and secured in position, with lines plumb and level and surfaces flush and square, or as otherwise required to conform to the structure as shown on the drawings.
- E. Wherever possible, all metalwork shall be built into the masonry work and shall have sufficient anchors, well- fastened. Anchors shall be welded to steelwork and shall be staggered where attached to structural shapes. Metal- work impracticable to set before masonry is built shall be anchored to it with approved expansion bolts set in solid masonry units or in concrete.
- F. Miscellaneous metalwork shall be plainly marked to indicate its location in the structure.

### 3.05 ALUMINUM WORK PROTECTION:

- A. Aluminum surfaces, which after erection are to be in contact with wood or treated wood, shall be given a heavy brush coat of aluminum-pigmented bituminous paint or two (2) coats of aluminum metal and masonry paint.
- B. Aluminum surfaces, which after erection are to be in contact with masonry or concrete, shall be given a heavy brush coat of alkali-resistant bituminous paint.
- C. Aluminum surfaces which after erection are to be in contact with dissimilar metals, other than zinc or stainless steel, shall receive a heavy brush coat of zinc chromate primer, followed by two (2) coats of aluminum metal and masonry paint, or shall receive a heavy brush coat of alkali-resistant bituminous paint.
- D. Aluminum surfaces which are to be exposed to the weather, including anodized surfaces, shall receive two sprayed-on shop coats of water-white methacrylate lacquer, capable of withstanding the action of lime mortar for at least one week in an atmosphere of 100 percent humidity at room temperature. Surfaces shall be perfectly clean and dry before lacquering.
- E. Prior to the application of any of the above coatings, any and all areas where the paint has been damaged by abrasion or other cause shall be cleaned and repainted as required so that the aluminum will have a complete protective paint film when brought into contact with the material against which it is being protected.
- F. Before application of any coating, the surface shall be cleaned of all dirt, heavy deposits of grease or oil, and other foreign substances such as paint, lacquer, tape, moisture, or other material, which might interfere with the adhesion of the coating to be applied. Aluminum shall be left in a clean condition. Cleaning methods shall employ steam, mild soaps, mild detergents, or solvents such as kerosene, or naphtha. Lacquered surfaces may be cleaned with a mineral solvent or turpentine. Thorough rinsing with clean water and

drying with clean, soft cloths shall follow any of the above cleaning methods. No other cleaning method may be used without the specific permission of the Engineer.

- G. After suitable cleaning, all aluminum work shall be given an approved shop coating of methacrylate lacquer to protect the surface from stain. The protective coating of lacquer on all aluminum work worn off due to handling or erection shall be replaced by a new coating of lacquer of the same type.
- H. During construction, precautions shall be taken to prevent damage to the aluminum work from splashing or the accumulation of paint, concrete, mortar, or other similar materials, or from staining adjacent surfaces during cleaning operations. Any staining or damage that does occur shall be immediately and completely removed.
- I. Each piece of aluminum in transit and in storage shall be individually wrapped with a non-scratching material, with the joints securely sealed. Wrapping shall completely cover and protect each item. Storage shall be out of the weather, protected from moisture, and with adequate ventilation around each piece of aluminum.

### 3.06 PAINTING:

- A. Ferrous metals of this section, except for galvanized or stainless steel shall be shop primed in accordance with the following:
  - 1. Submerged service components shall be sandblasted clean in accordance with SSPC-SP-10, Near White, immediately prior to priming.
  - 2. Non-submerged service components shall be sandblasted clean in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming.
  - 3. Shop primer, except as otherwise noted, shall be one spray applied coat with dry film thickness of 3.5 to 4.5 mils of Tnemec 66 Boston Gray Primer by Tnemec Co.; or Aquapun by PPG, Inc; or approved equal.
  - 4. Portions of ferrous metals to be embedded in concrete or masonry shall be given a heavy brush coat of alkali resistant bituminous paint.
  - 5. Scratches or abrasions in the shop coat and areas at field welds, bolts, nuts and other unpainted areas shall be touched up after erection with the paint specified for the shop coat. Cold galvanized paint shall be used for touch up of galvanized surfaces. Paint shall be one of the following; Sealube Co., ZRC; Galvicon Corp., Galvicon; Stanley Chemical Div., Zinc Shield; Duncan Galvanizing Corp., ZIRP; or an approved equal.
  - 6. Shop and field prime paint systems shall be compatible with the finish coat.
- B. Aluminum louvers shall be finished with polyvinylidene fluoride (PVDF) colored opaque fluorocarbon coating. PVDF resins shall be "Kynar 500" or "Hylar 5000."

END OF SECTION

SECTION 05 52 13  
PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All the Contract Documents, including the General and Supplementary Conditions and Division 00 – Bidding Documents, Contract Forms, and Conditions of the Contract and Division 01 – General Requirements, apply to the work of this Section.
- B. Carefully examine all the Contract Documents for requirements which 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.
- C. Related Work:
  - 1. Section 03 30 00, CAST-IN-PLACE CONCRETE.
  - 2. Section 32 12 16, PAVING.

1.02 SUMMARY

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
  - 1. Exterior steel pipe railings, galvanized.
  - 2. Other items indicated on Drawings as Work of this Section.

1.03 COORDINATION

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.04 ACTION SUBMITTALS

- A. Make Submittals in accordance with Section 01 33 23 “Submittals”.
- B. At least thirty days prior to intended use, the Contractor shall provide the following samples and submittals for approval in conformance with the requirements of this specification. Do not order materials until Owner’s Representative approval of

samples, certifications or test results have been attained. Delivered materials shall closely match the approved samples.

- C. Product Data: For the following:
  - 1. Railing brackets.
  - 2. Grout products.
- D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Sections of each distinctly different linear railing member, including handrails, top rails and posts.
  - 2. Fittings and brackets.
  - 3. Show method of connecting and finishing members at intersections.
- E. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates.
- C. Galvanizer Certificates: Submit a notarized certificate of compliance from the galvanizer, with an itemized listing and description of items that have been hot-dip galvanized and hot-dip galvanized/shop finished.
  - 1. Submit a laboratory analysis of the zinc bath with the names and percentages of metals.
- D. Evaluation Reports: For post-installed anchors, from ICC-ES.

#### 1.06 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  - i. AWS D1.1/D1.1M, "Structural Welding Code – Steel
- B. The following standards including all current amendments form a part of these Specifications:
  - i. A36 Structural Steel.
  - ii. A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.

- iii. A120 Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
- iv. A307 Carbon Steel Externally and Internally Threaded Standard Fasteners.
- v. A325 High Strength Bolts for Structural Steel Joints.
- vi. A500 Cold Formed Welded and Seamless Carbon Steel Structural Tubing Rounds and Shapes.
- vii. SSPC Surface Preparation Specifications.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.08 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Handrails and Top Rails of Guards:
    - i. Uniform load of 50 lbf/ ft. applied in any direction.
    - ii. Concentrated load of 200 lbf applied in any direction.
    - iii. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F.

2.02 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

## 2.03 STEEL AND IRON

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
  - 1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

## 2.04 FASTENERS

- A. General: Provide the following:
  - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
  - 2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
  - 3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
  - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.



1. Material for Exterior Locations: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

## 2.05 MISCELLANEOUS MATERIALS

- A. A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for exterior applications.

## 2.06 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. 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.
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove flux immediately.
  4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
  - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- J. Form Changes in Direction as Follows: By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

## 2.07 EXTERIOR RAILINGS, STEEL AND IRON FINISHES

- A. Galvanized Exterior Railings:
  - 1. Hot-dip galvanize, including hardware, after fabrication.
  - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
  - 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
  - 4. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

## PART 3 - EXECUTION

### 3.01 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

### 3.02 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

### 3.03 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions. Grout posts to within 1/2" of top surface.

C. Provide a sealant joint to finished grade.

3.04           ADJUSTING AND CLEANING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas.

3.05           PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of substantial completion.

END OF SECTION

## SECTION 11 68 13

### PLAYGROUND EQUIPMENT

#### PART 1 – GENERAL

##### 1.01 WORK INCLUDED:

- A. The Contractor is responsible for preparing all base materials, sub-grades and playground areas as well as adjacent site features. The playground equipment shall be as noted on the plans and herein.
- B. **The town of Holden has pre-purchased the playground equipment. All playground equipment shall be furnished by Owner and installed by the Contractor.**
- C. The work of this section includes installation of the Play Equipment, as indicated in the Contract Documents.
- D. Refer to Part-2 for manufacturer's data.
- E. The following items shown on the Drawings and/or noted herein shall be furnished and installed under their Sections of the specifications:
  - a. Concrete for concrete footings under 03 30 00 Cast in Place Concrete.
  - b. Playground Protective Surfacing under Section 32 18 16.13.

##### 1.02 REFERENCES:

- A. Playground equipment design, layout, and installation shall comply with the following standards and guidelines as applicable. The following items are included herein and shall mean:
  - a. S.S.H.B. - Standard Specifications for Highway and Bridges, the Commonwealth of Massachusetts, Department of Public Works, latest edition.
  - b. A.S.T.M. - American Society for Testing and Materials. The following standard specifications are applicable to the associated items as listed.
  - c. CPSC - Consumer Product Safety Commission.
  - d. ADA - Americans with Disabilities Act and its current regulations.
  - e. MAAB: Massachusetts Architectural Access Board Rules and Regulations.
  - f. AWS: American Welding Society.
  - g. SSPS: Steel Structures Painting Council.
- 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 Owner's Representative, and unless otherwise required in writing,

the agency standards shall be the minimum requirement to be followed.

1.03 QUALIFICATIONS:

- A. Equipment Installer Qualifications: An experienced and certified installer who has completed work with similar equipment, materials, and design, and to the extent similar with this project and whose work has resulted in construction with a record of successful performance in a minimum of 10 installations over 5 years. Contractor to provide their subcontractor's appropriate qualifications including references and experience. Installer shall follow manufacturer's instructions and installation documentation for all equipment.

1.04 GUARANTEE AND ACCEPTANCE/LIABILITY:

- A. All operating parts and structural elements of the play equipment and safety surface shall be guaranteed against failure or defect during normal use and operation for the entire warranty period as established by the manufacturer.
- B. The Contractor and the manufacturer shall hold the Owner and Owner's Representative harmless from any and all damages or liability resulting from negligent acts and omissions on the part of the Contractor or manufacturer, or resulting from defective parts, or improperly assembled equipment. Contractor shall provide secure storage for all equipment on job site.
- A. The playground installation contractor shall provide written certification by a Certified Playground Safety Inspector (CPSI) that the installed equipment conforms to all applicable safety and accessibility standards including, but not limited to ASTM, CPSC, ADA, and MAAB. The Owner reserves the right to retain an independent CPSI to inspect the playground equipment and surfacing after reinstallation. The Contractor will be responsible for correcting any deficiencies at their own expense to the satisfaction of the Landscape Architect.

1.06 COORDINATION:

- A. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work as necessary to assure the steady progress of the work of this Contract.
- B. Substrates: Proceed with work only when substrate construction and penetrating work is complete.
- C. Contractor shall be responsible for transporting the equipment from the Owner's storage facility, located at 18 Industrial Drive, Holden, MA, or as specified by the town to the site.

**PART 2 - PRODUCTS**

**2.01 PLAYGROUND EQUIPMENT:**

- A. Play Equipment to be **furnished by the Owner and to be installed by the Contractor**  
 Equipment shall be manufactured by Landscape Structures Inc. (LSI) as represented by John McConkey, M.E. O'Brien & Sons, Inc., 17 Trotter Drive , Medway, MA 02053, (508)-359-4200, or approved equal.

| <b>PlayBooster and Forma (5-12 years)</b> |            |  |                    |                    |
|---|------------|--|--------------------|--------------------|
| PHASE-1 Direct Bury Aluminum              |            |  | <b>UNIT</b>        | <b>TOTAL</b>       |
| <b>QTY</b>                                | <b>NO.</b> | <b>DESCRIPTION</b>   | <b>WEIGHT (lb)</b> | <b>WEIGHT (lb)</b> |
| <b>PlayBooster®</b>                       |            |  |                    |                    |
| <b>Custom</b>                             |            |  |                    |                    |
| 1   | CP016776A  | DTR PB Tree Tops w/Steel Post DB Only  |                    | 5121.0             |
| <b>Forma™</b>                             |            |  |                    |                    |
| <b>Climbers</b>                           |            |  |                    |                    |
| 3   | 307436A    | Footprint Balance Beam DB  | 47.0               | 141.0              |
| <b>Sensory Play</b>                       |            |  |                    |                    |
| 1   | 307430A    | Focal Sensory Wall DB  |                    | 589.0              |
| 1   | 307431A    | Fox Den Hangouts DB Only   |                    | 769.0              |
| <b>Freestanding Play</b>                  |            |  |                    |                    |
| <b>Climbers</b>                           |            |  |                    |                    |
| 1   | 156435A    | Hemisphere Climber DB Only <sup>1</sup>  |                    | 432.0              |
| 1   | 120711A    | Pod Climber 16" DB   |                    | 14.0               |
| 3   | 120712A    | Pod Climber 24" DB   | 15.0               | 45.0               |
| <b>Custom</b>                             |            |  |                    |                    |
| 3   | CP008524   | SET OF 12 HILLSIDE CLIMBING HANDGRIPS 2i SM Set of twelve Tri-Handhold Handgrips with mating steel plate for SM embedment into concrete. Surfacing thickness to be 2i. | 32.0               | 96.0               |
| 3   | CP001153   | SINGLE HILL LOOP, 36"OC DB   | 23.0               | 92.0               |
| <b>Motion &amp; More Fun</b>              |            |  |                    |                    |
| 1   | 248819A    | We-Go-Round w/Perf Panels - 2 seats DB Only <sup>1</sup>   |                    | 2100.0             |
| <b>Signs</b>                              |            |  |                    |                    |
| 1   | 182503C    | Welcome Sign (LSI Provided) Ages 5-12 years Direct Bury  |                    | 24.0               |
| <b>Swings</b>                             |            |  |                    |                    |
| 1   | 173592A    | Oodle Swing DB Only <sup>1</sup>   |                    | 395.0              |

| <b>SUMMARY</b>                               | <b>CONCRETE</b><br>(cu-ft) | <b>FOOTINGS</b><br>(count) | <b>LABOR</b><br>(hours) | <b>WEIGHT</b><br>(lb) |
|--|----------------------------|----------------------------|-------------------------|-----------------------|
| PlayBooster and Forma (5-12 years)           | 236.2                      | 75                         | 68.3                    | 9,818.0               |
| <b>Total Safety Zone Area = 3038 sq. ft.</b> |                            |                            |                         |                       |

Contractor shall coordinate delivery date with Owner.

2.02 RESILIENT SAFETY SURFACE:

- A. The resilient safety surface shall meet the requirements as specified in Section 32 18 16.13 Playground Protective Surfacing.

2.03 CAST IN PLACE CONCRETE:

- A. Concrete for the footings will be cast in place cement concrete as specified in Section 03 30 00 of the Specifications. Top of concrete footings shall be twelve (12) inches minimum below finished grade, or , as described on the Construction Drawings Details.

2.04 MAINTENANCE KIT:

- A. The Contractor shall provide the Town with a maintenance kit that is to include twenty (20) replacement hardware covers/caps for each play structure, any special tools required for replacement of parts, one (1) gallon of graffiti removal/ cleaning solutions as recommended by the manufacturer, one (1) gallon of touch-up paint for each color of painted metal, a manual that includes all installation and maintenance instruction provided by the manufacturer.
- B. All maintenance parts are to be delivered to the Owner.

PART 3 – EXECUTION

3.01 The Contractor shall assemble the specified equipment under the supervision of an approved Supervisor according to the manufacturer's instructions, the contract drawings and these Specifications.

3.02 The Contractor shall locate the structures to the lines and grades specified in the drawings in these Specifications 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.

3.03 The Contractor shall prepare the subgrade, drainage system and excavate below proposed play area. After the area is prepared and play equipment installed, the Contractor is responsible to complete the installation of the remainder of the site work (sidewalks,



poured in place surfacing, etc).

- 3.04 The excavation for the footings shall be done as specified in Section 31 00 00 of these Specifications and according to the Contract Drawing details.
- A. The Contractor shall do all necessary excavation required for the installation of all 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
  - B. Concrete footings shall meet the specifications for concrete as specified under 03 30 00 Cast in Place Concrete of these specifications. The depth of the top of the footing depends on the safety surfacing specified.
- 3.05 Play equipment to be installed per manufacturer's directions. Provide safety use zones in accordance with ASTM, CPSC and ASTM standards.
- 3.06 Equipment shall be assembled to conform to the approved shop drawings. 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 shall be left on the finished work.
- 3.07 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.
- 3.08 The concrete shall be poured around the supporting pieces of the equipment to the grades detailed. The concrete shall be poured and cured according to Section 03 30 00 Cast in Place Concrete of these Specifications. Slope tops of footings to drain; set bottom of vertical members into gravel base to ensure drainage; do not encase bottom in concrete.
- 3.09 After the specified cure period of the concrete has passed the bracing may be removed.
- 3.10 The fills and surfaces shall then be placed and brought to the grades shown in the Contract Drawings and in accordance with Section 31 00 00 EARTHWORK of these Specifications.
- 3.11 Manufacturer's Guarantees and Insurance.
- A. Product Liability Insurance: The manufacturer of the playground equipment shall maintain, and have in effect at the time of the completed installation, an insurance policy covering completed operations (Product Liability) with a minimum limit of \$1,000,000.00 (One Million Dollars). A certificate of insurance shall be available to the project owner on request.
  - B. Guarantees: The manufacturer shall furnish a written guarantee, covering the replacement of any damaged Structures or components, at no extra charge for the period of 15 (Fifteen) years. This guarantee does not cover Structures damaged by improper use or vandalism. Labor is not covered in this guarantee.

### 3.12 Warranties.

- A. 10-Year Limited Warranty for all stainless steel fasteners, aluminum posts, clamps, beams and caps, against structural failure due to corrosion/natural deterioration or manufacturing defects. This warranty does not include any cosmetic issues or wear and tear from normal use.
- B. 15-Year Limited Warranty for all plastic and steel components, against structural failure due to corrosion/natural deterioration or manufacturing defects. This warranty does not include any cosmetic issues or wear and tear from normal use.
- C. The Contractor shall warrant that all structures and/or equipment installed will conform in kind and quality to the specifications set forth above, and will be free of defect in workmanship and material.
- D. The Contractor shall offer a 10-year limited warranty for all aluminum and all posts, clamps, beams, and caps against structural failure due to corrosion, deterioration, or workmanship (cosmetic issues excluded).
- E. The Contractor shall offer a 10-year limited warranty for all plastic and steel components against structural failure due to corrosion, deterioration, or workmanship (cosmetic issues excluded).
- F. The Contractor shall offer a 1-year limited warranty for all moving parts, swing seats and swing hangers bumpers and other equipment not included above against failure due to corrosion, deterioration, or workmanship.
- G. An authorized representative of the play equipment manufacturer must inspect and approve the completed installation. The play equipment will not be accepted by the play equipment manufacturer or the Owner until they are satisfied with the installation. No additional compensation will be given for any necessary corrective work. Contractor shall submit written certification from Manufacturer's Representative that all play equipment has been installed in accordance with manufacturer's prescribed standards.

### 3.13 CLEANING, REPAIR AND PROTECTION.

- A. Repair minor damage to eliminate all evidence of repair. Remove and replace work that cannot be satisfactorily repaired.
- B. Provide temporary protection to ensure that the work will be without dirt, stains, damage or deterioration at time of final acceptance. Clean up stains and spills as they occur. Remove protections and clean as necessary immediately before final acceptance.

- C. Upon completion of the work and before acceptance, the Contractor shall remove and dispose of in an approved manner all surplus materials, rubbish, etc. which the Contractor may have accumulated during the course of the work and shall leave the site in a clean and orderly condition. The Contractor shall not abandon any material at or near the site regardless of whether or not it has any value.

END OF SECTION

## SECTION 11 68 33

### ATHLETIC FIELD EQUIPMENT

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This Section covers all miscellaneous equipment and furniture as indicated herein or on the Drawings.
- B. The Contractor shall provide all equipment, materials, tools and labor to furnish, assemble and install the track and field equipment.

##### 1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

Shop drawings, installation, operating and maintenance instructions, and parts list of all equipment specified herein.

##### 1.03 DESIGN CRITERIA:

All equipment supplied shall be the manufacturer's latest and proven design and shall meet all specifications as stated on the models specified. These specifications call attention to certain features but do not purport to cover all details entering into the design of the equipment. Final approval on all equipment shall be given by the Engineer.

#### PART 2 - PRODUCTS

##### 2.01 SOCCER GOAL:

- A. Provide regulation size soccer goals for all fields as indicated on the Drawings. Soccer goals shall be: SG824R 8'x24' Regulation Size Round Faced Soccer Goals and Accessories - 8'H x 24'L x 4'B x 8'D; as manufactured by Sportfield Specialties Inc. POBox 231, 41155 Shate Highway 10, Delhi, NY 13753, 888-975-3343; Or approved equivalent.
- B. Components.
  - a. Top Crossbar.
    - i. Fabricated of 6061-T6 Extruded Aluminum.
    - ii. Length: 24' – Regulation Size.
    - iii. 4.375" Square x 4.688" Round Faced Crossbar, 3/16" (0.1875") wall thickness.
    - iv. Powder coat- WHITE.

- b. End Frame Construction
  - i. Fabricated of 6061-T6 Extruded Aluminum.
  - ii. 4.375" Square x 4.688" Round Faced Corner Post, 8'H, 3/16" (.1875") Wall thickness.
  - iii. Rolled Side Frame, 2" x 3" x 0.125" Thick Wall,
  - iv. Radius backside corners.
  - v. Powder coat- WHITE.
- c. Rear Bottom Ground Bar.
  - i. 2" x 2" x 0.25" Thick Wall with Welded ½" end plates.
  - ii. Powder coat- WHITE.
- d. Mobility kit.
  - i. SGMobile SGMKR-Soccer Goal Portable Mobility Wheel Kit and Handel.
  - ii. Welded Stainless Steel Frame.
  - iii. Ultra High Molecular Weight Polyethylene plastic wheels.
- e. Accessories.
  - i. Welded Aluminum Net Clips.
  - ii. 5mm Braided, Knotless Polypropylene Soccer Net with Rope bound perimeter and 4" square mesh.
  - iii. 8.2'H x 24.4'L x 4.3'B x 8.6'D.
  - iv. Color – WHITE.
  - v. Weighted anchoring sacks to reduce tipping potential.

## 2.03 20' HT. BALL SAFETY NETTING

- A. BSS420 "STORMGUARD" professionally pre-engineered breakaway ball safety system, 4-inch O.D., 3-½-inch schedule 80 aluminum straight pole ball stopper system with standard coated black pole finish.
  - a. Contractor shall provide stamped engineered drawings of post footings.
- B. Model TFBSS-NET-ULTRACROSS, 4 ply ultra-cross dyneema knotless UHMWPE netting, 1-¾-inch square mesh with sewn rope binding on perimeter edges as manufactured by Sportsfield Specialties, Inc., or approved equivalent.

## 2.05 SCOREBOARD

- A. Scoreboard shall be a single sides LED multi-sport scoreboard as offered by Daktronics, Inc, Scoreboard Enterprises, Inc 274 Fruit St, Mansfield, MA 02048; or an approved equal.
- B. Scoreboard
  - a. Daktronics Scoreboard Model# MS-2008. Single-sided multisport scoreboard displays period time to 99:59, HOME and GUEST scores to 99, PERIOD to nine. During the last minute of the period, the clock displays time to 1/10 of a second.
  - b. Dimensions: 4'-6" (1.37 m) high, 16'-0" (7.62 m) wide, 0'-8" (203 mm) deep.
  - c. Body of the scoreboard shall be constructed of aluminum alloy 5052.
  - d. Scoreboard back, face, and perimeter: 0.063" (1.60 mm)thick.
  - e. Scoreboard top and bottom: 0.125" (3.18 mm)thick.

- f. Digits and indicators shall be LED in color: WHITE.
- g. HOME, GUEST, and clock digits: 24" (610 mm)tall.
- h. PERIOD digit: 18" (457 mm) tall.
- i. Seven bar segments per digit.
- j. All digits are sealed front and back with weather-tight silicone gel.
- k. Captions shall be vinyl applied to scoreboard face. HOME and Guest shall be 15" tall. PERIOD shall be 10" tall. Colors shall be WHITE.
- l. Scoreboard shall have a programmable Team Name Message Centers (TNMCs) in WHITE
- m. Scoreboard shall act as a clock (standalone time of day) when control console is unplugged/off).
- n. Scoreboard shall have an integrated Horn.

C. Scoring Console

- a. Console is an All Sport® 5000 controller.
- b. Able to keep scores of multiple sports using changeable keyboard.
- c. Recalls clock, score, and period information if power is lost.
- d. Console capable of automatically calculating and displaying DOWN & TO GO for each play.
- e. Console includes:
  - i. aluminum enclosure to house electronics.
  - ii. Sealed membrane water-resistant keyboard.
  - iii. 32-character LCD to verify entries and recall information currently displayed.
  - iv. Power cord that plugs into a standard grounded outlet; 6 watts max.
  - v. Control cable to connect to the control receptacle junction box (wired system only).
  - vi. Hand-held switch for main clock start/stop and horn.
  - vii. Accessory equipment shall include a 2.4 GHz spread spectrum radio system with frequency hopping technology and 64 non-interfering channels; system includes a transmitter installed inside the console and a receiver installed inside the scoreboard.
- f. All Sport MX-1 (App Based Control).

D. Submit engineered shop drawings for scoreboard foundation. Concrete foundation shall be designed and engineered by a registered engineer with a State of Massachusetts designation.

E. See Electrical Specifications for power and communication requirements and connections.

PART 3 - EXECUTION

3.01 Sports Equipment shall be permanently installed in concrete anchorages unless otherwise indicated by manufacturer specifications. See Division 3-Concrete.

3.02 Sports Equipment shall be installed in accordance with National Federation of State High School Associations (NFHS), manufacturer's installation instructions, and as shown on the plans.

- 3.03 Any site improvement materials which are constructed of steel and not galvanized, or factory coated with a finish system shall be painted in the field in accordance with Division 9 Finishes. Colors by Owners Representative.
- 3.04 All Sports Equipment shall be installed ready for use. All nets, cables, uprights, etc., shall be in place. Bleachers and benches shall be placed as required by Owners Representative.
- 3.05 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.
- 3.06 The Contractor shall be responsible for timing the delivery of all site improvement elements so as to minimize on-site storage time prior to installation. All stored materials must be protected from weather, careless handling and vandalism.
- 3.07 Contractor shall anchor all site element to cement concrete pad using approved bolts and/or anchoring devices.
- 3.08 Installation of the Scoreboard.
- A. Verify that mounting structure is ready to receive the display. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings. Verify concrete has cured adequately according to specifications.
  - B. All power and control cables to display will be routed in conduit. Power to the display as well as raceways shown on electrical plans by the Electrical Contractor. Display control wiring including conduit will be the responsibility of the contractor assigned the display equipment.
  - C. Install display to beams in location detailed and in accordance with manufacturer's instructions. Verify unit is plumb and level.
  - D. Provide boxes, cover plates and jacks in locations per plans.
  - E. Test the operation of the display, controller and all control jacks; leave control unit and other loose items with owner's designated representative.
  - F. Conduct operator training on the display/controller operation.
  - G. Manufacturer must supply all required signal conversion hardware to allow for direct wire control of electronic display.
  - H. Manufacture shall provide training on operation and use of the system.
  - I. Manufacture shall provide all documents, guides, manuals and other files to the Owner.

END OF SECTION

## SECTION 13 31 23

### PRE-ENGINEERED FABRIC SHADE STRUCTURE

#### PART 1 – GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this section.

##### 1.02 SUMMARY

- A. A single fabric shade structure contractor shall be responsible for the design, wet-stamped engineering drawings, permitting, fabrication, supply, and erection of the work specified herein, including foundations. The intent of this specification is to have only one shade contractor be responsible for all of the functions listed above.

##### 1.03 SUBSTITUTIONS

- A. To qualify as an approved equal, please submit the following manufacturer, installer and product documentation at least ten days prior to the bid:
  - 1. 2 full sets of fabric samples
  - 2. Detailed material and performance specifications for ALL fabric, steel, hardware and cables used in shade structure
  - 3. 2 full sets of powder coating color metal “chips”
  - 4. List of at least 5 reference sites within 100 miles of bid location
  - 5. List of at least 5 customer references within 100 miles of bid location
  - 6. Proof of compliance with all quality assurance criteria, as per Section 1.05
  - 7. Full set of wet stamped (by an engineer in the state of Massachusetts engineering drawings for the proposed structures
  - 8. Proof of installation competency and/or certification for type and size of structure specified.
  - 9. List of any and all deviations from product specifications in section 2.01.



- B. No substitutions will be allowed after the deadline. Any approval of alternate manufacturers and structures shall be by addendum prior to the bid date and shall not be allowed without written notification.

#### 1.04 SUBMITTALS

##### A. With Bid Submittals:

1. Provide proof of existing reference sites with structures of similar project scope and scale.
2. Provide a minimum of 18 fabric samples to demonstrate fabric color range, and a digital (PDF) or paper document showing a minimum of 9 powder coat color choices. Also, provide a letter of authorization from the fabric manufacturer delineating authorized use of the specified fabric.
3. Manufacturer to provide proof of all quality assurance items, including:
  - a) A list of at least 5 reference projects in REGION that have been installed a minimum of 12 years.
  - b) Proof of General Liability, Professional Liability, and Umbrella insurance, as per Section 1.04.A.2.
  - c) Proof of a minimum of \$15,000,000 aggregate bonding capacity.
  - d) Proof of current IAS certification
  - e) Proof of an Annual Maintenance Inspection Program.
  - f) Proof of a Corporate Safety and/or Injury & Illness Prevention Program.

#### 1.05 QUALITY ASSURANCE

Fabrication and erection are limited to firms with proven specific area experience in the design, fabrication, and erection of fabric shade structures, and such firms shall meet the following minimum requirements. No substitutions shall be allowed for the following:

- A. A single shade structure contractor shall design, engineer, manufacture, and erect the fabric shade structures, including the foundations, and shall provide a dedicated Project Manager throughout the entire Scope of Work related to the shade structure(s).
- B. All manufacturers shall have at least 15 years' experience in the design, engineering, manufacture, and erection of fabric shade structures, engineered to IBC requirements with similar scope, and a successful construction record of in-service performance.

- C. All manufacturers shall provide proof with bid submittal of a minimum of \$2,000,000 (ag) General/Public Liability insurance, \$3,000,000 Professional Liability (PL) insurance, and additional \$10,000,000 Umbrella/Excess Liability insurance.
- D. Manufacturer shall be accredited by the IAS (International Accreditation Service) for Structural Steel Fabrication under IBC 2006 Section 1704.2.5.2.
- E. The fabric shade structure contractor shall have a Corporate Quality Control program/manual, which describes their complete quality assurance program.
- F. All manufacturers must be a current Member Contractor with ISNetwork, which confirms the bidder's strict adherence to Safety, Insurance, Quality, and Regulatory standards.

## 1.06 WARRANTY

- A. The successful installer shall provide a 12-month warranty on all installation labor and materials.
- B. A supplemental warranty from the manufacturer shall be provided for a period of 10 years (pro-rated) on fabric and 10 years (non-prorated) on the structural integrity of the steel, from date of shade invoice.
- C. The warranty shall not deprive the Owner of other rights the Owner may have under the provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

## PART 2 – PRODUCTS

### 2.01 GENERAL

- A. The structures shall consist of a custom structure which includes 3-Point Hypar Sail, with entry heights of 8' and 13', 25' x 30' @ ~195sf of sail area.
- B. The structures shall be manufactured by
  - 1. Shade Structures, Inc., d/b/a USA SHADE & Fabric Structures, 2580 Esters Blvd, Suite 100, DFW Airport, TX 75261, (800) 966-5005, (954) 649-6757, Representative: Angel Rich, Email: [angel.rich@usa-shade.com](mailto:angel.rich@usa-shade.com), or
  - 2. Poligon Fabric, A Division of PORTERCORP, 4240 N. 136th AVE HOLLAND, MI 49424 (616) 399-1963, [www.poligon.com](http://www.poligon.com), or
  - 3. ShadeSails.com LLC, 2216 Padre Blvd. Suite B #77, South Padre Island, TX 78597, <https://shadesails.com/>, or
  - 4. An approved equal
- C. The fabric shade structure(s) shall conform to the current adopted version of the International Building Code 2015.

D. All fabric shade structures shall be designed and engineered to meet the minimum of 115mph “Ultimate” Wind Load, Risk Category II, Exposure C, and a Snow Load of 5 psf and Live Load of 5 psf. All fabric shade structures shall be engineered with a zero wind pass-through factor on the fabric.

E. Steel:

1. All steel members of the fabric shade structure shall be designed in strict accordance with the requirements of the “American Institute of Steel Construction” (AISC) Specifications and the “American Iron and Steel Institute” (AISI) Specifications for Cold-Formed Members and manufactured in a IAS- (International Accreditation Service) accredited facility for Structural Steel Fabrication under IBC 2006 Section 1704.2.5.2.
2. All connections shall have a maximum internal sleeving tolerance of .0625” using high-tensile strength steel sections with a minimum sleeve length of 6”.
3. All non-hollow structural steel members shall comply to ASTM A-36. All hollow structural steel members shall be cold-formed, high-strength steel and comply with ASTM A-500-10, Grade B. All steel plates shall comply with ASTM A-572, Grade 50.
4. All galvanized steel tubing shall be triple-coated for rust protection using an in-line electroplating coat process. All galvanized steel tubing shall be internally coated with zinc and organic coatings to prevent corrosion.

F. Bolts:

1. All structural field connections of the shade structure shall be designed and made with high-strength bolted connections using ASTM A-325, Grade B.
2. Where applicable, all stainless steel bolts shall comply with ASTM F-593, Alloy Group 1 or 2. All bolt fittings shall include rubber washers for water-tight seal at the joints. All nuts shall comply with ASTM F-594, Alloy Group 1 or 2.

G. Welding:

1. All shop-welded connections of the fabric shade structure shall be designed and performed in strict accordance with the requirements of the “American Welding Society” (AWS) Specifications. Structural welds shall be made in compliance with the requirements of the “pre-qualified” welded joints, where applicable and by certified welders. No onsite or field welding shall be permitted.
2. All full penetration welds shall be continuously inspected by an independent inspection agency and shall be tested to the requirement of IBC 2015.

H. Powder Coating:

1. Galvanized steel tubing preparation prior to powder coating shall be executed in accordance with solvent cleaning SSPC-SP1. Solvents such as water, mineral spirits, xylol, and toluol, which are to be used to remove foreign matter from the surface. A mechanical method prior to solvent cleaning, and prior to surface preparation, shall be executed according to Power Tool Cleaning SSPC-SP3, utilizing wire brushes, abrasive wheels, needle gun, etc.
2. Carbon structural steel tubing preparation prior to powder coating shall be executed in accordance with commercial blast cleaning SSPC-SP6 or NACE #3. A commercial blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, mill scale, rust, coating, oxides, corrosion, and other foreign material.
3. Powder coating shall be sufficiently applied (minimum 3 mils thickness) and cured at the recommended temperature to provide proper adhesion and stability to meet salt spray and adhesion tests, as defined by the American Society of Testing Materials.
4. Raw powder used in the powder coat process shall have the following characteristics:
  - a) Specific gravity: 1.68 +/- 0.05
  - b) Theoretical coverage: 114 +/- 4ft<sup>2</sup>/mil
  - c) Mass loss during cure: <1%
  - d) Maximum storage temperature: 80oF
  - e) Interpon® 800 is a high-durability TGIC powder coating designed for exterior exposure. Tested against the most severe specifications, Interpon 800 gives significantly improved gloss retention and resistance to color change.
5. When the fabric shade structure(s) will be located within potentially corrosive environments such as (pools, reclaimed water irrigation, saltwater bodies, other standing bodies of water) hot dip galvanizing of Carbon steel or rust protection undercoat primer will be required on all structures at manufacturer's discretion. The rust protection primer shall be Sherwin-Williams® POWDURA® epoxy powder coating Z.R Primer and shall be applied to Carbon steel in accordance with the manufacturer's specifications. Primer should be fused only and then top coated with the selected powder coat to ensure proper inter-coat adhesion.
  - a) The primer's attributes shall be:
    - 1) a. Specific gravity (g/ml): 2.37
    - 2) Coverage at 1.0 mil (ft<sup>2</sup>/lb): 81.6
    - 3) Adhesion: ASTM D-3359 5B
    - 4) Flexibility: ASTM D-552 Pass 1/8"

- 5) Pencil hardness: ASTM D-3363 H-2H
- 6) Impact resistance (in.lb): ASTM D-2794 Dir & Rev, 120 in-lbs
- 7) Salt spray resistance: ASTM B-117 2000 hours
- 8) Humidity resistance: ASTM D-4585 2000 hours
- 9) 60° Gloss: ASTM D-523 50 ~ 70
- 10) Cure schedule (metal temp): 10min @ 200°C (390°F)  
25min @ 135°C (275°F)
- 11) Film thickness range (mils): 2.0 ~ 3.0

I. Tension Cable: Steel wire rope cable is determined based on calculated engineering loads. Standard cabling is galvanized. Stainless steel cabling required when hot dip galvanized frame or primer frame are required.

- 1. 0.25" (nominal) galvanized 7x19 strand core wire rope shall be used for tension loads up to 4,500 lbs.
- 2. 0.375" (nominal) galvanized 7x19 strand core wire rope shall be used for tension loads up to 9,000 lbs.
- 3. 0.5" (nominal) galvanized 6x19 strand core wire rope shall be used for tension loads up to 13,500 lbs.

J. Fabric Roof Systems:

1. UV Shade Fabric:

a) Shadesure® shade fabric is made of a UV-stabilized, high-density polyethylene (HDPE), as manufactured by Multiknit® (Pty) Ltd. HDPE mesh shall be a heat-stentored, three bar Rachel-knitted, lockstitch fabric with one monofilament and two tape yarns to ensure that the material will not unravel if cut. Raw fabric rolls shall be 9.84 feet wide.

b) Fabric Properties:

- 1) Life Expectancy: minimum 8 years with continuous exposure to the sun
- 2) Fading: minimum fading after 5 years (3 years for Red)
- 3) Fabric Mass: 5.31 oz/yd<sup>2</sup> ~ 5.6 oz/yd<sup>2</sup> (180gsm ~ 190gsm)
- 4) Fabric Width: 9.84 feet (3m)
- 5) Roll Length: 164.04 feet (50m)
- 6) Roll Dimensions: 62.99 inches x 16.5354 inches (160cm x 42cm)
- 7) Roll Weight +/- 66 lbs (+/- 30kg)

- 8) Minimum Temp: -13°F (-25°C)
- 9) Maximum Temp: +176°F (80°C)
- c) Fabric shall meet the following flame spread and fire propagation tests:
  - 1) ASTM E-84
  - 2) NFPA 701 Test Method 2

2. Stitching & Thread:

- a) All sewing seams are to be double-stitched.
- b) The thread shall be GORE® TENARA® mildew-resistant sewing thread, manufactured from 100% expanded PTFE (Teflon™). Thread shall meet or exceed the following:
  - 1) Flexible temperature range
  - 2) Very low shrinkage factor
  - 3) Extremely high strength, durable in outdoor climates
  - 4) Resists flex and abrasion of fabric
  - 5) Unaffected by cleaning agents, acid rain, mildew, salt water, and is unaffected by most industrial pollutants.
  - 6) Treated for prolonged exposure to the sun.
  - 7) Rot resistant.

3. Shade and UV Factors:

- a) Shade protection and UV screen protection factors shall be as follows:

| <b>Color</b>     | <b>Shade %</b> | <b>UV Block %</b> |
|------------------|----------------|-------------------|
| Laguna Blue      | 92%            | 96%               |
| Royal Blue       | 86%            | 94%               |
| Navy Blue        | 90%            | 94%               |
| Turquoise        | 83%            | 92%               |
| Rainforest       | 89%            | 96%               |
| Desert Sand      | 80%            | 92%               |
| Black            | 95%            | 96%               |
| Sunflower Yellow | 70%            | 94%               |
| Terracotta       | 84%            | 90%               |
| Arizona          | 86%            | 91%               |
| White            | 57%            | 86%               |
| Silver           | 88%            | 93%               |
| Red              | 91%            | 92%               |
| Electric Purple  | 84%            | 90%               |
| Zesty Lime       | 83%            | 92%               |
| Cinnamon         | 88%            | 93%               |

|           |     |     |
|-----------|-----|-----|
| Olive     | 93% | 97% |
| Chocolate | 92% | 93% |

## PART 3 – EXECUTION

### 3.01 INSTALLATION

- A. The installation of fabric shade structures shall be performed by manufacturer or manufacturer-approved contractor. All installation personnel must have experience in the erection of tensioned fabric structures.
- B. The installation shall comply with the manufacturer’s instructions for assembly, installation, and erection, per approved drawings.
- C. Concrete:
  - 1. Unless noted otherwise for footings and piers by the Project Engineer, the concrete specification for footings, piers, slabs, curbs, and walkways shall meet a minimum 4,000 psi at 28-day strength.
  - 2. Concrete work shall be executed in accordance with the latest edition of American Concrete Building Code ACI 318-14.
  - 3. Concrete shall comply in accordance with the Section 03 30 00 Cast-in-Place Concrete
  - 4. All reinforcement shall conform to ASTM A-615 grade 60.
  - 5. Reinforcing steel shall be detailed, fabricated, and placed in accordance with the latest ACI Detailing Manual and Manual of Standard Practice.
- D. Foundations:
  - 1. All anchor bolts set in new concrete shall comply with ASTM F1554 GR 55.
  - 2. All anchor bolts shall be Hot-Dip Galvanized.
  - 3. Footings and full rebar cages shall be drilled or dug, set, and poured as per manufacturer’s specifications. The estimated the foundations are 30” diameter by 11’ deep full of rebar, exact size and design to be determined by Structural Engineer.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

END OF SECTION



## SECTION 13 34 23

### PRE-ENGINEERED SUPPORT BUILDING

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This section of the specification covers all materials, labor, tools and equipment, and operations necessary to furnish and install a pre-engineered support building including sealed architectural, structural, mechanical, and electrical plan sets. The building components shall be delivered to the jobsite and installed by the Contractor. The building manufacturer shall provide all lifting cables and hardware needed to off-load and set the building.
- B. Building foundation shall be as shown on the drawings and specified in Section 02300, EARTHWORK.

##### 1.02 RELATED WORK:

- A. Section 05 50 00, MISCELLANEOUS METALS
- B. Division 26, ELECTRICAL WORK
- C. Section 31 00 00, EARTHWORK
- D. Division 33, UTILITIES

##### 1.03 QUALITY ASSURANCE:

- A. The **Building Supplier** of the pre-engineered support building shall be a single source design, engineering, and manufacturing firm who shall meet all the following requirements.
  - a. The design and engineering and furnishing all specified building package components shall be supplied by Romtec, Inc., or pre-approved alternate
  - b. The **Building Supplier** shall be regularly engaged in and have at least ten (10) years of experience in packaged restroom building engineering, design, supply, and construction.
  - c. Alternate **Building Suppliers** shall demonstrate that they have designed, engineered, produced, delivered, and constructed at minimum ten (10) functioning site-built restroom buildings of similar type. Project completion dates and a reference contact from the owner of each project must be provided.
  - d. The building and its concrete footings, foundation, and slab are to be engineered by the **Building Supplier** to meet site-specific conditions, including wind and snow loading, local frost depth, and ground conditions.

- e. Fasteners that are normally included with individual components, as well as any atypical fasteners, shall be supplied by **Building Supplier**.
  - f. No approval by any external entity will override the local building authority's codes and inspections. Seals meant for modular homes and production plant certifications will not be allowed in lieu of sealed plans from a licensed engineer and conventional inspection during construction.
  - g. The **Building Supplier** shall provide complete, code-compliant building plans including plans, elevations, sections, and details, under seal of a National Kitchen and Bathroom Association (NKBA) certified technical designer.
  - h. The **Building Supplier** shall provide complete structural calculations meeting code for design loads and seismic design under seal of a professional Engineer with current license in the state of MASSACHUSETTS.
  - i. All work and materials shall comply with current industry building codes and regulations for the state of MASSACHUSETTS.
  - j. Americans with Disabilities Act Accessibility Guidelines (ADAAG) will be followed in design, manufacture, and construction.
  - k. The building will be designed as a complete building package to be delivered to the job site for construction on-site by the contractor.
- B. The **Building Installer** is responsible for building package installation. **Building installer** work will generally include foundation/pad construction and building package assembly/construction.
- a. **Building Supplier's** scope is separate from the **Building Installer's** scope. Romtec, Inc., is the approved **Building Supplier**, not a designated **Building Installer**.
  - b. Installation items may be provided by the same **Building Installer** (typically when a single entity is acting as both the **Building Installer** and **Contractor**), or the items may be provided by a separate entity such as a general contractor or site contractor, (typically when the **Building Installer** is a separate subcontractor). **Contractor** work will generally include site preparation and grading, excavations for structures, backfill and/or structural backfill, and any site or utility work outside the building package footprint.

#### 1.04 REFERENCES:

The following standards form a part of these specifications:

American Concrete Institute (ACI)

ACI 318 Building Code Requirements for Reinforced Concrete

ACI 512 Recommended Practice for Manufactured Reinforced Concrete Floor and Roof Units.

American National Standard Institute (ANSI)

ANSI A58.1 Standard Building Code Requirements for Minimum Design Loads in Buildings and Other Structures

ASTM International (ASTM)

ASTM A123 Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates and Strip.

ASTM A185 Welded Steel Wire Fabric for Concrete Reinforcement.

ASTM A615 Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

ASTM C33 Concrete Aggregates

ASTM C150 Portland Cement

1.05 DESIGN CRITERIA:

- A. The building shall be designed to meet the latest edition of the local or state building code (if requirements are more stringent than **Massachusetts State Building Code (780 CMR) 8<sup>th</sup> Edition**) or the following minimum loadings as required in ANSI A58.1:
  - 1. Roof live load -
  - 2. Snow load-as required in ASCE 7-05
  - 3. Wall wind load -
  - 4. Earthquake load - as required in ASCE 7-05 for Zone 2A.
- B. The building floor and roof shall be designed for minimum outside dimensions of 21 feet by 28 feet without the use of interior supports of any type. The building interior finished height shall be 8 feet minimum. The roof, floor and wall thickness shall be a minimum of 4-inches thick.
- C. The roof shall have a minimum slope of 1-inch over 8 feet, sloped in a direction as required by the Engineer. The roof shall overhang all walls a minimum of 1-1/2-inches.
- D. The building design shall be such that the floor, walls and roof are monolithic at manufacture with end walls attached. Design shall also allow for expansion needs.
- E. The exterior walls shall be finished with an exposed aggregate 1/2-inch architectural fluted finish with a cantilever strip type extension at the base and roofline.

1.06 WARRANTY:

- A. The building package and all associated components provided by **Building Supplier** shall be warranted against defects in materials and workmanship for a period of not less than one (1) year from the date of acceptance. Acceptance is the date of delivery of the building

package, or, if delivery is delayed for any reason beyond *Building Supplier's* control, the date that the building and all its associated components were ready to deliver

- C. *Building Installer's* work shall be warranted against defects in materials and workmanship for a period of not less than one (1) year from the date of acceptance. Acceptance is the date that installation work for the building package is completed, including any relevant final punch list. In the event that final acceptance of the completed building is delayed for reasons beyond *Building Installer's* control, the warranty shall be one (1) year from the completion of *Building Installer's* installation work and demobilization.
  - D. *Contractor's* work shall be warranted against defects in materials and workmanship for a period of not less than one (1) year from the date of acceptance. Acceptance is the date that installation work for the building package is completed, including any relevant final punch list. In the event that final acceptance of the completed building is delayed for reasons beyond *Contractor's* control, the warranty shall be one (1) year from the completion of *Contractor's* installation work and demobilization.
- 1.07 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:
- A. The *Building Supplier* work shall include the design of the architectural, mechanical, structural, and electrical components that will be required for this building. Shop and erection drawings showing all dimensions of precast sections; location openings; the locations, type, size and strength of inserts, embedded angles, steel reinforcement; and all other information necessary to insure proper handling, fabrication, and erection of the building.
  - B. The building will be designed as a complete building package to be delivered to the job site for construction on- site by the contractor.
  - C. The *Building Supplier* shall submit the packaged restroom building preliminary Scope of Supply and Design Submittal (SSDS), including the building plan view and elevation drawings.
  - D. The *Building Supplier* will provide complete submittal documentation in the *Building Supplier's* standard electronic submittal format for review.
  - E. Once the preliminary SSDS has been approved, the *Building Supplier* will provide full sealed plan sets stamped by an engineer licensed in the state that the building is located for review by the permitting authority.
  - F. Up to three (3) wet stamped sets of the plans and structural calculations shall be provided by *Building Supplier*.

## PART 2 - MATERIALS

### 2.01 BUILDING SUPPLIER PACKAGE PRODUCTS:

- A. Approved Building Suppliers
  - a. Romtec, Inc., 18240 North Bank Road, Roseburg, OR 97470

Tel: 541-496-3541  
Web: [www.romtec.com](http://www.romtec.com)  
Cody Dooley: [cdooley@romtec.com](mailto:cdooley@romtec.com)

- b. Requests for use of an alternate **building supplier** will be considered in accordance with provisions of Section 1.

B. Structure

- a. Concrete Masonry Units (CMU) shall be supplied by **building supplier**.
  - i. Walls shall be constructed of 8"W x 16"L x 8"H split-face mortar joint concrete masonry units (concrete blocks).
  - ii. Blocks shall be manufactured to ASTM C90 designation for load bearing concrete masonry units.
  - iii. Block color to be **Gray**.
- b. Rain Guard anti-graffiti coating shall be supplied by **building supplier**.
- c. Inside face of all exterior walls shall have rigid insulation finished with **white** FRP panels supplied by **building supplier**.
- d. Exterior wall finish shall be fiber cement lap siding above stone veneer accent.
  - i. Siding shall be mounted over OSB sheathing supplied by **building supplier**.
  - ii. Stone veneer color shall be selected by **owner** from the manufacturer's standard color chart.
- e. Sanitary tile cove base on interior restroom walls to be supplied by **building supplier**.
- f. Polycarbonate gable windows shall be supplied by **building supplier**.
  - i. Windows shall include pre-assembled steel frame with 1/8" thick polycarbonate with translucent pebble finish.
  - ii. Steel frames shall be primed and painted **black**.
- g. Kick proof wall vents for natural ventilation shall be supplied by **building supplier**.
  - i. Pre-assembled steel frame with 10-gauge, 1" square lock joint wire weave mesh and interior louver with integral insect screen.
  - ii. Vents shall be primed and painted **black**.
- h. Wire weave gable vents for natural ventilation shall be supplied by **building supplier**.
  - i. Pre-assembled steel frame with 10-gauge, 1" square lock joint wire weave mesh and interior louver with integral insect screen.
  - ii. Vents shall be primed and painted **black**.
- i. Door system components shall be supplied by **building supplier**.
  - i. Doors shall be Steelcraft® SL18 standard laminated honeycomb core and 18-gauge galvanized steel.
  - ii. Door frame shall be pre-welded Steelcraft® 3-Sided flush frame, 16-gauge galvanized A-60 steel.
  - iii. Doors and frames shall be powder coated with undercoating (**color to be selected by owner**).
  - iv. Masonry door clips (3/16" dia.) for door frame shall be fitted between the doorframe and concrete blocks to bond frame to wall. Door clips shall allow full internal grouting of the frame during installation.

- v. Hinges shall meet ANSI A5112 with non-removable pin and two ball bearings.
- vi. Hager 5100 Series Grade 1 door closer shall be constructed of cast iron.
- vii. Door closure shall be LCN-4111, grade 1, heavy duty closure with cast iron body, full complement bearing, double heat-treated pinion journal.
- viii. Door shall have 0.038" gauge, stainless steel protection plates.
- ix. Doors shall have aluminum alloy 6063, T5 temper mill finish saddle thresholds, model 424E.
- x. Doors shall have aluminum alloy 6063, T5 temper synthetic rubber polymer blend neoprene sweeps, model 200NA, anodized aluminum finish.
- xi. Doors shall have pull handles with stainless steel plates and deadbolt locks.
- xii. Restroom doors shall have Hager 3700 series interconnected locks with occupancy indicator.
- xiii. Door lock shall be Grade 2, standard duty commercial cylindrical lever locks with no exposed mounting screws.
- xiv. Restroom doors to have 18" x 18" louvered vents.
- xv. Restroom doors to have magnetic locking system.

C. Roofing

- a. The following roof components shall be supplied by **building supplier**.
  - i. Glulam beam shall be 24F-V4 and architectural grade.
  - ii. Tongue & groove decking shall be 2x6 V-edge deck boards, select deck Douglas fir.
- b. Roof system shall consist of prefabricated structural insulated panels.
  - i. Panels shall be constructed of expanded polystyrene foam, OSB and urethane adhesives.
  - ii. Interior finish shall be white FRP.
- c. Roof system shall consist of wood truss package.
  - i. **Building supplier** shall provide batt insulation.
- d. Roofing shall be Fabral, 26-gauge, Horizon 16, standing seam panels, with 16 in. coverage width.
  - i. Roofing package shall include inside and outside foam closures, matching trim (eaves, gables, and ridge) and fasteners, sheet metal flashing (all sides), and 30# felt (under metal).
  - ii. Roofing color to be selected by the **owner** from the manufacturers standard color chart.

D. Plumbing Fixtures and Accessories

- a. The following plumbing fixtures and accessories shall be supplied by **building supplier**.
- b. Toilet shall be floor mount, top supply, white vitreous china.
- c. Urinal shall be wall mount, top supply, back discharge, white vitreous china
  - i. Flush valve shall be a chrome, manual lever with ADA compliant metal oscillating non-hold-open handle.
- d. Lavatory shall be 19 in. x 17 in. white vitreous china and wall hung with anti-splash rim and concealed front overflow.

- i. Faucets shall be deck mounted single hole single supply metering, sink faucet.
  - ii. Faucets shall be a 2.2gpm, pivot action lever style faucet.
- e. Grab bars shall be stainless steel.
- f. Freestanding, stainless steel, 36-gallon trash receptacle with no lid.
- g. Mirror shall be 18" x 36", framed with one-piece, roll-formed stainless steel with 3/4" face and neatly mitered corners.
- h. Toilet paper dispenser shall be stainless steel, wall mount with two-roll capacity.
- i. Surface-mounted towel dispenser shall be fabricated of type heavy duty, 22 gauge stainless steel with exposed surfaces in satin finish. Refill indicator on face of cabinet. Tumbler lock to secure hinged front panel. Towel dispenser capacity 525 multi-fold or 400 C-fold towels.
- j. Surface-mounted liquid soap dispenser shall be fabricated of 20-gauge satin finish stainless steel. Dispenser shall have completely concealed mounting, vandal resistant filler hole cover and sight gauge. Push-in corrosion- resistant liquid soap valve. Capacity: 40-oz. liquid soap.
- k. Surface mounted baby changing station shall be solid light grey (9631) molded bacterial-resistant, high density polyethylene. Steel to steel support hinges with pneumatic gas shock mechanism. Unit shall have integrated liner dispenser and bag hooks. Unit shall have an anti-microbial safety belt. Unit shall be operable with less than 5lbs. of force and complies with ASTM F2285 Standard.
- l. Drinking fountain shall include bi-level with bottle filling station. VRCTLDDWS shall deliver non-chilled drinking water. Units shall be stainless steel construction and include vandal-resistant bubbler. Bottle filling unit shall include an automatic 20-second shut-off timer. Shall include Green Ticker™ displaying count of plastic bottles saved from waste. Bottle filler shall provide 1.1 - 1.5 gpm flow rate with laminar flow to minimize splashing. Unit shall meet ADA guidelines. Unit shall be lead-free design which is certified to NSF/ANSI 61 and 372 and meets federal and state low-lead requirements. Unit shall be certified to UL399 and CAN/CSA 22.2 No. 120.

E. Electrical

- a. The following electrical fixtures shall be supplied by **building supplier**.
- b. Main breaker panel shall be supplied by **building supplier**.
  - i. Breaker Panel shall be 100 Amp, single-phase, indoor.
  - ii. Breaker panel shall be sized to accept only the loads of the **building supplier** electrical fixture package. The **building supplier** should modify the main breaker panel as needed to be most efficient based on any design changes.
- c. Electric tank, 20-gallon, 2.5kw water heater supplied by **building supplier**.
- d. Surface mount, 1000 - 2750-Watt wall heater in mechanical room only shall be supplied by **building supplier**.
- e. Broan #771, ceiling exhaust fans shall be supplied by **building supplier**.
- f. Wall mount, white, Bradley hand dryer with 15 second dry time supplied by **building supplier**.
- g. Light fixtures shall be supplied by **building supplier**.

- i. Exterior lights to be LED downlights with cast-aluminum housing with corrosion-resistant paint in dark bronze. Polycarbonate lens.
  - ii. Exterior wall mounted, Lithonia, LED vaportight light fixtures that have cast-aluminum housing with corrosion-resistant paint in an industrial grey finish. Sealed gasket protects against moisture and dust.
  - iii. Exterior lights controlled by photocell.
  - iv. Interior surface mount, 48" LED light fixtures.
    - v. Restroom lights controlled by motion sensor.
    - vi. Mech room lights controlled by switch (switches by installer).
- F. Delivery, Storage and Handing
  - a. The **building supplier** freight shall be based on delivering the product on a 48' to 53' flatbed or van truck and trailers, or as close to those dimensions as can legally access the site.
  - b. **Building supplier** shall deliver organized building package components in stages as shrink-wrapped pallets that correspond to a typical sequence of construction. A bill of material stating the stages of palletized components shall be included with every delivery.
    - i. Stage 1 pallets shall include structural components such as block, frames, vents, beams, connectors, trusses, etc.
    - ii. Stage 2 pallets shall include second stage structural components such as filler wall material, windows, skylights, roofing, etc.
    - iii. Stage 3 pallets shall include structural finish components such as siding material, tile, doors etc.
    - iv. Stage 4 pallets shall include plumbing and electrical fixtures and other finish materials such as toilets, sinks, drinking fountains, electrical fixtures, accessories, etc

## 2.02 BUILDING INSTALLER PACKAGE AND SCOPE:

- A. The installing contractor or subcontractor, hereafter designated as the **building installer**, is responsible for building package installation. **Building installer** work will generally include foundation/pad construction and building package assembly/construction.
  - a. **Building supplier's** scope is separate from the **building installer's** scope. Romtec, Inc., is an approved **building supplier**, not a designated **building installer**.
- B. Structure
  - a. Masonry (concrete) grout shall be supplied and installed by **building installer**
    - i. Grout shall have a minimum compressive strength of 2,500 psi at 28 days, 9+/-1" slump, with max 1/2" aggregate.
    - ii. Fine or coarse grout may be used in accordance with 2009 UBC.
    - iii. All CMU block must be fully grouted and may not be wetted.
    - iv. If required for installation, **building installer** will be responsible for providing appropriate equipment and labor for notching CMU block for bond beams, cutting CMU block to make any required shapes, and/or grinding CMU block for fixture mounting.



- b. Rebar for walls shall be supplied and installed by **building installer**.
    - i. All walls shall have # 4 and # 5 rebar. See final approved plans for spacing.
    - ii. All rebar used in the building must meet ASTM A615 manufacturing standards and is to be placed per the final approved plans.
  - c. Interior block wall finish shall be latex epoxy paint supplied and installed by **building installer**.
    - i. Ceiling finish shall be supplied and installed by the **building installer** per the final approved plans.
  - d. Interior floors to be sealed concrete finish supplied by **building installer**.
  - e. Sealant for all exposed wood shall be supplied and installed by **building installer**.
  - f. Sealant for all exterior CMU block is required, to be supplied and installed by **building installer**.
  - g. Doors and frames are factory primed to be painted on-site by **building installer**.
  - h. Fiber cement siding is primed to be painted on-site by **building installer**.
    - i. Siding shall be mounted over OSB sheathing (sheathing supplied by **building supplier**).
  - i. Gutters and downspouts are supplied and installed by **building installer**.
- C. Cast-in-place Concrete.
- a. All equipment, labor, trades, and materials for cast-in-place concrete shall be provided by **building installer**.
    - i. Includes all materials and labor for building package foundations/footings and interior slabs.
  - b. Footings for the building package are to be dug by the **building installer** and poured on-site to meet local code for permanent structures. A prefabricated, modular mat placed on compacted base is not an accepted equal to a site specific, site poured, engineered foundation.
  - c. The foundation shall be installed as designed with all cast in-place concrete poured to dimensions specified, or as required in the final plans.
    - i. Footings will be built to frost depth or as required by the permitting authority.
    - ii. Refer to section 03 30 00-CAST IN PLACE CONCRETE for concrete mix design.
    - iii. Slabs shall have a fine broom finish with joints required in flat work as shown on plans.
    - iv. Steel rebar shall be installed as specified in final plans.
  - d. **Building installer** shall supply and install concrete slab sealer.
    - i. Refer to section 03 30 00-CAST IN PLACE CONCRETE for concrete mix design.
- D. Electrical.
- a. Electrical rough-in, installation and trim shall be provided by **building installer**.
    - i. All underground and/or overhead service to building shall be as specified in the final site plan.
    - ii. **Building installer** is responsible for all necessary wire, connectors, grounding, conduit, and related items to install the building package electrical components and meet all relevant national, state, and local codes.

- iii. **Building installer** shall supply and install all switches and outlets required to complete the building package installation.
- E. Plumbing.
- a. Plumbing rough-in, installation and trim within 10' of the building footprint shall be provided by **building installer**.
    - i. **Coordinate with Site Contractor on utility lines.**
    - ii. All underground water service and sewer drain(s) from building to be as specified in final approved site plan.
    - iii. Building water shutoff valve, drain, and all rough piping shall be as shown on final building plans. Final installation location to be determined onsite.
    - iv. Piping shall be installed per the final approved plans with minimum pipe sizing per 2009 Uniform Plumbing Code Section 610.
  - b. Floor drains in the building shall be supplied and installed by **building installer**.
- F. Other Materials and Equipment.
- a. Unless otherwise specified, the **building installer** shall provide materials and products to complete the installation of the building package.
  - b. Materials and products include, but are not limited to, the following:
    - i. Typical fasteners; for example: roofing nails, staples, etc.
    - ii. Fasteners not included in product packaging.
    - iii. Wood sealant for all decking, glulam beams, posts, and extensions.
    - iv. Mortar, grout
    - v. Rebar reinforcement
    - vi. Cast-in-place concrete foundations, footings, slabs
    - vii. Paint and sealants
    - viii. Caulking
    - ix. Switches and outlets
    - x. Rough in for plumbing and electrical
    - xi. Other items within the building footprint indicated on the final plans or as required by building code to complete the installation of the building package which are not specifically stated as supplied by the **building supplier**.
- G. Delivery, Storage and Handling
- a. The **building installer** will be responsible for all equipment and labor required for off-loading of the delivered building package onsite.
  - b. The **building installer** will assume responsibility for adequate protection and maintenance of delivered building package materials from weather, damage, and pilferage during installation work. Any failure to adequately protect building package materials that affects the warranty of those materials will be at **building installer's** expense.
  - c. **Building installer** shall collect and maintain for final delivery to owner any operation & maintenance manuals included by individual product manufacturers with their respective product packaging. Any failure to collect, maintain, and/or deliver these O&M manuals to the **owner** that results in fees from **building supplier** for additional copies shall be at **building installer's** expense.

## 2.02 CONTRACTOR SCOPE ITEMS:

- A. The items in this section may be provided by the same **building installer** as defined in Section 3 above, or the items in this section may be provided by a separate entity such as a general contractor, hereafter designated as. **Contractor** work will generally include site preparation and grading, excavations for structures, backfill and/or structural backfill, and any site or utility work outside the building package footprint.
- B. Cast-In-Place Concrete for Building Exterior
  - a. All equipment, labor, trades, and materials shall be supplied by **contractor**.
    - i. Includes all materials and labor for exterior/entry slabs, sidewalks and approaches.
  - b. Refer to drawings for sidewalks and entry slabs.
- C. Plumbing
  - a. Incoming plumbing to within approximately 10' of the building shall be provided by **contractor**.
    - i. All underground water service and sewer drain(s) from building to be as specified in final approved site plan.
    - ii. Building water shutoff valve is to be supplied and installed by **contractor**.
    - iii. **Contractor** is responsible to ensure that incoming water pressure is sufficient to meet building package fixture demands.
    - iv. Minimum water pressure at toilet and urinal flush valves shall be 40 psi with minimum pipe sizing as per 2009 Uniform Plumbing Code Section 610, or as required in final approved plans.
  - b. Water line drain valve shall be supplied and installed by **contractor**.
  - c. Sewer line backflow check valve shall be supplied and installed by **contractor**.
- D. Electrical
  - a. Incoming electrical utility lines to within approximately 10' of the building shall be provided by **contractor**.
    - i. Electric meter base and all rough wiring, switches, plugs and circuit breakers shall be as shown on final plans.
  - b. **Contractor** supplies and installs the meter base and meter.
- E. Other Materials and Equipment
  - a. All items not specifically listed as supplied by **building supplier** or **building installer**.
  - b. Any item listed as supplied by "contractor" or "others".
  - c. Materials and products include, but are not limited to, the following:
    - i. Incoming electrical, water, sewer, and gas utilities.
    - ii. Asphalt paving.
    - iii. Concrete sidewalks and paved areas.
    - iv. Landscaping.
    - v. Stite Grading.
    - vi. Drain valves and backflow check valves.

- vii. Branch circuit breakers.
- viii. Lighting equipment not attached to the building.
- ix. All other items exterior of the building footprint indicated on final plans or required by building codes which are not specifically stated as supplied by ***building supplier or building installer.***

F. Delivery, Storage and Handling

- a. The ***contractor*** will assume responsibility for adequate protection and maintenance of the installed building package materials after completion of installation work by ***building installer.*** Any failure to adequately protect building package materials that affects the warranty of those materials will be at ***contractor's*** expense.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Erection of the building shall be done by experienced workmen, in accordance with the previously mentioned standards.
- B. Installation as instructed by the ***building supplier.***

3.02. MANUFACTURER'S SERVICES:

The services of a factory-trained, qualified manufacturer's service representative shall be provided for not less than one 8-hour day to assist in installation of the precast concrete utility building, to assure that the installation is in accordance with the manufacturer's recommendations.

END OF SECTION

## SECTION 13 34 23

### PRE-ENGINEERED PAVILION

#### PART 1: BUILDING SUPPLIER SCOPE:

##### 1.1 SUMMARY

- A. The work shall include furnishing the sealed architectural, structural, mechanical, and electrical plan sets and furnishing the structural, mechanical, and electrical building components as a complete, pre-designed pavilion package as shown on drawings and as specified herein.

##### 1.2 GENERAL REQUIREMENTS

- A. Packaged building design and engineering and furnishing all specified building package components shall be supplied by Romtec, Inc., or approved equal, hereafter designated as the building supplier.
- B. The building supplier shall be a single source design, engineering, and manufacturing firm who shall meet all the following requirements.
- C. The packaged building shall be a current standard product of building supplier.
- D. Building supplier shall be regularly engaged in and have at least ten (10) years of experience in packaged building engineering, design, supply, and construction.
- E. The building supplier must meet or exceed the product specifications. The Romtec, Inc. building package is an approved guide and example.
- F. Alternate building suppliers shall demonstrate that they have designed, engineered, produced, delivered, and constructed at minimum ten (10) functioning site-built buildings of similar type. Project completion dates and a reference contact from the owner of each project must be provided.
- G. Bidders who propose and alternate building supplier other than Romtec, Inc. are required to provide a complete submittal package minimum of ten (10) calendar days prior to the bid opening date with full sealed plan sets, calculations, and all pre-engineered structural items.
- H. Any products proposed as “or equal” that are not as specified must be specifically listed in the alternate building supplier submittal package and accompanied by manufacturers data sheets for review. These products will be approved or denied

prior to the bid opening. Incomplete submittals will be rejected and returned to the bidder.

- I. The building and its concrete footings, foundation, and slab are to be engineered by the building supplier to meet site-specific conditions, including wind and snow loading, local frost depth, and ground conditions.
- J. Fasteners that are normally included with individual components, as well as any atypical fasteners, shall be supplied by building supplier.
- K. Building is to be designed and constructed to meet local codes and approvals for permanent structures. Any building that is temporary, permanently relocatable, prefabricated modular, an offsite constructed product, or constructed of precast material is not an accepted equal to permanent, onsite, conventional construction.
- L. No approval by any external entity will override the local building authority's codes and inspections. Seals meant for modular homes and production plant certifications will not be allowed in lieu of sealed plans from a licensed engineer and conventional inspection during construction.
- M. Building sidings, treatments, and roofing are to be as specified. Precast buildings with painted textures are not considered architecturally equivalent.
- N. The building supplier shall provide complete, code-compliant building plans including plans, elevations, sections, and details, under seal of a National Kitchen and Bathroom Association (NKBA) certified technical designer.
- O. The building supplier shall provide complete structural calculations meeting code for design loads and seismic design under seal of a professional Engineer with current license in the state where the project is located.
- P. The reviewing authority reserves the right to review or reject all submittals at its sole discretion.
- Q. All work and materials shall comply with current industry building codes and regulations for the state where the project is located.
- R. Americans with Disabilities Act Accessibility Guidelines (ADAAG) will be followed in design, manufacture, and construction.

### 1.3 DESIGN & SUBMITTAL DOCUMENTATION

- A. The building supplier work shall include the design of the architectural, mechanical, structural, and electrical components that will be required for this building.

- B. The building will be designed as a complete building package to be delivered to the job site for construction on-site by the contractor.
- C. The building supplier shall submit the packaged building preliminary Scope of Supply and Design Submittal (SSDS), including the building plan view and elevation drawings.
- D. The building supplier will provide complete submittal documentation in the building supplier's standard electronic submittal format for review.
- E. The preliminary SSDS will be reviewed by relevant parties and returned to the building supplier with any required revisions to the terms, product data sheets, and/or building plan view and elevation drawings noted as comments.
- F. The building supplier shall make any required corrections or revisions and resubmit the preliminary SSDS until the preliminary SSDS is approved by the relevant parties.
- G. Once the preliminary SSDS has been approved, the building supplier will provide full sealed plan sets stamped by an engineer licensed in the state that the building is located for review by the permitting authority.
- H. Up to three (3) wet stamped sets of the plans and structural calculations shall be provided by building supplier before any additional fees apply. Standard plan set size is 11" x 17".
- I. Permitting authority will review the full sealed plan set and return with any required revisions or corrections noted as comments.
- J. Building supplier shall provide one full round of sealed plan revisions in response to permitting authority comments before any additional fees are allowed.
- K. The following sections shall be included in the **building supplier's** preliminary Scope of Supply and Design Submittal. Incomplete submittals will be rejected and returned to the bidder.
  - 1. INTRODUCTION
  - 2. BUILDING DESIGN,
    - (a) SUPPLIED ITEMS
    - (b) EXCLUDED ITEMS
    - (c) PLAN VIEW AND ELEVATION DRAWINGS
  - 3. PRODUCT DATA
  - 4. WARRANTY & LIMITATIONS

#### 1.4 WARRANTY

- A. The building package and all associated components provided by building supplier shall be warranted against defects in materials and workmanship for a period of not less than one (1) year from the date of acceptance. Acceptance is the date of delivery of the building package, or, if delivery is delayed for any reason beyond building supplier's control, the date that the building and all its associated components were ready to deliver.
- B. Building supplier shall pass through to owner all relevant manufacturers warranties for individual products and components of the building package.

## PART 2: BUILDING PACKAGE PRODUCTS:

### 2.1 APPROVED BUILDING SUPPLIERS

- A. Romtec, Inc.,  
18240 North Bank Road, Roseburg, OR 97470  
Tel: 541-496-3541; Fax: 541-496-0803; Email: [RIsales@romtec.com](mailto:RIsales@romtec.com)  
Web: [www.Romtec.com](http://www.Romtec.com)
- B. RomTec Model#3012; Or approved equal
- C. An approved equal building supplier will be considered in accordance with provisions of Section 1.

### 2.2 BUILDING DESCRIPTION

- A. Refer to drawings for quantities, dimensions, locations, and installation methods for the materials and items described in this section.
- B. Building dimensions shall match what is indicated on drawings.

### 2.1 STRUCTURE

- A. Steel truss and post pavilion structure shall be supplied by building supplier.
  - 1. All exposed steel components are powder coated black.

### 2.2 ROOFING

- A. The following roof components shall be supplied by building supplier.
  - 1. Glulam beam shall be 24F-V4 and architectural grade.
  - 2. Tongue & groove decking shall be 2x6 V-edge deck boards, select deck Douglas fir.
- B. Roofing shall be Fabral, 26-gauge, Horizon 16, standing seam panels, with 16 in. coverage width.



1. Roofing package shall include inside and outside foam closures, matching trim (eaves, gables, and ridge) and fasteners, sheet metal flashing (all sides), and 30# felt (under metal).
2. Roofing color to be selected by the *owner* from the manufacturers standard color chart.

### 2.3 DELIVERY, STORAGE, AND HANDLING

- A. The building supplier freight shall be based on delivering the product on a 48' to 53' flatbed or van truck and trailers, or as close to those dimensions as can legally access the site. Overall dimensions of the truck and trailers allowed to access the site are: 70' overall length, 102" wide and 168" high.
- B. Building supplier shall deliver organized building package components in stages as shrink-wrapped pallets that correspond to a typical sequence of construction. A bill of material stating the stages of palletized components shall be included with every delivery.
  1. Stage 1 pallets shall include structural components such as block, frames, beams, connectors, trusses, etc.
  2. Stage 2 pallets shall include second stage structural components such as roofing, framing, decking, etc.
  3. Stage 3 pallets shall include structural finish components such as siding material, trim sections, gutters, etc.

### PART 3: BUILDING INSTALLER SCOPE:

The installing contractor or subcontractor, hereafter designated as the building installer, is responsible for building package installation. Building installer work will generally include foundation/pad construction and building package assembly/construction.

*Note:* Building supplier's scope is separate from the building installer's scope. Romtec, Inc., is the approved building supplier, not a designated building installer.

### 3.1 CONSTRUCTION SUBMITTALS

- A. The building installer shall submit product data sheets and relevant information about the specified building installer supplied products below for review and approval.

### 3.2 WARRANTY

- A. Building installer's work shall be warranted against defects in materials and workmanship for a period of not less than one (1) year from the date of acceptance. Acceptance is the date that installation work for the building package is completed, including any relevant final punch list. In the event that final acceptance of the

completed building is delayed for reasons beyond building installer's control, the warranty shall be one (1) year from the completion of building installer's installation work and demobilization.

- B. Building installer shall pass through to owner all relevant manufacturers warranties for individual products and components supplied by building installer.

### 3.3 STRUCTURE

- A. Interior floors to be sealed concrete finish supplied by building installer.
- B. Sealant for all exposed wood shall be supplied and installed by building installer.

### 3.4 CAST IN-PLACE CONCRETE FOR BUILDING PACKAGE

- A. All equipment, labor, trades, and materials for cast-in-place concrete shall be provided by building installer.
  - 1. Includes all materials and labor for building package foundations/footings and interior slabs.
- B. Footings for the building package are to be dug by the building installer and poured on-site to meet local code for permanent structures. A prefabricated, modular mat placed on compacted base is not an accepted equal to a site specific, site poured, engineered foundation.
- C. Engineered fill shall be ¾" minus crushed aggregate around footings, foundations, and slabs, or as required in the final approved plans.
- D. Slab vapor barrier shall be 6-mil continuous plastic under the concrete slab, or as required in the final approved plans.
- E. The foundation shall be installed as designed with all cast in-place concrete poured to dimensions specified, or as required in the final plans.
  - 1. Footings will be built to local frost depth or permitting authority.
  - 2. Minimum compressive strength of foundation concrete shall be 5,000 psi at 28 days, 4" +/-1" slump, with max ¾" aggregate, cured in accordance with ACI 308, or as required in approved final plans.
  - 3. Slabs shall have a fine broom finish with joints required in flat work as shown on plans.
  - 4. Steel rebar shall be installed as specified in final plans.
- F. Building installer shall supply and install concrete slab sealer.
  - 1. Concrete slab sealer shall be a water-based, transparent curing, sealing and dust proofing compound with two (2) coats to be applied per manufacturer's instructions.

### 3.5 OTHER MATERIALS & EQUIPMENT

- A. Unless otherwise specified, the following products and materials are supplied by building installer (if applicable).
  - 1. Building package installation
  - 2. Cast-in-place concrete foundations, footings, interior slabs
  - 3. Concrete slab sealer
  - 4. Concrete grout
  - 5. Rebar
  - 6. Caulk
  - 7. Typical fasteners; for example: roofing nails, staples, etc.
  - 8. Fasteners not included in product packaging
  - 9. Wood sealant for all decking, glulam beams, posts, and extensions
  - 10. All other items within the building footprint indicated on final plans or required by building codes to complete installation of the building package which are not specifically stated as supplied by building supplier.

### 3.6 DELIVERY, STORAGE, AND HANDLING

- A. The building installer will be responsible for all equipment and labor required for off-loading of the delivered building package onsite.
- B. The building installer will assume responsibility for adequate protection and maintenance of delivered building package materials from weather, damage, and pilferage during installation work. Any failure to adequately protect building package materials that affects the warranty of those materials will be at building installer's expense.
- C. Building installer shall collect and maintain for final delivery to owner any operation & maintenance manuals included by individual product manufacturers with their respective product packaging. Any failure to collect, maintain, and/or deliver these O&M manuals to the *owner* that results in fees from *building supplier* for additional copies shall be at *building installer's* expense.

### PART 4: CONTRACTOR SCOPE ITEMS:

The items in this section may be provided by the same building installer as defined in Section 3 above (typically when a single entity is acting as both the building installer and contractor), or the items in this section may be provided by a separate entity such as a general contractor or site contractor, hereafter designated as contractor (typically when the building installer is a separate subcontractor). Contractor work will generally include site preparation and grading, excavations for structures, backfill and/or structural backfill, and any site or utility work outside the building package footprint.

Items in this section are generally to be completed prior to building installer beginning its installation work described in Section 3 above.

#### 4.1 CONSTRUCTION SUBMITTALS

- A. The contractor shall submit product data sheets and relevant information about the specified contractor supplied products below for review and approval.

#### 4.2 WARRANTY

- A. Contractor's work shall be warranted against defects in materials and workmanship for a period of not less than one (1) year from the date of acceptance. Acceptance is the date that installation work for the building package is completed, including any relevant final punch list. In the event that final acceptance of the completed building is delayed for reasons beyond contractor's control, the warranty shall be one (1) year from the completion of contractor's installation work and demobilization.
- B. Contractor shall pass through to owner all relevant manufacturers warranties for individual products and components supplied by contractor.

#### 4.3 CAST IN-PLACE CONCRETE FOR BUILDING EXTERIOR

- A. All equipment, labor, trades, and materials shall be supplied by contractor.
  - 1. Includes all materials and labor for exterior/entry slabs and sidewalks.
- B. Refer to drawings for sidewalks and entry slabs.
  - 1. Minimum concrete compressive strength of 4,500 psi at 28 days, or as required in final approved plans.
  - 2. Remesh or rebar reinforcement shall be used in sidewalks.
  - 3. All sidewalks shall be finished with a fine broom with control joints installed per the final approved site plan.

#### 4.4 OTHER MATERIALS & EQUIPMENT

- A. Unless otherwise specified, the following products and materials are supplied by contractor.
  - 1. All items not specifically listed as supplied by building supplier or building installer.
  - 2. Any item listed as supplied by "contractor" or "others".
- B. Unless specified in the plans or submittals, contractor supplies the following items (if applicable):
  - 1. Incoming electrical, water, sewer, and gas utilities.
  - 2. Asphalt paving
  - 3. Sidewalks
  - 4. Landscaping
  - 5. Site grading
  - 6. Exterior/entry slabs

7. Irrigation Equipment
8. Fire alarm and fire suppression equipment
9. Lighting equipment not attached to the building.
10. All other items exterior of the building footprint indicated on final plans or required by building codes which are not specifically stated as supplied by building supplier or building installer.

#### 4.5 DELIVERY, STORAGE, AND HANDLING

- A. The contractor will assume responsibility for adequate protection and maintenance of the installed building package materials after completion of installation work by building installer. Any failure to adequately protect building package materials that affects the warranty of those materials will be at contractor's expense.

### PART 5: OWNER'S SCOPE:

#### 5.1 SPECIAL INSPECTION

- A. If required, special inspection(s) services shall be provided by contractor.
- A. If special inspection(s) are required by the permitting authority or relevant agency(ies), then the building supplier, building installer, and/or contractor shall accommodate the special inspection(s).

END OF SECTION

SECTION 26 27 13  
ELECTRICITY METERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes electricity metering work to accommodate utility company revenue meter.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For electricity-metering equipment.
  - 1. Include elevation views of front panels of control and indicating devices and control stations.
  - 2. Include diagrams for power, signal, and control wiring.
  - 3. Metering equipment shall meet the requirements of National Grid Electric.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Submit evidence that meters are compatible and conform to National Grid Company requirements.
- B. Field quality-control reports.
- C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.

## 1.6 COORDINATION

- A. Electrical Service Connections: Coordinate with utility companies and utility-furnished components.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 916.

### 2.2 UTILITY METERING INFRASTRUCTURE

- A. Install metering accessories furnished by the utility company, complying with its requirements.
- B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.
- C. Meter Sockets:
  - 1. Comply with requirements of electrical-power utility company.
- D. Arc-Flash Warning Labels:
  - 1. Labels: Comply with requirements for "Self-Adhesive Equipment Labels" and "Signs" in Section 26 05 53 "Identification for Electrical Systems." Apply a properly sized self-adhesive label for each work location included in the analysis. Labels shall be machine printed, with no field-applied markings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.

- B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written instructions. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
- C. Install arc-flash labels as required by NFPA 70.
- D. Wiring Method:
  - 1. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- E. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

### 3.2 FIELD QUALITY CONTROL

- A. Testing: By Contractor.
- B. Perform tests and inspections with the assistance of a factory-authorized service representative.
- C. Prepare test and inspection reports.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

### 4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION



## SECTION 26 05 19

### LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Copper wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

##### 1.02 ACTION SUBMITTALS

###### A. Product Data: For each type of product.

##### 1.03 INFORMATIONAL SUBMITTALS

###### A. Field quality-control reports.

#### PART 2 - PRODUCTS

##### 2.01 COPPER BUILDING WIRE

###### A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

###### B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. American Bare Conductor.
3. Belden Inc.
4. Okonite Company (The).
5. Southwire Company.

###### C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

- D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- E. Conductor Insulation:
  - 1. Type RHH and Type RHW-2: Comply with UL 44.
  - 2. Type THHN and Type THWN-2: Comply with UL 83.
  - 3. Type XHHW-2: Comply with UL 44.
  - 4. Type XLP: Comply with UL 44. (all underground Lighting wiring)

## 2.02 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. 3M Electrical Products.
  - 2. AFC Cable Systems; a part of Atkore International.
  - 3. Hubbell Power Systems, Inc.
  - 4. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 5. Thomas & Betts Corporation; A Member of the ABB Group.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
  - 1. Material: Copper.
  - 2. Type: One hole with standard barrels.
  - 3. Termination: Compression.

## PART 3 - EXECUTION

### 3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### 3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW, USE single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway
- C. Exposed Branch Circuit: Type THHN-THWN, single conductors in raceway.
- D. Underground Feeders and Branch Circuits: Type UF multiconductor cable in conduit.
- E. Underground Feeders for pedestrian lighting: Type XLP, Single Conductors in raceway

### 3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

### 3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12-inches of slack.

### 3.05 IDENTIFICATION

- A. Identify and color-code conductors and cables.
- B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

### 3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor, slab and wall assemblies.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

### 4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION

## SECTION 26 05 26

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
  - 1. Underground distribution grounding.

##### 1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.

##### 1.03 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports

##### 1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
  - 1. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
    - a. Ground rods.
    - b. Grounding arrangements and connections for separately derived systems.
  - 2. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NETA MTS.

- a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
- b. Include recommended testing intervals.

#### 1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

### PART 2 - PRODUCTS

#### 2.01 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

#### 2.02 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Burndy; Part of Hubbell Electrical Systems.
  - 2. ERICO International Corporation.
  - 3. Harger Lightning & Grounding.
  - 4. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 5. SIEMENS Industry, Inc.; Energy Management Division.
  - 6. Thomas & Betts Corporation; A Member of the ABB Group.

#### 2.03 CONDUCTORS

- A. Retain "Insulated Conductors" Paragraph below to require one of two preferred conductor materials permitted by NFPA 70; delete to allow Contractor to use any material that complies with Code. See "Grounding Products" Article in the Evaluations for discussion on alternative materials.
- B. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- C. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
  2. Stranded Conductors: ASTM B 8.
  3. Tinned Conductors: ASTM B 33.
  4. Bonding Cable: 28 kc mil, 14 strands of No. 17 AWG conductor, 1/4-inch in diameter.
  5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8-inches wide and 1/16-inch thick.
- D. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4-inches in cross section, with 9/32-inch holes spaced 1-1/8-inches apart.

## 2.04 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Conduit Hubs: Mechanical type, terminal with threaded hub.
- G. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- H. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
- I. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- J. Straps: Solid copper, copper lugs. Rated for 600 A.

## PART 3 - EXECUTION

### 3.01 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor.
  - 1. Bury at least 24-inches below grade.
- C. Grounding Bus: Install in electrical equipment enclosure and elsewhere as indicated.
  - 1. Install bus horizontally, on insulated spacers 2-inches minimum from wall, 6-inches above finished floor unless otherwise indicated.
  - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- D. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except as otherwise indicated.

### 3.02 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

### 3.03 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.



### 3.04 INSTALLATION

- C. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
  - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

### 3.05 FIELD QUALITY CONTROL

- A. "Perform tests and inspections" Paragraph below to require Contractor to perform tests and inspections.
- B. Tests and Inspections:
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  - 3. Test completed grounding system at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
  - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and

include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

#### PART 4 – MEASUREMENT AND PAYMENT

##### 4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

##### 4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION

## SECTION 26 05 29

### HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

##### 1.2 ACTION SUBMITTALS

###### A. Product Data: For each type of product.

###### B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

##### 1.3 INFORMATIONAL SUBMITTALS

###### A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.

###### B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.

###### C. Welding certificates.

## 1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M.
  - 2. AWS D1.2/D1.2M.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."

### 2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8-inches o.c. in at least one surface.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.
    - c. ERICO International Corporation.
    - d. Thomas & Betts Corporation; A Member of the ABB Group.
    - e. Approved equal.
  - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  - 3. Material for Channel, Fittings, and Accessories: Stainless steel, Type 316.
  - 4. Channel Width: Selected for applicable load criteria.
  - 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  - 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Hilti, Inc.
      - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      - 3) MKT Fastening, LLC.
      - 4) Approved equal.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened Portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) B-line, an Eaton business.
      - 2) Empire Tool and Manufacturing Co., Inc.
      - 3) MKT Fastening, LLC.
      - 4) Approved equal.
  - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
  - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: Stainless-steel springhead type.
7. Hanger Rods: Threaded steel.

## 2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  1. NECA 1.
  2. NECA 101
  3. NECA 102.
  4. NECA 105.
  5. NECA 111.
- B. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be ¼-inch in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  1. Secure raceways and cables to these supports with two-bolt conduit clamps
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, RMC may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4-inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4-inches thick.
  - 6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
  - 7. To Light Steel: Sheet metal screws.
  - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

### 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

- B. Field Welding: Comply with AWS D1.1/D1.1M.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION



## SECTION 26 05 33

### RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

##### 1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

#### PART 2 - PRODUCTS

##### 2.01 METAL CONDUITS AND FITTINGS

###### A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. AFC Cable Systems; a part of Atkore International.
  - b. Allied Tube & Conduit; a part of Atkore International.
  - c. Anamet Electrical, Inc.
  - d. Opti-Com Manufacturing Network, Inc (OMNI).
  - e. O-Z/Gedney; a brand of Emerson Industrial Automation.
2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. GRC: Comply with ANSI C80.1 and UL 6.
4. ARC: Comply with ANSI C80.5 and UL 6A.
5. IMC: Comply with ANSI C80.6 and UL 1242.
6. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
  - a. Comply with NEMA RN 1.
  - b. Coating Thickness: 0.040-inch, minimum.
7. EMT: Comply with ANSI C80.3 and UL 797.
8. FMC: Comply with UL 1; zinc-coated steel or aluminum.
9. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. AFC Cable Systems; a part of Atkore International.
  - b. Allied Tube & Conduit; a part of Atkore International.
  - c. Anamet Electrical, Inc.
  - d. FSR Inc.
  - e. O-Z/Gedney; a brand of Emerson Industrial Automation.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5. Fittings for EMT:
  - a. Material: Steel.
  - b. Type: Setscrew.
6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040-inch, with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.02 NONMETALLIC CONDUITS AND FITTINGS

### A. Nonmetallic Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. AFC Cable Systems; a part of Atkore International.
  - b. Anamet Electrical, Inc.
  - c. FRE Composites.
  - d. RACO; Hubbell.
  - e. Thomas & Betts Corporation; A Member of the ABB Group.

### B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1. ENT: Comply with NEMA TC 13 and UL 1653.
2. RNC: Type EPC-80-PVC as noted complying with NEMA TC 2 and UL 651 unless otherwise indicated.
3. LFNC: Comply with UL 1660.

### C. Nonmetallic Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. AFC Cable Systems; a part of Atkore International.
  - b. Anamet Electrical, Inc.
  - c. Arnco Corporation.
  - d. FRE Composites.
  - e. RACO; Hubbell.
2. Fittings, General: Listed and labeled for type of conduit, location, and use.
3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
4. Fittings for LFNC: Comply with UL 514B.
5. Solvents and Adhesives: As recommended by conduit manufacturer.

## 2.03 BOXES, ENCLOSURES, AND CABINETS

- ### A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Crouse-Hinds, an Eaton business.
  2. Erickson Electrical Equipment Company.
  3. Hoffman; a brand of Pentair Equipment Protection.
  4. Hubbell Incorporated.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Device Box Dimensions: as required for the use.
- G. Gangable boxes are prohibited.
- H. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  2. Nonmetallic Enclosures: Plastic.
  3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- I. Cabinets:
1. NEMA 250, Type 1 or Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  2. Hinged door in front cover with flush latch and concealed hinge.
  3. Key latch to match panelboards.
  4. Metal barriers to separate wiring of different systems and voltage.
  5. Accessory feet where required for freestanding equipment.
  6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.04 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
  2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Armorcast Products Company.
    - b. NewBasis.
    - c. Oldcastle Enclosure Solutions.
    - d. Oldcastle Precast, Inc.
    - e. Quazite: Hubbell Power Systems, Inc.
  2. Standard: Comply with SCTE 77.
  3. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
  4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
  5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  6. Cover Legend: Molded lettering, "ELECTRIC." or per appropriate system.
  7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

## PART 3 - EXECUTION

### 3.01 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
  2. Underground Conduit: RNC, Type EPC-80-PVC, direct buried or concrete encased as indicated on plans.
  3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting

manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface raceways only where indicated on Drawings.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

### 3.02 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- C. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12-inches of changes in direction.
- D. Support conduit within 12-inches of enclosures to which attached.
- E. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- F. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- H. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- I. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12-inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

- J. Surface Raceways:
1. Install surface raceway with a minimum 2-inch radius control at bend points.
- K. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- L. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where an underground service raceway enters a building or structure.
  3. Where otherwise required by NFPA 70.
- M. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
  2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
  3. Install fitting(s) that provide expansion and contraction for at least 0.00041-inch per foot of length of straight run per degree F of temperature change for PVC conduits.
  4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- N. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72-inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.

2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- O. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- P. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- Q. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

### 3.03 INSTALLATION OF UNDERGROUND CONDUIT

#### A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 20 00 "Earth Moving" for pipe less than 6-inches in nominal diameter.
2. Install backfill as specified in Section 31 20 00 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12-inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 20 00 "Earth Moving."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
  - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3-inches of concrete for a minimum of 12-inches on each side of the coupling.
  - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60-inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

### 3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Retain this article if Project includes small amounts of exterior underground wiring 600 V and less.



- B. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- C. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- D. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1-inch above finished grade.
- E. Install handholes with bottom below frost line.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

### 3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

### 3.06 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

### 4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION

## SECTION 26 05 44

### SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

##### 1.2 ACTION SUBMITTALS

- ###### A. Product Data: For each type of product.

#### PART 2 - PRODUCTS

##### 2.1 SLEEVES

###### A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

- ###### B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
- Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

###### C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

- a. For sleeve cross-section rectangle perimeter less than 50-inches and with no side larger than 16-inches, thickness shall be 0.052-inch.
- b. For sleeve cross-section rectangle perimeter 50-inches or more and one or more sides larger than 16-inches, thickness shall be 0.138-inch.

## 2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Advance Products & Systems, Inc.
    - b. Metraflex Company (The).
    - c. Pipeline Seal and Insulator, Inc.
    - d. Approved equal.
  2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  3. Pressure Plates: Carbon steel.
  4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

## 2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, water-stop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber water-stop collar with center opening to match piping OD.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. HOLDRITE.

## 2.4 GROUT

- A. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.

- D. Packaging: Premixed and factory packaged.

## 2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

## PART 3 - EXECUTION

### 3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
  - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
    - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
    - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
  - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
  - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
  - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
  - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2-inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
  2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

### 3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position water stop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing

all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION

## SECTION 26 05 53

### IDENTIFICATION FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

##### 1.2 SUMMARY

###### A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### PART 2 - PRODUCTS

##### 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with ANSI Z535.4 for safety signs and labels.
- D. Comply with NFPA 70E requirements for arc-flash warning labels.



- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

## 2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage.
- B. Color-Coding for Phase-Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit] conductors.
  - 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
  - 2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
  - 3. Colors for 480/277-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
  - 4. Colors for 240-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
  - 5. Color for Neutral: White or gray.
  - 6. Color for Equipment Grounds: Green.
- C. Warning Label Colors:
  - 1. Identify system voltage with black letters on an orange background.
- D. Warning labels and signs shall include, but are not limited to, the following legends:
  - 1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36-INCHES."
- E. Equipment Identification Labels:

1. Black letters on a white field.

## 2.3 LABELS

- A. Self-Adhesive Labels: Polyester or Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Brady Corporation.
    - b. Brother International Corporation.
    - c. Ideal Industries, Inc.
    - d. Panduit Corp.
  2. Minimum Nominal Size:
    - a. 1-1/2 by 6-inches for raceway and conductors.
    - b. 3-1/2 by 5-inches for equipment.
    - c. As required by authorities having jurisdiction.

## 2.4 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Champion America.
    - b. Ideal Industries, Inc.
    - c. Panduit Corp.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2-inches wide; compounded for outdoor use.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Brady Corporation.
    - b. emedco.

- c. Marking Services, Inc.
- C. Underground-Line Warning Tape:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Brady Corporation.
    - b. Ideal Industries, Inc.
    - c. Marking Services, Inc.
  - 2. Tape:
    - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
    - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
    - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
  - 3. Color and Printing:
    - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
    - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
    - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

## 2.5 SIGNS

- A. Laminated Acrylic or Melamine Plastic Signs:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Brady Corporation.
    - b. Carlton Industries, LP.
    - c. emedco.
  - 2. Engraved legend.

3. Thickness:
  - a. For signs up to 20 sq. in., minimum 1/16-inch thick.
  - b. For signs larger than 20 sq. in., 1/8-inch thick.
  - c. Engraved legend with black letters on white face.
  - d. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## 2.6 CABLE TIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  1. Hellermann Tyton.
  2. Ideal Industries, Inc.
  3. Marking Services, Inc.
  4. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
  1. Minimum Width: 3/16-inch.
  2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
  3. Temperature Range: Minus 40 to plus 185 deg F.
  4. Color: Black, except where used for color-coding.

## 2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

- B. Verify identity of each item before installing identification products.
- C. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- D. Apply identification devices to surfaces that require finish after completing finish work.
- E. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- F. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.
- G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- H. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- I. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- J. Underground Line Warning Tape:
  - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8-inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
  - 2. Install underground-line warning tape for direct-buried cables and cables in raceways.
- K. Laminated Acrylic or Melamine Plastic Signs:
  - 1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2-inches high.
- L. Cable Ties: General purpose, for attaching tags, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.

### 3.2 IDENTIFICATION SCHEDULE

- A. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage.
- B. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- C. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive equipment labels.
  - 1. Apply to exterior of door, cover, or other access.
  - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
    - a. Controls with external control power connections.
- E. Arc Flash Warning Labeling: Self-adhesive labels.
- F. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.
- G. Equipment Identification Labels:
  - 1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
  - 2. Outdoor Equipment: Laminated acrylic or melamine sign.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

### 4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION

## SECTION 26 24 16

### PANELBOARDS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Distribution panelboards.
  - 2. Lighting and appliance branch-circuit panelboards.

##### 1.02 DEFINITIONS

- A. MCCB: Molded-case circuit breaker.
- B. SPD: Surge protective device.

##### 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 5. Include evidence of NRTL listing for SPD as installed in panelboard.
  - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 7. Include wiring diagrams for power, signal, and control wiring.

##### 1.04 INFORMATIONAL SUBMITTALS

- A. Panelboard schedules for installation in panelboards.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.06 FIELD CONDITIONS

- A. Service Conditions: NEMA PB 1, usual service conditions, as follows:
  - 1. Ambient temperatures within limits specified.
  - 2. Altitude not exceeding 6600 feet.

1.07 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
  - 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Surface -mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - b. Outdoor Locations: NEMA 250, Type 3R.
    - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
  - 2. Height: 84-inches maximum.



3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
  4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- F. Incoming Mains Location: Top or Bottom.
- G. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
  2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
  3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
- I. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

## 2.02 PERFORMANCE REQUIREMENTS

- A. Retain "Seismic Performance" Paragraph for projects requiring seismic design. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Verify requirements of authorities having jurisdiction.
- B. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
- C. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

## 2.03 POWER PANELBOARDS

- D. Power panelboards, as specified in this article, fall under requirements of "Distribution Panelboards" in NEMA PB 1.
- E. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. Square D; by Schneider Electric.
- F. Panelboards: NEMA PB 1, distribution type.
- G. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
  - 1. For doors more than 36-inches high, provide two latches, keyed alike.
- H. Mains: Circuit breaker.
- I. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers or Bolt-on circuit breakers.
- J. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger than 125 A: Bolt-on circuit breakers.

## 2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Panelboards, as specified in this article, comply with requirements of "Lighting and Appliance Branch-Circuit Panelboards" in NEMA PB 1.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. SIEMENS Industry, Inc.; Energy Management Division.
  - 4. Square D; by Schneider Electric.
- C. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- D. Mains: Circuit breaker.

- E. Branch Overcurrent Protective Devices: Plug-in or Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

## 2.05 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. SIEMENS Industry, Inc.; Energy Management Division.
  - 4. Square D; by Schneider Electric.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

## 2.06 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NECA 407.
- C. Mount panelboard cabinet plumb and rigid without distortion of box.
- D. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
- E. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- F. Install filler plates in unused spaces.
- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

### 3.02 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components.
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification.
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate

### 3.03 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.
- C. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.

#### PART 4 – MEASUREMENT AND PAYMENT

##### 4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

##### 4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION

SECTION 26 27 13  
ELECTRICITY METERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes electricity metering work to accommodate utility company revenue meter.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For electricity-metering equipment.
  - 1. Include elevation views of front panels of control and indicating devices and control stations.
  - 2. Include diagrams for power, signal, and control wiring.
  - 3. Metering equipment shall meet the requirements of National Grid Electric.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Submit evidence that meters are compatible and conform to National Grid Company requirements.
- B. Field quality-control reports.
- C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.

## 1.6 COORDINATION

- A. Electrical Service Connections: Coordinate with utility companies and utility-furnished components.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 916.

### 2.2 UTILITY METERING INFRASTRUCTURE

- A. Install metering accessories furnished by the utility company, complying with its requirements.
- B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.
- C. Meter Sockets:
  - 1. Comply with requirements of electrical-power utility company.
- D. Arc-Flash Warning Labels:
  - 1. Labels: Comply with requirements for "Self-Adhesive Equipment Labels" and "Signs" in Section 26 05 53 "Identification for Electrical Systems." Apply a properly sized self-adhesive label for each work location included in the analysis. Labels shall be machine printed, with no field-applied markings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.

- B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written instructions. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
- C. Install arc-flash labels as required by NFPA 70.
- D. Wiring Method:
  - 1. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- E. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

### 3.2 FIELD QUALITY CONTROL

- A. Testing: By Contractor.
- B. Perform tests and inspections with the assistance of a factory-authorized service representative.
- C. Prepare test and inspection reports.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

### 4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION



## SECTION 26 27 26

### WIRING DEVICES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. GFCI receptacles.
  - 2. Toggle switches.
  - 3. Wall plates.

##### 1.02 DEFINITIONS

- A. Abbreviations of Manufacturers' Names:
  - 1. Cooper: Copper Wiring Devices; Division of Cooper Industries, Inc.
  - 2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
  - 3. Leviton: Leviton Mfg. Company, Inc.
  - 4. Pass & Seymour: Pass& Seymour/Legrand.

##### 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

##### 1.04 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

##### 1.05 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

## PART 2 - PRODUCTS

### 2.01 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.
- D. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
- E. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations

### 2.02 GFCI RECEPTACLES

- A. Non-feed-through-type GFCI unit shall be selected where no protection of downstream receptacles is required.
- B. General Description:
  - 1. 125 V, 20 A, straight blade, feed-through type.
  - 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
  - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- C. Duplex GFCI Convenience Receptacles:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.

- c. Leviton Manufacturing Co., Inc.
- d. Pass & Seymour/Legrand (Pass & Seymour).

## 2.03 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
  - 1. Single Pole:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).

## 2.04 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: High-impact thermoplastic in finished spaces.
  - 3. Material for Unfinished Spaces: Galvanized steel.
  - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

## 2.05 FINISHES

- A. Device Color:
  - 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: For plastic covers, match device color.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  - 4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pig tailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
  - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6-inches in length.
  5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
  6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
  7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  8. Tighten unused terminal screws on the device.
  9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
- H. GFCI Receptacles: Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

### 3.02 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform the following tests and inspections:
1. Tests for Convenience Receptacles:
    - a. Line Voltage: Acceptable range is 105 to 132 V.
    - b. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
    - c. Using the test plug, verify that the device and its outlet box are securely mounted.

- d. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- D. Wiring device will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION

## SECTION 26 28 13

### FUSES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:
  - a. Control circuits.
  - b. Panelboards.
  - c. Enclosed controllers.
  - d. Enclosed switches.

##### 1.2 ACTION SUBMITTALS

- ###### A. Product Data: For each type of product.

##### 1.3 CLOSEOUT SUBMITTALS

- ###### A. Operation and maintenance data.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- ###### A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bussmann, an Eaton business.
2. Edison; a brand of Bussmann by Eaton.
3. Littelfuse, Inc.
4. Mersen USA.
5. Approved equal.

##### 2.2 CARTRIDGE FUSES

- ###### A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC.
  2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC.
  3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC.
  4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC.
  5. Type J: 600-V, zero- to 600-A rating, 200 kAIC.
  6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC.
  7. Type T: 600-V, zero- to 800-A rating, 200 kAIC.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s) in location shown on the Drawings or as indicated in the field by Owner.

#### 3.2 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

### PART 4 – MEASUREMENT AND PAYMENT

#### 4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.



4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION

## SECTION 26 43 13

### SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

#### PART 1 - GENERAL

##### 1.1 SUMMARY:

- A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

##### 1.2 ACTION SUBMITTALS:

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
  - 2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For manufacturer's special warranty.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

##### 1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 GENERAL SPD REQUIREMENTS

- A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Comply with UL 1449.
- D. MCOV of the SPD shall be the nominal system voltage.

### 2.2 SERVICE ENTRANCE SUPPRESSOR

- A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. ABB USA.
  - 2. Eaton.
  - 3. General Electric Company.
  - 4. Leviton Manufacturing Co., Inc.
- B. SPDs: Comply with UL 1449, Type 2.
  - 1. SPDs with the following features and accessories:
    - a. Integral disconnect switch.
    - b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
    - c. Indicator light display for protection status.
- C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V or 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
  - 1. Line to Neutral: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
  - 2. Line to Ground: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
  - 3. Line to Line: 2000 V for 480Y/277 V, 1000 V for 208Y/120 V.
- E. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:
  - 1. Line to Neutral: 700 V.

2. Line to Ground: 700 V.
3. Line to Line: 1000 V.

F. SCCR: Equal or exceed 100 kA.

G. Inominal Rating: 20 kA.

## 2.3 PANEL SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advanced Protection Technologies Inc. (APT).
2. Current Technology Inc.
3. Eaton.
4. General Electric Company.

B. SPDs: Comply with UL 1449, Type 2.

1. Include LED indicator lights for power and protection status.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V or 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
3. Neutral to Ground: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
4. Line to Line: 2000 V for 480Y/277 V, 1200 V for 208Y/120 V.

E. SCCR: Equal or exceed 100 kA.

F. Inominal Rating: 20 kA.

## 2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

B. Outdoor Enclosures: NEMA 250, Type 3R.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.
- C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- D. Use crimped connectors and splices only. Wire nuts are unacceptable.
- E. Complete startup checks according to manufacturer's written instructions. Energize SPDs after power system has been energized, stabilized, and tested.

### 3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
  - 1. Compare equipment nameplate data for compliance with Drawings and Specifications.
  - 2. Inspect anchorage, alignment, grounding, and clearances.
  - 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- B. An SPD will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.3 DEMONSTRATION

- A. Train Owner's maintenance personnel to operate and maintain SPDs.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION

SECTION 26 56 00  
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Exterior luminaires with lamps.
  - 2. Poles and accessories.

1.3 DEFINITIONS

- A. AASHTO: American Association of State Highway and Transportation Officials.
- B. CCT: Correlated color temperature.
- C. CRI: Color-rendering index.
- D. HID: High-intensity discharge.
- E. LER: Luminaire efficacy rating.
- F. Luminaire: Complete lighting fixture, including ballast housing if provided.
- G. Pole: Luminaire support structure, including tower used for large area illumination.
- H. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

- A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.
- B. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.

- C. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.
  - 1. Basic wind speed for calculating wind load for poles 50 feet high or less is 120 mph.
    - a. Wind Importance Factor: 1.0.
    - b. Minimum Design Life: 25 years.
    - c. Velocity Conversion Factors: 1.0.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
  - 1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
  - 2. Details of attaching luminaires and accessories.
  - 3. Details of installation and construction.
  - 4. Luminaire materials.
  - 5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
    - a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
  - 6. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
  - 7. Materials, dimensions, and finishes of poles.
  - 8. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
  - 9. Anchor bolts for poles.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
  - 3. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples: For products designated for sample submission in the Exterior Lighting Device Schedule. Each Sample shall include lamps and ballasts.



## 1.6 INFORMATIONAL SUBMITTALS

- A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.
- B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.
- C. Field quality-control reports.
- D. Warranty: Sample of special warranty.

## 1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and poles.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps: Furnish at least one of each type.
  - 2. Glass and Plastic Lenses, Covers, and Other Optical Parts: Furnish at least one of each type.
  - 3. Globes and Guards: Furnish at least one of each type.

## 1.9 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with IEEE C2, "National Electrical Safety Code."
- D. Comply with NFPA 70.

## 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Package aluminum poles for shipping according to ASTM B 660.

- B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- C. Retain factory-applied pole wrappings on metal poles until right before pole installation.

#### 1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
  - 1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
  - 2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
  - 3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
  - 4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide products indicated in Luminaire Schedule on Drawings.

#### 2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
  - 1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.
  - 2. LER Tests Fluorescent Fixtures: Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
  - 3. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- K. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
  - 1. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
    - a. Color: As selected by Architect from manufacturer's full range.
- L. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
  - 1. Label shall include the following lamp and ballast characteristics:
    - a. "USES ONLY" and include specific lamp type.
    - b. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
    - c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.

- d. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
- e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
- f. CCT and CRI for all luminaires.

## 2.3 DRIVERS FOR LED LAMPS

- A. Description: Electronic driver designed for applicable fixture(s) and load indicated by LED lamps. Driver shall be designed for full light output unless dimmer or bi-level control is indicated.
  - 1. Input Voltage Range: 120 – 277 +/-10%.
  - 2. Output Current: 0.35A dc.
  - 3. Input Frequency: 50/60 Hz.
  - 4. Power Factor: >90% at full load.
  - 5. THD: <20% at full load.
  - 6. Case Temperature: Rated for -40 deg C through +80 deg C.
  - 7. Overheat protection, self-limited short circuit protection and overload protected.
  - 8. Primary fused.

## 2.4 LED LAMPS

- A. LED Lamps: Minimum CRI of 70 and color temperature of 3000 K +/-500 K.

## 2.5 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4-M.
  - 1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
  - 2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
  - 1. Materials: Shall not cause galvanic action at contact points.
  - 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

3. Anchor-Bolt Template: Plywood or steel.
- D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

### PART 3 - EXECUTION

#### 3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Fasten luminaire to indicated structural supports.
  1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Adjust luminaires that require field adjustment or aiming. Adjust photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

#### 3.2 POLE INSTALLATION

- A. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
  1. Fire Hydrants and Storm Drainage Piping: 60 inches.
  2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
  3. Trees: 15 feet from tree trunk.
- B. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."
- C. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
  1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
  2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
  3. Install base covers unless otherwise indicated.
  4. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
- D. Raise and set poles using web fabric slings (not chain or cable).

### 3.3 INSTALLATION OF INDIVIDUAL GROUND-MOUNTING LUMINAIRES

- A. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 03 30 00 "Cast-in-Place Concrete."

### 3.4 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

### 3.5 GROUNDING

- A. Ground metal poles and support structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
  - 1. Install grounding electrode for each pole unless otherwise indicated.
  - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

### 3.6 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
  - 1. Verify operation of photoelectric controls.
- C. Illumination Tests:
  - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
    - a. IESNA LM-64, "Photometric Measurements of Parking Areas."
    - b. IESNA LM-72, "Directional Positioning of Photometric Data."
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. The lump sum price for work included in this section of the specifications shall be included as part of Section 26 00 50 and shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, as shown on the drawings and called for in the specifications.

4.02 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION

SECTION 26 56 68  
EXTERIOR ATHLETIC LIGHTING

Lighting System with LED Light Source

PART 1 – GENERAL

1.1 SUMMARY

- A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.
- B. The purpose of these specifications is to define the lighting system performance and design standards for the Industrial Drive Field Complex lighting project using an LED Lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.
- C. The sports lighting will be for the following venues:
  - 1. Soccer/Field Hockey Field
- D. The primary goals of this sports lighting project are:
  - 1. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore light levels are guaranteed to not drop below specified target values for a period of 25 years.
  - 2. Environmental Light Control: It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players, spectators and neighbors.
  - 3. Control and Monitoring: To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Fields should be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.

1.2 LIGHTING PERFORMANCE

- A. Illumination Levels and Design Factors: Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Appropriate light loss factors shall be applied and submitted for the basis of design. Average illumination level shall be measured in accordance with the IESNA LM-5-04 (IESNA Guide for Photometric Measurements of Area and Sports Lighting Installations). Illumination levels shall not to drop below desired target values in accordance to IES RP-6-15, Page 2, Maintained Average Illuminance and shall be guaranteed for the full warranty period.

| Area of Lighting | Average Target Illumination Levels | Maximum to Minimum Uniformity Ratio | Grid Points | Grid Spacing |
|------------------|------------------------------------|-------------------------------------|-------------|--------------|
| Soccer           | 50FC                               | 2:1                                 | 77          | 30' x 30'    |
| Field Hockey     | 50FC                               | 2:1                                 | 60          | 30' x 30'    |



- B. Color: The lighting system shall have a minimum color temperature of 5700K and a CRI of 75.
- C. Mounting Heights: To ensure proper aiming angles for reduced glare and to provide better playability, minimum mounting heights shall be as described below. Higher mounting heights may be required based on photometric report and ability to ensure the top of the field angle is a minimum of 10 degrees below horizontal.

| # of Poles | Pole Designation | Pole Height |
|------------|------------------|-------------|
| 4          | S1, S2, S3, S4   | 70'         |

1.3 ENVIRONMENTAL LIGHT CONTROL

- A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted.
- B. Spill Light and Glare Control: To minimize impact on adjacent properties, spill light and candela values must not exceed the following levels taken at 3 feet above grade.

| Specified Spill Line @ 150' | Maximum |
|-----------------------------|---------|
| Horizontal Footcandles      | .1 FC   |
| Vertical Footcandles        | .2 FC   |
| Candela                     | 3585 CD |

- C. Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights. Illumination level shall be measured in accordance with the IESNA LM-5-04 after 1 hour warm up.
- D. The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testing laboratory with a minimum of five years experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

PART 2 – PRODUCT

2.1 SPORTS LIGHTING SYSTEM CONSTRUCTION

- A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.
- B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel of 18-8 grade or better, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion

and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.

- C. System Description: Lighting system shall consist of the following:
1. Galvanized steel poles and cross-arm assembly.
  2. Non-approved pole technology:
    - a. Square static cast concrete poles will not be accepted.
    - b. Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long term performance concerns.
  3. Lighting systems shall use concrete foundations. See Section 2.4 for details.
    - a. For a foundation using a pre-stressed concrete base embedded in concrete backfill the concrete shall be air-entrained and have a minimum compressive design strength at 28 days of 3,000 PSI. 3,000 PSI concrete specified for early pole erection, actual required minimum allowable concrete strength is 1,000 PSI. All piers and concrete backfill must bear on and against firm undisturbed soil.
    - b. For anchor bolt foundations or foundations using a pre-stressed concrete base in a suspended pier or re-inforced pier design pole erection may occur after 7 days. Or after a concrete sample from the same batch achieves a certain strength.
  4. Manufacturer will supply all drivers and supporting electrical equipment
    - a. Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure. Integral drivers are not allowed.
    - b. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2\_2002.
  5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
  6. All luminaires, visors, and cross-arm assemblies shall withstand 150 mph winds and maintain luminaire aiming alignment.
  7. Control cabinet to provide remote on-off control, monitoring of the lighting system. See Section 2.3 for further details.
  8. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
    - a. Integrated grounding via concrete encased electrode grounding system.
    - b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the

structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

D. Safety: All system components shall be UL listed for the appropriate application.

## 2.2 ELECTRICAL

A. Electric Power Requirements for the Sports Lighting Equipment:

1. Electric power: 208 Volt, 3 Phase
2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

B. Energy Consumption: The kW consumption for the field lighting system shall be 34kW, or less.

## 2.3 CONTROL

A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.

B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.

C. Dimming: System shall provide for 3-stage dimming (high-medium-low). Dimming with be set via scheduling options (Website, app, phone, fax, email)

D. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute “early off” commands by phone. Scheduling tool shall be capable of setting curfew limits.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

E. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).

F. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS, Android and Blackberry devices.

Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.

1. Cumulative hours: shall be tracked to show the total hours used by the facility
2. Report hours saved by using early off and push buttons by users.

- G. Communication Costs: Manufacturer shall include communication costs for operating the control and monitoring system for a period of 25 years.
- H. Communication with luminaire drivers: Control system shall interface with drivers in electrical components enclosures by means of powerline communication.

## 2.4 STRUCTURAL PARAMETERS

- A. Wind Loads: Wind loads shall be based on the 2015 International Building Code. Wind loads to be calculated using ASCE 7-10, an ultimate design wind speed of 115 mph and exposure category C.
- B. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2013 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-6).
- C. Foundation Design: The foundation design shall be based on soil parameters as outlined in the geotechnical report. Weston & Sampson Engineers, Inc. ENG22-0852 January 18, 2023
- D. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole. These drawings must be submitted at time of bid to allow for accurate pricing.

## PART 3 – EXECUTION

### 3.1 SOIL QUALITY CONTROL

- A. It shall be the Contractor's responsibility to notify the Owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. Contractor may issue a change order request / estimate for the Owner's approval / payment for additional costs associated with:
  - 1. Providing engineered foundation embedment design by a registered engineer in the State of Massachusetts for soils other than specified soil conditions;
  - 2. Additional materials required to achieve alternate foundation;
  - 3. Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

### 3.2 DELIVERY TIMING

- A. Delivery Timing Equipment On-Site: The equipment must be on-site 8-12 weeks from receipt of approved submittals and receipt of complete order information.

### 3.3 FIELD QUALITY CONTROL

- A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA LM-5-04.
- B. Field Light Level Accountability
  - 1. Light levels are guaranteed not to fall below the target maintained light levels for the entire warranty period of 25 years. These levels will be specifically stated as "guaranteed" on the illumination summary provided by the manufacturer.

2. The contractor/manufacturer shall be responsible for conducting initial light level testing and an additional inspection of the system, in the presence of the owner, one year from the date of commissioning of the lighting.
  3. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities.  
Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs.
- C. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles and uniformity ratios are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy Owner.

### 3.4 WARRANTY AND GUARANTEE

- A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.
- B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer is responsible for removal and replacement of failed luminaires, including all parts, labor, shipping, and equipment rental associated with maintenance. Owner agrees to check fuses in the event of a luminaire outage.

## PART 4 – DESIGN APPROVAL

### 4.0 PRE-BID SUBMITTAL REQUIREMENTS (Non-Musco)

- A. Design Approval: The owner / engineer will review pre-bid submittals per section 4.0.B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.
- B. Approved Product: Musco's Light-Structure System™ with TLC for LED™ is the approved product. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.
- C. All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.

- D. Bidders are required to bid only products that have been approved by this specification or addendum by the owner or owner's representative. Bids received that do not utilize an approved system/design, will be rejected. **REQUIRED SUBMITTAL INFORMATION FOR ALL MANUFACTURERS (NOT PRE-APPROVED) 10 DAYS PRIOR TO BID**

*All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements. Complete the Yes/No column to indicate compliance (Y) or noncompliance (N) for each item. Submit checklist below with submittal.*

| Yes / No | Tab | Item                      | Description   |
|----------|-----|---------------------------|---|
|          | A   | Letter/ Checklist         | Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.   |
|          | B   | Equipment Layout          | Drawing(s) showing field layouts with pole locations  |
|          | C   | On Field Lighting Design  | Lighting design drawing(s) showing: <ul style="list-style-type: none"> <li>a. Field Name, date, file number, prepared by</li> <li>b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x &amp; y), Illuminance levels at grid spacing specified</li> <li>c. Pole height, number of fixtures per pole, horizontal and vertical aiming angles, as well as luminaire information including wattage, lumens and optics</li> <li>d. Height of light test meter above field surface.</li> <li>e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number of luminaires, total kilowatts, average tilt factor; light loss factor.</li> </ul> |
|          | D   | Off Field Lighting Design | Lighting design drawing showing initial spill light levels along the boundary line (defined on bid drawings) in footcandles. Lighting design showing glare along the boundary line in candela. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights.   |
|          | E   | Photometric Report        | Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.   |
|          | F   | Performance Guarantee     | Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed to not fall below target levels for warranty period.  |
|          | G   | Structural Calculations   | Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of Massachusetts, if required by owner. (May be supplied upon award).  |

|   |                             |   |
|---|-----------------------------|---|
| H | Control & Monitoring System | Manufacturer of the control and monitoring system shall provide written definition and schematics for automated control system. They will also provide ten (10) references of customers currently using proposed system in the state of Massachusetts.  |
| J | Warranty                    | Provide written warranty information including all terms and conditions. Provide ten (10) references of customers currently under specified warranty in the state of Massachusetts.   |
| K | Project References          | Manufacturer to provide a list of ten (10) projects where the technology and specific fixture proposed for this project has been installed in the state of Massachusetts. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number. |
| L | Product Information         | Complete bill of material and current brochures/cut sheets for all product being provided.  |
| M | Delivery                    | Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.  |
| N | Non-Compliance              | Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.  |

The information supplied herein shall be used for the purpose of complying with the specifications for the Industrial Drive Field Complex lighting project. By signing below I agree that all requirements of the specifications have been met and that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in the Non-Compliance section.

Manufacturer: \_\_\_\_\_ Signature: \_\_\_\_\_

Contact Name: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

Contractor: \_\_\_\_\_ Signature: \_\_\_\_\_

## SECTION 31 00 00

### EARTHWORK

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

The Contractor shall make excavations of normal depth in earth for trenches and structures, shall backfill and compact such excavations to the extent necessary, shall furnish the necessary material and construct embankments and fills, and shall make miscellaneous earth excavations and do miscellaneous grading.

##### 1.02 RELATED WORK:

- A. Section 00 31 32, SUBSURFACE DATA
- B. Section 00 31 43, PERMITS
- C. Section 01 11 00, CONTROL OF WORK AND MATERIALS
- D. Section 31 11 00, CLEARING AND GRUBBING
- E. Section 31 23 19, DEWATERING
- G. Section 31 50 00, SUPPORT OF EXCAVATION
- H. Section 32 12 00, PAVING
- I. Section 32 18 13, SYNTHETIC GRASS INFILL SYSTEM
- J. Section 32 32 53, STONE RETAINING WALLS
- K. Section 32 91 00, LOAMING AND PLANTING PREPARATION

##### 1.03 REFERENCES:

#### ASTM International (ASTM)

- |            |  |
|------------|--|
| ASTM C131  | Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.                                |
| ASTM D1557 | Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft <sup>3</sup> ) (2700 kN-m/m <sup>3</sup> ) |
| ASTM D2216 | Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soils and Rock by Mass ASTM D2487 Standard                               |



Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D6913 Standard Test Method Particle Size Analysis of Soils

ASTM D6938 Test Methods for Density of Soil and Soil-aggregate in Place by Nuclear Methods (Shallow Depth).

Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges.

Code of Massachusetts Regulations (CMR) 310.40.0032 Contaminated Media and Contaminated Debris

Code of Massachusetts Regulations (CMR) 520 CMR 14.00 Excavation & Trench Safety Regulation

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Material Test Reports: From a qualified independent testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - 1. Classification according to ASTM D 2487 and particle size distribution according to ASTM D 6913 of each on-site and borrow soil and/or fill material proposed for fill and backfill.
  - 2. Laboratory compaction curve according to ASTM D 1557 for each onsite and borrow soil and/or fill material proposed for fill and backfill.

1.05 PROTECTION OF EXISTING PROPERTY:

- A. The work shall be executed in such manner as to prevent any damage to facilities at the site and adjacent property and existing improvements, such as but not limited to streets, curbs, paving, service utility lines, structures, monuments, benchmarks, observation wells, and other public or private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout and other hazards created by earthwork operations.
- B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at its own expense, make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to at least the condition that existed at the start of operations. The Contractor shall replace, at its own cost, existing benchmarks, observation wells, monuments, and other reference points, which are disturbed or destroyed.

- C. Buried drainage structures and pipes, observation wells and piezometers, including those which project less than eighteen inches (18") above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment and shall be maintained at all times until completion of project.

1.06 DRAINAGE:

- A. The Contractor shall provide, at its own expense, adequate drainage facilities to complete all work items in an acceptable manner. Drainage shall be done in a manner so that runoff will not adversely affect construction procedures or cause excessive disturbance of underlying natural ground or abutting properties.

1.07 FROST PROTECTION AND SNOW REMOVAL:

- A. The Contractor shall, at its own expense, keep earthwork operations clear and free of accumulations of snow as required to carry out the work.
- B. The Contractor shall protect the subgrade beneath new structures and pipes from frost penetration when freezing temperatures are expected.

1.08 GEOTECHNICAL FIELD AND LABORATORY TESTING:

- A. The Contractor shall retain the services of a geotechnical testing laboratory to conduct the laboratory analyses and field testing of soil materials required by this specification. Coordinate locations and types of field tests to be performed with the Engineer and cooperate in every way with the Engineer and testing laboratory during field testing and with collection of soil samples for laboratory testing.

PART 2 - PRODUCTS

2.01 BACKFILL MATERIALS:

A. GRAVEL BORROW:

Gravel Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.03.0, Type b.

B. CRUSHED STONE:

Crushed stone shall satisfy the requirements listed in MassDOT Specification Section M2.01.4 (3/4-inch crushed stone) or M2.01.1 (1 1/2-inch crushed stone) or unless otherwise required.

C. SAND BORROW:

Sand Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.04.0.

D. PEASTONE:

Peastone shall be smooth, hard, naturally occurring, rounded stone meeting the following gradation requirements:

|                                       |   |      |
|---------------------------------------|---|------|
| Passing 5/8 inch square sieve opening | - | 100% |
| Passing No. 8 sieve opening           | - | 0%   |

E. DENSE GRADED CRUSHED STONE:

Dense Graded Crushed Stone shall satisfy the requirements listed in MassDOT Specification Section M2.01.7.

F. RIPRAP:

1. Stone for pipe ends shall be angular and shall be in accordance with MassDOT Specification Section M2.02.3, Stone for Pipe Ends.
2. Stone for slope protection shall be angular and shall be in accordance with MassDOT Specification Section M2.02.4, Modified Rockfill.
3. Stone for drainage swale ends shall conform to MassDOT Specification Section M2.02.3 and shall be not weigh less than 50 pounds or more than 125 pounds and least 75% of the volume shall consist of stones not less than 75 pounds each. The stones shall be so graded that when placed with larger stones, the entire mass will be compact.

G. IMPERVIOUS SOIL BORROW:

Impervious soil borrow shall be in accordance with MassDOT Specification Section M1.08.0, Impervious soil borrow.

H. BACKFILL MATERIALS:

1. Class B Backfill:

Class B backfill shall be granular, well graded friable soil; free of rubbish, ice, snow, tree stumps, roots, clay and organic matter; with 30 percent or less passing the No. 200 sieve; no stone greater than two-third (2/3) loose lift thickness, or six inches, whichever is smaller.

2. Select Backfill:

Select backfill shall be granular, well graded friable soil, free of rubbish, ice, snow, tree stumps, roots, clay and organic matter, and other deleterious or organic material; graded within the following limits:

| <u>Sieve Size</u> | <u>Percent Finer by Weight</u> |
|-------------------|--------------------------------|
| 3"                | 100                            |
| No. 10            | 30-95                          |
| No. 40            | 10-70                          |
| No. 200           | 0-10                           |

I. ORDINARY FILL:

Ordinary Fill shall be granular, well graded friable soil; free of rubbish, ice, snow, tree stumps, roots, clay and organic matter; with 30 percent or less passing the No. 200 sieve; no stone greater than two-third (2/3) loose lift thickness, or six inches, whichever is smaller.

J. BASE STONE for SYNTHETIC TURF

Refer to Section 32 18 13 - SYNTHETIC GRASS INFILL SYSTEM for material requirements on base stone and finishing stone.

2.02 FABRIC MATERIALS:

A. GEOTEXTILE FABRIC:

1. Geotextile Fabric shall consist of a nonwoven fabric made from polypropylene or polyethylene filaments or yarns.
2. Geotextile Fabric shall be inert to organic chemicals commonly encountered in the soil.
3. The Geotextile Fabric shall be Tencate Mirafi 140N as manufactured by Tencate Geosynthetics, Pendergrass, GA; Foss 65 by Foss Manufacturing Co., Hampton, NH; US 120NW, as manufactured by US Fabrics, Cincinnati, OH, or approved equal.
4. The Geotextile Fabric shall be installed at locations shown on the drawings or designated by the Owner's Representative. Each width of Geotextile Fabric shall be overlapped in accordance with manufacturer's recommendations, but not less than 2 feet, to prevent intrusion of soil fines.

PART 3 - EXECUTION

3.01 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING

## CONSTRUCTION:

- A. Contractor shall take the necessary steps to avoid disturbance of subgrade during excavation and filling operations, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering and other acceptable control measures.
- B. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be removed and replaced with a minimum 12-inch layer of compacted crushed stone wrapped all around in non-woven Geotextile Fabric . Costs of removal and replacement shall be borne by the Contractor.
- C. The Contractor shall place a minimum of 12-inch layer of Crushed Stone wrapped in Geotextile Fabric over the natural underlying soil to stabilize areas which may become disturbed as a result of rain, surface water runoff or groundwater seepage pressures, all at no additional cost to the Owner. The Contractor also has the option of drying materials in-place and compacting to specified densities.

## 3.02 EXCAVATION:

### A. GENERAL:

- 1. The Contractor shall perform all work of any nature and description required to accomplish the work as shown on the Drawings and as specified herein.
- 2. Excavations, unless otherwise required by the Engineer, shall be carried only to the depths and limits shown on the Drawings. If unauthorized excavation is carried out below required subgrade and/or beyond minimum lateral limits shown on Drawings, it shall be backfilled with Gravel Borrow and compacted at the Contractor's expense as specified below, except as otherwise indicated. Excavations shall be kept in dry and good conditions at all times, and all voids shall be filled to the satisfaction of the Engineer.
- 3. In all excavation areas, the Contractor shall strip the surficial topsoil layer and underlying subsoil layer separate from underlying soils. In paved areas, the Contractor shall first cut pavement as specified in paragraph 3.02 B.1 of this specification, strip pavement and pavement subbase separately from underlying soils. All excavated materials shall be stockpiled separately from each other within the limits of work.
- 4. The Contractor shall follow a construction procedure, which permits visual identification of stable natural ground. Where groundwater is encountered, the size of the open excavation shall be limited to that which can be handled by the Contractor's chosen method of dewatering, and which will allow visual observation of the bottom and backfill in the dry.

5. The Contractor shall excavate unsuitable materials to stable natural ground where encountered at proposed excavation subgrade, as required by the Engineer. Unsuitable material includes undocumented fill, topsoil, loam, peat, other organic materials, snow, ice, trash, and soils that cannot be proof compacted as described herein. Unless specified elsewhere or otherwise required by the Engineer, areas where unsuitable materials have been excavated to stable ground shall be backfilled with compacted Crushed Stone wrapped all around in non-woven Geotextile Fabric .

**B. TRENCHES:**

1. Prior to excavation, trenches in pavement shall have the traveled way surface cut in a straight line by a concrete saw or equivalent method, to the full depth of pavement. Excavation shall only be between these cuts. Excavation support shall be provided as required to avoid undermining of pavement. Cutting operations shall not be done by ripping equipment.
2. The Contractor shall satisfy all dewatering requirements specified in Section 31 23 19 DEWATERING, before performing trench excavations.
3. Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes, and depths of cover indicated on the Drawings. Trench widths shall be as shown on the Drawings or as specified.
4. Where pipe is to be laid in bedding material, the trench may be excavated by machinery to, or just below, the designated subgrade provided that the material remaining in the bottom of the trench is not disturbed.
5. If pipe is to be laid in embankments or other recently filled areas, the fill material shall first be placed to a height of at least 12-inches above the top of the pipe before excavation.
6. Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed.
7. If, in the opinion of the Engineer, the subgrade, during trench excavation, has been disturbed as a result of rain, surface water runoff or groundwater seepage pressures, the Contractor shall remove such disturbed subgrade to a minimum of 12 inches and replace with Crushed Stone wrapped in Geotextile Fabric . The cost of removal and replacement shall be borne by the Contractor.
8. The Contractor shall obtain a trench permit from the municipality where the trench is located prior to making any excavations of trenches (any subsurface excavation greater than three (3) feet in depth and fifteen (15) feet or less between soil walls as measured from the bottom).

9. All trenches required to be permitted must be attended, covered, barricaded, or backfilled. Covers must be road plates at least ¾-inch thick or equivalent, barricades must be fences at least 6-feet high with no openings greater than 4-inches between vertical supports and all horizontal supports required to be located on the trench-side of the fencing.

C. BUILDING AND FOUNDATION EXCAVATION:

1. Excavations shall not be wider than required to set, brace, and remove forms for concrete, or perform other necessary work.
2. After the excavation has been made, and before forms are set for footings, mats, slabs, or other structures, and before reinforcing is placed, all loose or disturbed material shall be removed from the subgrade. The bearing surface shall then be compacted to meet the requirements of this specification.
3. If, in the opinion of the Engineer, the existing material at subgrade elevation is unsuitable for structural support, the Contractor shall excavate and dispose of the unsuitable material to the required width and depth as required by the Engineer. If, in the opinion of the Engineer, Geotextile Fabric is required; the Contractor shall place Geotextile Fabric, approved by the Engineer, as per manufacturer's recommendations. Crushed Stone shall then be placed in lifts and compacted to required densities. Backfill shall be placed to the bottom of the proposed excavation.

D. EXCAVATION NEAR EXISTING STRUCTURES:

1. Attention is directed to the fact that there are pipes, manholes, drains, and other utilities in certain locations. An attempt has been made to locate all utilities on the drawings, but the completeness or accuracy of the given information is not guaranteed.
2. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and excavation shall be done by means of hand tools, as required. Such manual excavation, when incidental to normal excavation, shall be included in the work to be done under items involving normal excavation.
3. Where determination of the exact location of a pipe or other underground structure is necessary for properly performing the work, the Contractor shall excavate test pits to determine the locations.

3.03 BACKFILL PLACEMENT AND COMPACTION:

A. GENERAL:

1. Prior to backfilling, the Contractor shall compact the exposed subgrade to a firm and unyielding condition with at least 5 passes by a 12-ton smooth drum vibratory

roller over the subgrade or other acceptable compaction equipment subject to the approval of the Engineer.

2. After approval of subgrade by the Engineer, the Contractor shall backfill areas to required contours and elevations with specified materials.
3. The Contractor shall place and compact materials to the specified density in continuous horizontal layers, not to exceed nine (9) inches in uncompacted lifts. The degree of compaction shall be based on maximum dry density as determined by ASTM Test D1557, Method C. The minimum degree of compaction for fill placed shall be as follows:

| <u>Location</u>                       | <u>Percent of<br/>Maximum Density</u> |
|---------------------------------------|---------------------------------------|
| Below pipe centerline                 | 95                                    |
| Above pipe centerline                 | 92                                    |
| Below pavement (upper 3 ft.)          | 95                                    |
| Embankments                           | 95                                    |
| Below pipe in embankments             | 95                                    |
| Adjacent to structures                | 92                                    |
| Below structures                      | 95                                    |
| Below Geosynthetic Soil Stabilization | 95                                    |

4. Crushed Stone shall be placed in horizontal layers not exceeding 12 inches of uncompacted lifts and each lift compacted to a firm and unyielding condition with at least four (4) passes of a 12-ton smooth drum vibratory roller or other acceptable compaction equipment subject to the approval of the Engineer.
5. The Engineer reserves the right to test backfill for conformance to the specifications and the Contractor shall assist as required to obtain the information. Compaction testing will be performed by the Engineer or by an inspection laboratory designated by the Engineer, engaged and paid for by the Owner. If test results indicate work does not conform to specification requirements, the Contractor shall remove or correct the defective Work by recompacting where appropriate or replacing as necessary and approved by the Engineer, to bring the work into compliance, at no additional cost to the Owner. All backfilled materials under structures and buildings shall be field tested for compliance with the requirements of this specification.
6. Where horizontal layers meet a rising slope, the Contractor shall key each layer by benching into the slope.
7. If the material removed from the excavation is suitable for backfill with the exception that it contains stones larger than permitted, the Contractor has the option to remove the oversized stones and use the material for backfill or to provide replacement backfill at no additional cost to the Owner.



8. The Contractor shall remove loam and topsoil, loose vegetation, stumps, large roots, etc., from areas upon which embankments will be built or areas where material will be placed for grading. The subgrade shall be shaped as indicated on the Drawings and shall be prepared by forking, furrowing, or plowing so that the first layer of the fill material placed on the subgrade will be well bonded to the subgrade.
9. Maintain backfill material with a uniform moisture content, with no visible wet or dry streaking, between plus 2 percent and minus 2 percent of optimum moisture content. The final filled soil mass shall be as uniform as possible in lift thickness, moisture content, and effort required to compact soil mass. Backfill which is too wet for use shall be stockpiled, allowed to dry sufficiently, and reused by the Contractor at no additional cost to the Owner.

**B. TRENCHES:**

1. Bedding as detailed and specified shall be furnished and installed beneath the pipeline prior to placement of the pipeline. A minimum bedding thickness shall be maintained between the pipe and undisturbed material, as shown on the Drawings.
2. As soon as practicable after the pipes have been laid, backfilling shall be started.
3. Unless otherwise indicated on the Drawings, select backfill shall be placed by hand shovel in 6-inch thick lifts up to a minimum level of 12-inches above the top of pipe. This area of backfill is considered the zone around the pipe and shall be thoroughly compacted before the remainder of the trench is backfilled. Compaction of each lift in the zone around the pipe shall be done by use of power-driven tampers weighing at least 20 pounds or by vibratory compactors. Care shall be taken that material close to the bank, as well as in all other portions of the trench, is thoroughly compacted to densities required.
4. If the materials above the trench bottom are unsuitable for backfill, the Contractor shall furnish and place backfill materials meeting the requirements for trench backfill, as shown on the drawings or specified herein.
5. Should the Engineer order Crushed Stone for utility support or for other purposes, the Contractor shall furnish and install the Crushed Stone as directed.

**C. BACKFILLING UNDER BUILDINGS AND FOUNDATIONS:**

1. Material to be used under structures shall be Dense Graded Crushed Stone or Gravel Borrow or as shown on the Drawings or as required by the Engineer. Where Gravel Borrow fill is required to support proposed footings, walls, slabs, and other structures, the material shall be placed in a manner accepted by the Engineer. Compaction of each lift shall meet the density requirements of this specification.

D. BACKFILLING ADJACENT TO STRUCTURES:

1. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads to which they will be subjected. Excavated material approved by the Engineer may be used in backfilling around structures. Backfill material shall be thoroughly compacted to meet the requirements of this specification.
2. Contractor shall use extra care when compacting adjacent to pipes and drainage structures. Backfill and compaction shall proceed along sides of drainage structures so that the difference in top of fill level on any side of the structure shall not exceed two feet (2') at any stage of construction.

3.04 DISPOSAL OF SURPLUS MATERIALS:

- A. Surplus excavated materials, which are acceptable to the Engineer, shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill. Upon written approval of the Engineer, surplus excavated materials shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes as indicated by the Owner, within its jurisdictional limits; all at no additional cost to the Owner.
- B. Surplus excavated material not needed as specified above shall be hauled away and disposed of by the Contractor at no additional cost to the Owner, at appropriate locations, and in accordance with arrangements made by it. Disposal of all rubble shall be in accordance with all applicable local, state and federal regulations.
- C. No excavated material shall be removed from the site of the work or disposed of by the Contractor unless approved by the Engineer.
- D. The Contractor shall comply with Massachusetts regulations (310 CMR 40.0032) that govern the removal and disposal of surplus excavated materials. Materials, including contaminated soils, having concentrations of oil or hazardous materials less than an otherwise Reportable Concentration and that are not a hazardous waste, may not be disposed of at locations where concentrations of oil and/or hazardous material at the receiving site are significantly lower than the levels of those oil and /or hazardous materials present in the soil being disposed or reused.

END OF SECTION

SECTION 31 12 00.13

SELECTIVE CLEARING, INVASIVE SPECIES

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. The work of this Section includes the following:
  - 1. Pruning, to include all existing trees located within the designated areas of the Project. Work shall also include the removal of limbs as necessary to provide appropriate clearances for various site features, facilities, and park users.
  - 2. Removal of selected living trees and removal of all dead, dying or diseased vegetation from within the project limits in accordance with these specifications.
  - 3. Removal of invasive species and undesirable undergrowth in accordance with these specifications.
- B. Refer to the Contract Drawings for the general quantity and locations of existing trees that require pruning or removal. Trees shall be pruned in conformance with this specification. Tree removals shall be limited to areas as denoted on the plans and shall include the removal of individual trees that would impede the construction of proposed facilities or those that are dead or dying.
- C. Prospective bidders are advised to complete a site visit to review the extent of work required and to confirm existing conditions, access issues, terrain and the general nature of the work of this Section.

1.02 QUALIFICATIONS OF CONTRACTOR:

- A. This work shall be limited to individuals, partnerships and corporations who are actively engaged in the field of Arboriculture, and who demonstrate competence, experience and financial capability to carry out the terms of this project. Eligible contractors/subcontractors must derive a majority of their income from arboricultural work. The Owner may require proof of these qualifications.
- B. All work shall be conducted by qualified and trained personnel under the direct supervision of a **Massachusetts Certified Arborist (MCA)** in the Contractor's employ.

1.03 PERSONNEL:

- A. The Contractor shall submit each employee's name and title prior to the commencement of work. The Contractor shall advise the Owner of any changes in personnel assigned to this contract.
- B. A crew shall consist of one (1) tree trimmer/climber, and one (1) ground person (one of whom shall be a crew foreman). The crew foreman shall have a minimum of five (5) years climbing/pruning experience. At least one (1) crew person shall be an MCA and shall be certified in CPR.
- C. Each trimmer shall be experienced and highly qualified with the necessary tree worker skills to successfully complete the work of this Section, including the ability and training to perform aerial rescue. Said skill shall also include worker safety and ability in compliance with current OSHA and ANSI Z-133.1 Standards.

#### 1.04 SPECIAL REQUIREMENTS:

- A. Trees: The trees to be removed shall be those shown on the plans or designated by the Engineer/Arborist.
- B. Undergrowth: All plants less than 4-inches in diameter, measured at a height of 4 feet 6-inches above the ground, shall be classified as undergrowth. All undergrowth shall be removed from areas shown on the plans, described in the special provisions, or designated by the Engineer; except for those plants designated by the Engineer to be preserved.
- C. General: When specified in the special provisions, stumps shall be treated with an herbicide immediately after cutting to prevent sprouting. The herbicide to be used, and the method and rate of application shall be as specified in the special provisions. The Contractor's licensed herbicide applicator shall follow all applicable instructions, warnings, and safety precautions stated on the manufacturer's label, and shall comply with all laws and regulations governing herbicides that are in effect at the time of use. When work is performed properly in accordance with these specifications, no subsequent recutting of sprouts or seeding growth will be required. All trees and undergrowth cut shall be disposed of in accordance with the applicable requirements of Section 2.03 Removals of these specifications.
- D. Dutch Elm diseased wood shall be disposed of in accordance with provisions of General Laws, Chapter 87, Section 5, and Chapter 132, Sections 8 and 11 as amended; and in accordance with any additional local regulations. All wood shall be removed from the site and be properly disposed of in accordance with state and local regulations.
- E. No burning shall be permitted on the project site.
- F. Prior to commencing work, the Contractor shall submit a plan to the Owner for

legal disposal of removed materials, in conformance with State and Federal regulations.

#### 1.05 STANDARDS AND DEFINITIONS:

- A. All pruning work shall conform to the following:
  - 1. The ANSI A300 ‘Standard Practices for Trees, Shrubs, and Other Wood Plant Materials’ of the Secretariat: National Arborist Association, Post Office Box 1094, Amherst, New Hampshire 03031.
  - 2. American National Standards Institute (ANSI) Standard Z-133.1.
  - 3. National Arborist Association Standards for Pruning
- B. The term ‘Owner’ shall mean the Owner’s designated representative charged with carrying out the requirements of this Project –‘Landscape Architect’, ‘Arborist’, ‘Engineer’, ‘Planner’, or ‘Tree Warden’ as referenced herein, rendering approvals for the Owner.
- C. The Engineer will monitor job progress throughout the project and approve all payments. A site walk will be conducted before work begins between the Contractor and the Engineer. Specific trees, undergrowth and invasive species may be identified at this time for removal/eradication.

#### 1.06 EXAMINATION OF SITE AND DOCUMENTS:

- A. The Contractor shall be responsible for having a clear understanding of the existing site conditions and shall be responsible for fully carrying out the work of this Section, regardless of actual site conditions encountered.

#### 1.07 SCHEDULE OF WORK:

- A. The Contractor shall submit a schedule of work for the Owner’s review and approval prior to beginning work. Unless otherwise authorized by the Owner, failure of the Contractor to comply with the approved schedule shall be sufficient cause to give notice that the Contractor is in default of the contract.

#### 1.08 PROTECTION OF THE VEGETATION TO BE PRESERVED:

- A. The Contractor shall protect all existing trees, shrubs, lawns and other site features designated to remain. The placement of protection devices, such as snow fence enclosures, shall, however, be at the Contractor’s discretion. Contractor shall consult with a certified arborist to determine adequate tree protection methods, including but not limited to, fencing, root cutting, and mulch or plywood sheeting to protect root systems from compaction.

- B. Damage no plant to remain by burning, pumping water, cutting of live roots or branches, or any other means. Neither vehicles nor equipment shall be parked within the dripline of trees to remain, or wherever damage may result to trees to be saved. Construction material shall not be stored beneath trees to be saved.
- C. The Contractor shall be liable for any damage to any trees, shrub, lawn or other features to remain and shall immediately report to the Owner. Damaged shrubs or lawns shall be restored or replaced to match existing to remain to the satisfaction of the Owner.
- D. The Contractor shall compensate the Owner for damages by installing replacement tree(s) of the size and species approved by the Owner and of sufficient quantity such that the sum of the caliper inches for replacement trees equals the total caliper inches of the damaged tree(s). Damaged shrubs shall be replaced with shrubs(s) of the same size, species, and quantity, unless determined otherwise by the Owner.
- E. Any plants that are damaged to such an extent as to destroy their value for landscape purposes shall be cut and disposed of, and grass that is damaged shall be reseeded and remulched as necessary by the Contractor at no cost to the Department when so required by the Engineer.
- F. The Contractor shall conduct its operations in such a manner to prevent injury to trees, shrubs, grass, or other types of vegetation that are to remain growing, and also to prevent damage to adjacent property.
- G. When any such injuries to trees or shrubs occur, broken branches shall be removed and rough edges of scarred areas shaped and made smooth in accordance with generally accepted arboricultural and horticultural practices.

1.09 USE AND CARE OF THE SITE:

- A. The Contractor shall leave the work site at the end of each working period in a condition satisfactory to the Owner.
- B. Pavements shall be swept and lawns or other surfaces raked and/or otherwise cleaned of all materials related to the work operation. Degree of clean-up required will be described by the Owner at the outset of the Contractor's work and will be based upon the character of the work area.
- C. All trimmings or any other form of debris (except diseased materials or trimmings from Elms) shall be collected and chipped. The Contractor shall remove all materials and shall dispose of such materials off site in a legal manner.
- D. The Contractor shall be fully and solely responsible for any damage to equipment

or vehicles left at the site of the work. All necessary permits shall be obtained by the Contractor.

## PART 2 - PRODUCTS

### 2.01 EQUIPMENT:

- A. Equipment necessary for this Contract shall be properly maintained and in good operating condition to the Owner's satisfaction. The Contractor shall promptly remove and replace any equipment which the Owner deems to be in unsatisfactory condition or otherwise unsuitable.
- B. A disc chipper shall be used which will process material up to twelve (12) inches in diameter.

## PART 3 - EXECUTION

### 3.01 TREE PRUNING:

- A. Under this Section, the Contractor shall furnish all labor, materials, equipment and transportation required to complete all aspects of the work in accordance with all local, state and federal regulations in force at the same time of this contract and in accordance with tree pruning as specified herein.
- B. The work of this Section consists of all tree pruning work and related items as specified herein and includes, but is not limited to:
  - 1. Pruning throughout the designated areas and limb removal required to allow for the proper installation of all proposed improvements. Pruning efforts shall consist of the removal of dead, dying, diseased, interfering, objectionable and weak branches on the main trunks as well as those within the leaf area. Consultation with a certified arborist is recommended. Pruning shall not be performed to an extent which may disrupt the balance of the tree or cause significant alteration to its natural form. An occasional branch one (1) inch or less in diameter may remain within the main leaf area where it is not practical to remove it, unless these limbs will be damaged by routine construction procedures.

### 3.02 TREE PRUNING DESCRIPTION OF WORK:

- A. Tree Pruning and trimming are generally described as the removal and disposal of limbs, branches and stubs which are either dead, potentially detrimental to the health of the tree or dangerous to pedestrians, visually deficient, interfering or otherwise objectionable as determined by the Owner.
- B. The limits of all trees to be pruned have been identified on the plans or referenced

elsewhere in this specification section.

- C. Vehicle access shall be controlled and approved by the Owner.
- D. If the Contractor discovers tree(s) which have not been designated for removal, but whose condition is such that removal is warranted, whether due to death, disease, decay, or structural weakness, such tree(s) shall not be pruned and the Contractor shall immediately report these findings in writing to the Owner and await the Owner's direction before proceeding with work on the particular tree(s) in question.
- E. All tree pruning shall be conducted in a manner that maintains the natural aesthetic characteristics of the species and variety of trees. No topping or dehorning of trees or stubbing back of branches shall be permitted. All cuts shall be made to a lateral branch that is a minimum of one-third (1/3) the size of the branch being removed, unless otherwise instructed by the Owner.
- F. The use of climbing spurs or spiked shoes shall not be permitted and their use will result in the immediate cancellation of the contract.
- G. All cuts shall be made sufficiently close to the parent stem so that wound closure can be readily started under normal conditions. Cuts shall, however, never be made through the branch collar. Slab cuts and rip cuts will result in cancellation of the contract.
- H. All limbs over two (2) inches in diameter to be removed shall be precut to prevent splitting. Any branches that by falling would injure existing trees to remain or other objects shall be lowered to the ground by proper ropes.
- I. On trees known to be diseased and where there is known to be danger of transmitting the disease on tools, tools shall be disinfected with alcohol after each cut between trees.
- J. Lateral branches as well as occasional branch suckers may be retained. Complete removal of secondary laterals and branch suckers resulting in the stripping of major limbs, ("lion tailing") will not be permitted.
- K. All branches and limbs shall be manually lowered to the ground via rope and pulley. This practice must be consistent with the National Arborist Association Standards for Pruning. All grade-level artifacts and landscaping must be protected from damage.

### 3.03 REMOVALS:

- A. The Contractor shall furnish all labor, materials, equipment and transportation required to complete all aspects of the removals work in accordance with all local, state, and federal regulations in force at the time of this contract and in accordance



with tree and stump removals as specified herein.

#### 3.04 REMOVALS DESCRIPTION OF WORK:

- A. For the purposes of this contract, removals shall also include all species that are dead, dying, or diseased, are undesirable or are considered to be invasive, as recognized by applicable entities of the Commonwealth of Massachusetts and Massachusetts Association of Arborists.
- B. The Contractor shall adhere to the specifications and provide suitable facilities for inspecting the work. Failure of the Owner to immediately reject unsatisfactory work or to notify the Contractor of deviations from the specification shall not relieve the Contractor of responsibility to correct or remedy unsatisfactory work.
- C. The Contractor shall only work on trees as designated by the contract documents and/or the Owner. No compensation will be made for work performed on any other tree or trees.
- D. Trees designated to be removed shall be taken down and all leaves, branches and trunks of trees properly disposed of by chipping and removal from the premises.
- E. Fell trees in a manner that allows all site features and those trees to be saved undamaged.
- F. Removal of all the parts of each tree shall be completed on the same day that the tree is cut unless otherwise required by the Engineer.
- G. Stumps of trees removed shall also be removed to eighteen (18) inches below grade by grinding or other means acceptable to the Owner. The void from the stump removal operations shall be filled with ordinary borrow soil to within six (6) inches of finished grade. The top six (6) inches shall be filled with screened loam, moderately tamped to prevent future settling. In grass areas, the disturbed area shall be sown with grass seed of a mix appropriate to the location, as directed by the Owner.
- H. Excavation or grading within the branch spread of trees to be saved shall be performed only under the direction of the Owner unless otherwise required.
- I. All equipment to be used and all work to be performed must be in full compliance with all standards as promulgated by OSHA at the time of bidding, including, but not limited to those regulations concerning noise levels, protective devices and operator safety.
- J. The Contractor shall be solely responsible for pedestrian and vehicular safety and control within the work site and shall protect the public and its property from injury

or damage that could be caused by the progress of the work. To this end the Contractor shall provide, erect, and maintain protective devices acceptable to the Owner, including but not limited to barricades, lights and warning signs.

- K. Any practice employed by the Contractor that is obviously hazardous as determined by the Owner shall be immediately discontinued by the Contractor upon receipt of either written or oral notice from the Owner to discontinue such practice.

### 3.05 SELECTIVE CLEARING AND INVASIVE SPECIES REMOVAL:

- A. The Contractor shall furnish all labor, materials, equipment and transportation required to complete all aspects of the selective clearing and invasive species work in accordance with all local, state, and federal regulations in force at the time of this contract and in accordance with selective clearing and invasive species removal as specified herein.

### 3.06 DESCRIPTION OF WORK-SELECTIVE CLEARING AND INVASIVE SPECIES REMOVAL:

- A. The Contractor's attention is called to the requirements for work under this item. The desired appearance to be attained in certain areas of heavy growth may require three or more operations. First, the obvious dead, dying and diseased trees and undergrowth shall be cut and cleared out of the area. This work includes removal of any previously fallen trees, branches, uprooted stumps and other debris as directed. Next, the area is to be thinned out, as required by the Owner or Engineer, by removing the less desirable trees and brush which interfere with the growth of the better plant material.
- B. Tree up-branching and shaping under this item will be restricted to trees which have limbs and branches restricting sight distance, extending over roadways, shoulders, turn outs, etc. Up-branching or trimming will be required to produce a 6-foot minimum vertical clearance over all locations described hereinbefore, and the removal of limbs and branches involved in this operation shall be accomplished as outlined hereafter.

END OF SECTION

## SECTION 31 23 19

### DEWATERING

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This section specifies designing, furnishing, installing, maintaining, operating and removing temporary dewatering systems as required to lower and control water levels and hydrostatic pressures during construction; disposing of pumped water; constructing, maintaining, observing and, except where indicated or required to remain in place, removing of equipment and instrumentation for control of the system.

##### 1.02 RELATED WORK:

- A. Section 00 31 43, PERMITS
- B. Section 01 57 19, ENVIRONMENTAL PROTECTION
- C. Section 31 00 00, EARTHWORK
- D. Section 31 50 00, SUPPORT OF EXCAVATION

##### 1.03 SYSTEM DESCRIPTION:

- A. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from the slopes or bottom of the excavation; increasing the stability of excavated slopes; preventing loss of material from beneath the slopes or bottom of the excavation; reducing lateral loads on sheeting and bracing; improving the excavation and hauling characteristics of sandy soil; preventing rupture or heaving of the bottom of any excavation; and disposing of pumped water.

##### 1.04 QUALITY ASSURANCE:

- A. The Contractor is responsible for the adequacy of the dewatering systems.
- B. The dewatering systems shall be capable of effectively reducing the hydrostatic pressure and lowering the groundwater levels to a minimum of 2 feet below excavation bottom, unless otherwise required by the Engineer, so that all excavation bottoms are firm and dry.
- C. The dewatering system shall be capable of maintaining a dry and stable subgrade until the structures, pipes and appurtenances to be built therein have been completed to the extent that they will not be floated or otherwise damaged.

- D. The dewatering system and excavation support (see Section 31 50 00, SUPPORT OF EXCAVATION) shall be designed so that lowering of the groundwater level outside the excavation does not adversely affect adjacent structures, utilities or wells.

1.05 SUBMITTALS:

- A. In accordance with Section 01 33 23, Contractor shall submit a plan indicating how it intends to control the discharge from any dewatering operations on the project, whether it is discharge of groundwater from excavations or stormwater runoff during the life of the project.

PART 2 - PRODUCTS: NOT APPLICABLE

PART 3 - EXECUTION

3.01 DEWATERING OPERATIONS:

- A. All water pumped or drained from the work shall be disposed of in a manner that will not result in undue interference with other work or damage to adjacent properties, pavements and other surfaces, buildings, structures and utilities. Suitable temporary pipes, flumes or channels shall be provided for water that may flow along or across the site of the work. All disposal of pumped water shall conform to the provisions of Section 01 57 19 ENVIRONMENTAL PROTECTION and Section 00 31 43 PERMITS.
- B. Dewatering facilities shall be located where they will not interfere with utilities and construction work to be done by others.
- C. Dewatering procedures to be used shall be as described below:
  - 1. Crushed stone shall encapsulate the suction end of the pump to aid in minimizing the amount of silt discharged.
  - 2. For dewatering operations with relatively minor flows, pump discharges shall be directed into straw bale sedimentation traps lined with filter fabric. Water is to be filtered through the straw bales and filter fabric prior to being allowed to seep out into its natural watercourse.
  - 3. For dewatering operations with larger flows, pump discharges shall be into a steel dewatering basin. Steel baffle plates shall be used to slow water velocities to increase the contact time and allow adequate settlement of sediment prior to discharge into waterways.
  - 4. Where indicated on the contract drawings or in conditions of excess silt suspended in the discharge water, silt control bags shall be utilized in catch basins.
- D. The Contractor shall be responsible for repair of any damage caused by its dewatering operations, at no cost to the Owner.

END OF SECTION

## SECTION 31 50 00

### SUPPORT OF EXCAVATION

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This section of the specification covers wood sheeting and bracing for support of excavations. The requirements of this section shall also apply, as appropriate, to other methods of excavation support and underpinning which the Contractor elects to use to complete the work.
- B. The Contractor shall furnish and place timber sheeting of the kinds and dimensions required, complying with these specifications, where indicated on the drawings or required by the Engineer.

##### 1.02 RELATED WORK:

- A. Section 31 23 19, DEWATERING.
- B. Section 31 00 00, EARTHWORK.

##### 1.03 QUALITY ASSURANCE:

- A. This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Safety and Department of Labor, Division of Occupational Safety “Excavation & Trench Safety Regulation (520 CMR 14.00)” and “Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et seq.).” Contractors shall be familiar with the requirements of these regulations.
- B. The excavation support system shall be of sufficient strength and be provided with adequate bracing to support all loads to which it will be subjected. The excavation support system shall be designed to prevent any movement of earth that would diminish the width of the excavation or damage or endanger adjacent structures.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS:

- A. Timber sheeting shall be sound spruce, pine, or hemlock, planed on one side and either tongue and grooved or splined. Timber sheeting shall not be less than nominal 2-inches thick.

- B. Timber and steel used for bracing shall be of such size and strength as required in the excavation support design. Timber or steel used for bracing shall be new or undamaged used material which does not contain splices, cutouts, patches, or other alterations which would impair its integrity or strength.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Work shall not be started until all materials and equipment necessary for their construction are either on the site of the work or satisfactorily available for immediate use as required.
- B. The sheeting shall be securely and satisfactorily braced to withstand all pressures to which it may be subjected and be sufficiently tight to minimize lowering of the groundwater level outside the excavation, as required in Section 31 23 19, DEWATERING.
- C. The sheeting shall be driven by approved means to the design elevation. No sheeting may be left so as to create a possible hazard to safety of the public or a hindrance to traffic of any kind.
- D. If boulders or very dense soils are encountered, making it impractical to drive a section to the desired depth, the section shall, as required, be cut off.
- E. The sheeting shall be left in place where indicated on the drawings or required by the Engineer in writing. At all other locations, the sheeting may be left in place or salvaged at the option of the Contractor. Steel or wood sheeting permanently left in place shall be cut off at a depth of not less than two feet below finish grade unless otherwise required.
- F. All cut-off will become the property of the Contractor and shall be removed by it from the site.
- G. Responsibility for the satisfactory construction and maintenance of the excavation support system, complete in place, shall rest with the Contractor. Any work done, including incidental construction, which is not acceptable for the intended purpose shall be either repaired or removed and reconstructed by the Contractor at its expense.
- H. The Contractor shall be solely responsible for repairing all damage associated with installation, performance, and removal of the excavation support system.

END OF SECTION

## SECTION 32 12 16.13

### HOT MIX ASPHALT PAVEMENT

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK:

- A. Under this Section, the Contractor shall furnish all necessary labor, materials, equipment, and transportation necessary to construct the following:
  - 1. The hot mix asphalt pavement for all walkways/service drives shall be composed of materials as specified herein and shall be constructed on a prepared base course to the depth, grade and cross-section shown on the plans, as specified herein and as required by the Engineer.
  - 2. Any reference to Hot Mix Asphalt (HMA) on the plans or in the specifications shall relate to this section.

##### 1.02 REFERENCE STANDARDS AND SPECIFICATIONS:

- A. Reference to the standards, specifications and tests of technical societies, organizations and governmental bodies are made in the Contract Documents.
  - 1. AASHTO - American Association of State Highway and Transportation Officials (tests or specifications).
  - 2. ASTM - ASTM International.
  - 3. Mass. Standard Specs. - Latest edition of the MassDOT Standard Specifications for Highways and Bridges hereinafter referred to as "The MassDOT Standard Specifications."

##### 1.03 SUBMITTALS: IN ACCORDANCE WITH SECTION 01 33 00 SUBMITTAL PROCEDURES, SUBMIT THE FOLLOWING:

- A. At least 30 days prior to intended use, submit material certificates signed by material producer and Contractor indicating that products comply with requirements. Provide master mix formula for all asphalt paving specified in this Section with a description of mix ingredients, proportions and aggregate gradation for review and approval.
- B. Do not order materials until Architect's approval of mix formula has been obtained. Delivered materials shall conform to the approved samples.
- C. Do not order materials until Architect's approval of mix formula has been obtained. Delivered materials shall conform to the approved samples.
- D. Submit product data for pavement marking paint.



#### 1.04 PROJECT CONDITIONS

- A. Weather: Perform work only when existing and forecasted weather conditions are within the limits established by referenced standards. Perform work only when ambient temperature is forecasted to be at least 50-degrees Fahrenheit and when temperatures have not been below 35-degrees Fahrenheit for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess amount of moisture or is in a frozen state.
- B. Asphalt paving shall not be applied until the finished compacted gravel base has been tested and approved. A delay in paving after the gravel base is tested and approved may require re-compaction and testing at no additional cost to the Owner.
- C. Construction methods, transportation and delivery of mixtures, spreading, finishing, compaction joints, etc. shall conform to Section 460 of the Massachusetts Department of Transportation Standard Specifications for Highways and Bridges unless otherwise specified herein.
- D. Substrates: Proceed with work only when substrate construction and penetrating work is complete and base is dry.
- E. Traffic Control: Maintain access for vehicular and pedestrian traffic and other construction activities.
- F. Grade Control: Establish and maintain required lines and elevations.

#### 1.05 QUALITY ASSURANCE

- A. Bituminous concrete shall be prepared, mixed, transported, placed, compacted and finished in accordance with the requirements set forth in the latest edition of the "Standard Specifications for Highways and Bridges" (hereinafter referred to as "SSHB"), as published by the Massachusetts Department of Transportation.
- B. Tolerances.
  - 1. Establish and maintain grade control to required elevations and slope tolerances indicated on the Drawings. The maximum deviation in the finished surface planarity shall be 3/16 inch when measured in any direction with a 10 ft. straightedge.
- C. Testing
  - 1. During the placing and rolling operation, repeated checks shall be made to ascertain the correct rate of application to provide the required compacted thickness.
  - 2. If the average thickness is deficient from the specified thickness by one quarter (1/4) inch or more, the extent of the deficient area shall be corrected at the Contractor's expense.
  - 3. Upon completion of testing, the Contractor shall properly fill all test holes by compacting a fine aggregate bituminous concrete for the full depth of the core. The finished surface shall be smooth

#### 1.06 DISTURBING EXISTING PAVEMENT DURING CONSTRUCTION.

- A. Existing paved areas indicated on the drawings to remain shall be protected from

- damage by construction activities. Where sections of the finished paved areas have to be removed, all edges shall be saw cut and patched in accordance with this Section.
- B. Existing finished paved areas that require extensive cutting and patching or have become damaged and cannot be satisfactorily repaired by cutting and patching shall be resurfaced. Shape of these resurfaced areas shall be near and in rectangular patterns or shall conform to the shape or edges of other adjacent surface improvements. Edges of resurfaced areas shall be saw cut and existing pavements shall be removed from a distance of two feet into areas to be resurfaced, so that new pavement can neatly blend into existing pavement showing no joints or imperfections. If the gravel base course has been disturbed, the Contractor shall remove the disturbed material, repair the existing gravel base and apply a new binder course as specified herein.
  - C. All paving beyond the project's property line shall be in accordance with the requirements of the authority having jurisdiction. Provide traffic control for any work within the Town's Right-of-Way.

PART 2 - PRODUCTS

2.01 DENSE GRADED CRUSHED STONE SUBBASE:

- A. Dense graded crushed stone subbase shall consist of inert material that is hard durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials.
- B. Gradation requirements for dense graded crushed stone subbase shall be as specified in Section 31 00 00, EARTHWORK.

2.02 HOT MIX ASPHALT PAVEMENT:

- A. Hot mix asphalt pavement shall consist of binder mix and dense mix courses constructed to the thickness shown on the plans or specified herein and shall conform to the relevant provisions of Sections 460 and (M3.11.03) of the MassDOT Standard Specifications, unless specified otherwise hereinafter.

B. Base/Binder Courses

- 1. Base/Binder Courses shall be Bituminous Concrete Pavement, Dense Finish Course Type I-1.
- 2. The Binder Course shall consist of one lift of Binder Course asphalt paving to thickness as shown on the Contract Documents. The aggregate for the binder course shall conform to the following gradation requirements:

| SIEVE SIZE | PERCENT PASSING |
|------------|-----------------|
| 1"         | 100             |
| 3/4"       | 80 - 100        |
| 1/2"       | 55 - 75         |
| #4         | 28 - 50         |
| #8         | 20 - 38         |

|                  |           |
|------------------|-----------|
| #30              | 8 – 22    |
| #50              | 5 - 15    |
| #200             | 0 - 5     |
| Bitumen % of mix | 4.5 - 5.5 |

C. Top Course/Overlay Courses

1. Leveling/Overlay Courses may conform to “Surface Treatment” dense mix, Table A, Section M3.11.03 of the MassDOT Standard Specifications, comprised of Class I Dense Bituminous Concrete, Type St or Dense Mix Type I-1, at the Contractor’s option.
2. The general composition of the bituminous concrete mixture (the proportion of asphalt cement to mineral aggregate) shall be in accordance with MHD requirements.

3. The mineral aggregate composition for Type St shall be as follows:

| TYPE ST SIEVE ANALYSIS<br>U.S. Standard Sieve No. | MINERAL AGGREGATE<br>Percent Passing by Weight<br>(per ASTM C-136) |                |
|---|--|----------------|
| <u>Size</u>                                       | <u>Minimum</u>   | <u>Maximum</u> |
| 1/2"  | 100  | -              |
| 3/8"  | 80   | 100            |
| #4  | 55   | 80             |
| #8  | 48   | 63             |
| #16   | 36   | 49             |
| #30   | 24   | 38             |
| #50   | 14   | 27             |
| #100  | 6  | 18             |
| #200  | 4  | 8              |
| Bitumen % of mix                                  | 5.5 – 7.0  |                |
| A.C. 20 of 30                                     |  |                |
| Voids content less than 9%                        |  |                |

2.03 ASPHALT EMULSION:

- A. Asphalt emulsion tack coat shall be Type SS-1 or SS-1H as specified by the Asphalt Institute.

2.04 SEAL COAT:

- A. Seal coats shall be within the composition limits for protective seal coat emulsion in accordance with MassDOT M3.03.3.
- B. Silica sand when blended with seal coat emulsion shall be No. 30 silica sand.

2.05 PAVEMENT MARKINGS:

- A. Pavement markings shall conform to the requirements of MassDOT 860.
- B. Pavement-Marking Paint: Fast Drying White Water-borne White Traffic Paint and Fast Drying Yellow Water-borne Traffic Paint as specified in SSHB under Sections M7.01.23 and M7.01.24, respectively. Additional pavement-marking colors as shown on the drawings or details shall conform to the above.
- C. The mixture of the marking material shall be within the composition limits for reflectorized pavement markings as described in the MassDOT Specifications as follows:

- 1. Thermoplastic reflectorized pavement markings - M7.01.03/04

- D. Application of the glass beads to be used as reflector material on the striping shall conform to Sections 860.62 and M7.03.07 of the MassDOT Specifications.

## 2.06 PAINT FOR PARKING LOTS

- A. Paint for parking lot lines shall conform to Federal Specification TT-P-115-E Type 1. Paint shall be 11-3 PPG Industries, Pittsburgh, PA or approved equal.
- B. Provide international symbol of accessibility at the designated accessible parking spaces. Color for accessible parking space lines and symbols shall be white. A blue painted square shall be painted at each symbol location prior to painting symbol.
- C. Stenciled pavement markings shall be installed on pavements as indicated on the Drawings to designate Fire Lanes, Reserved Parking, Fuel Efficient Vehicles, Electrical Vehicles, Bicycle Lanes or as determined by the Owner.
- D. Lines shall be true to alignment indicated on the Drawings. Stall lines shall be four inches wide with length and spacing as indicated on the Drawings.

## PART 3 - EXECUTION

### 3.01 GENERAL:

Paving courses required for the project shall be as shown on the drawings and as specified herein. Pavement thicknesses specified are measured in compacted inches. If a pavement course thickness exceeds 2-1/2 compacted inches, the course shall be installed in multiple lifts with each lift not exceeding 2-1/2 compacted inches in thickness.

### 3.02 DENSE GRADED CRUSHED STONE SUBBASE:

- A. Subgrade preparation and base course materials and construction shall be performed as specified in Section 312000 Earthwork and in accordance with geotech recommendations.
- B. The dense graded crushed stone shall be spread in layers not more than 4-inches thick, compacted measure. All layers shall be compacted to not less than 95 percent of the maximum dry density of the material as determined by ASTM D1557 Method C at optimum moisture content.
- C. Start of work under this Section shall constitute acceptance of the base 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 additional cost to the Owner.

### 3.03 TEMPORARY HOT MIX ASPHALT PAVEMENT:

- A. Where specified and required by the Engineer and after placement of the dense graded crushed stone subbase, the Contractor shall place temporary bituminous

pavement. It shall consist of hot mix asphalt, 1 ½"-inches thick, in accordance with MassDOT 460.

- B. The temporary pavement shall be repaired as necessary to maintain the surface of the pavement until replaced by permanent pavement. When so required by the Engineer, the Contractor shall remove the temporary pavement and install or regrade the subbase for installation of permanent pavement.

### 3.04 PERMANENT HOT MIX ASPHALT PAVEMENT:

- A. Preinstallation examination Required: The Asphalt Paving Installer of asphalt paving shall examine the sub base and all related work, and the 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 their work. Beginning work means Installer accepts substrates, previous work and site conditions.
- B. Subbase Preparation: Do necessary grading in addition to that specified under Section 312000 Earthwork to bring sub-grade to required grades and sections for asphalt pavement base course construction. Tamp traces of trenches. Remove soft and otherwise unsuitable material and replace with approved material. Take every precaution to obtain a foundation of uniform bearing strengths. Any defects in this work shall be corrected under this Section at no additional cost to the Owner.
- C. Gravel Base Course Preparation: shall consist of approved gravel fill and placed on approved subgrade to the depth indicated on the Drawings and as specified under Section 312000 Earthwork The surface of the gravel base shall be shaped to the cross section of the pavement.
  1. The gradation shall conform to Gravel Borrow as specified in Section 312000 Earthwork.
  2. The gravel shall be compacted to not less than 95-percent of the maximum dry density of the material as determined by the Method of Test for ASTM Designation D - 1557, Method D. Grading and compaction shall continue until the surface is even and true to the proposed lines and grades within a tolerance of 3/8-inch above or below the required cross-sectional elevations and to a maximum irregularity not exceeding 3/8-inch under a ten foot line longitudinally. Any specific area which after being rolled, does not form a satisfactory, solid foundation shall be removed, replaced, and re-compacted. The gravel shall be spread and compacted in layers not exceeding 6-inches in compacted thickness. The Contractor shall furnish, set and maintain all line and grade stakes necessary to guide the automated grade control equipment.
  3. Contractor shall maintain base course in an acceptable condition, protected from traffic, erosion and other elements until the surface is placed.
  4. After the subgrade and /or existing pavement surfaces have been prepared as specified herein, the Contractor shall check all frames, covers, grates, water valve boxes and all miscellaneous castings that are located in the proposed

pavement area to insure that all such items have been accurately positioned and set to the proper slope and elevation. All covers and grates shall be set flush with the required finished pavement surface. No depressions or mounds will be permitted in the pavement to accommodate inaccuracies in the setting of these appurtenances.

- D. The hot mix asphalt mixtures shall be placed on the approved base only when, in the opinion of the Engineer, the course is sufficiently dry and weather conditions are suitable
- E. Where walls, curbing, or other suitable permanent supports are not present, the Contractor shall secure proper alignment and adequate compaction of the binder and surface courses as shown on the Contract Drawings and finish all edges with a neat, tamped edge.
- F. Placing Mix: The thickness of each course shall be as shown on the Drawings and measured in place after compaction. The first course shall be the Binder Course and the second course shall be Top Course as defined in "Table A" of Section M3.11.03 "Job-Mix Formula" of the SSHB. Each course shall be spread and finished as required in the MassDOT Standard Specifications, Section 460.63. A minimum of two weeks (14-days) shall pass between the installation of the binder course and top course.
  - 1. Any unsatisfactory irregularities or defects remaining after the final compaction shall be corrected by removing and replacing with new material as specified, to form a true and even surface, All minor surface projections, joints and minor honeycombed surfaces shall be ironed out smoothly to grade, as directed.
  - 2. No vehicular traffic or loads shall be permitted on the newly completed pavement until stability has been attained and the material has cooled sufficiently to prevent distortion or loss of fines.
  - 3. All joints between binder and top course shall be staggered a minimum of 6-inches.
- G. Rolling: Begin rolling mixture when asphalt concrete can bear weight of roller without excessive displacement. Roll at least three times and provide a smooth, compact, uniform surface free of roller marks. After first rolling repair displaced area as needed with additional hot material. Roll at least two additional times to thoroughly compact concrete to maximum density and to remove roller marks.
- H. Tolerances: The finished surface of each hot-mixed asphalt course shall be tested for smoothness using a 10-foot straight edge applied parallel with and at right angles to the center line of the paved area. Surfaces exceeding the following tolerances within the 10-feet will not be accepted.
  - Binder Course: 1/4-inch
  - Top Course: 3/16-inch
- I. Prior to completion of bituminous concrete overlay, the Contractor shall have the

existing patched surfaces tack coated and leveled to eliminate all “birdbaths” or extreme lows which may create ponding or drainage problems. Leveling course (surface treatment) bituminous concrete applied as necessary, shall be raked and feathered and be properly rolled and compacted. The Contractor shall apply “level” lines, screeds, or use other measures to achieve the proper leveling surface suitable for overlay.

- J. After completion, the hot mix asphalt courses shall conform to the thickness shown on the Contract Drawings or specified herein, smooth and even and of a dense and uniform structure.
- K. The surface area to be seal coated, as shown on the drawings, shall be swept and air cleaned. The first coat shall be applied with eight (8) pounds of #30 silica sand blended with each gallon of emulsion applied at a rate of 0.15 gallons per square yard. The second coat shall be a straight sealer applied at the rate of 0.1 gallons per square yard.
- L. The Contractor shall prepare the pavement surface for painting lines according to the recommendations of the paint manufacturer. Applied markings shall have clean-cut edges, true and smooth alignment and uniform film thickness of 15 mils, +/- 1.0. The Contractor shall be responsible for removing, to the satisfaction of the Engineer, tracing marks, and spilled paint applied in an unauthorized area.

### 3.04 PATCHING EXISTING ASPHALT PAVEMENT

- A. In areas on site where new pavement abuts existing pavement and/or where existing pavement requires patching due to removal of existing pavement for installation of work under this Contract, patching of existing pavement shall be as follows:
  - 1. Sawcut the existing edge of pavement in a straight line at a 90-degree angle to the vertical in such a manner that all existing loose or cracked areas of pavement are removed.
  - 2. Edges of existing pavement shall be painted with a thin coat of bitumen (RS-1) immediately before placing new pavement.
  - 3. Any joints at junctions of old and new pavements shall be sealed with a hot poured rubber asphalt sealer and covered with sand.
  - 4. Asphalt shall be installed as specified herein. Smooth transition surfaces shall be provided where new pavement abuts existing paved surfaces.
- B. All asphalt patching work within public right-of-way's shall be completed in accordance with the requirements of the authority having jurisdiction.
  - 1. Provide traffic control for work within the public right-of-way.
  - 2. All road surfaces shall be saw cut before any excavation to prevent damage to pavement to remain.



3. Excavation shall be completed in a safe and workmanlike manner and shall minimize obstruction of pedestrian and vehicular traffic.
4. Gravel Borrow shall be used for base course construction and placed in six-inch lifts compacted to 95% of the maximum dry density by mechanical means.

### 3.05 ASPHALT EMULSION TACK COAT:

- A. To all existing surfaces to be paved against or overlaid, apply a single very thin (0.05 to 0.15 gallons per square yard) application of diluted asphalt emulsion (Type SS-1) to cover the entire surface of existing pavement.
- B. Essential qualities of coverage are (1) it must be very thin and (2) uniformly cover entire surface of existing pavement.
- A. Place only that amount of tack coat which can be overlaid with new pavement by the end of each day, and; IF RAIN IS ANTICIPATED DO NOT APPLY TACK COAT.

### 3.06 PAVEMENT MARKINGS

- A. Work under this item shall be in conformance with Section 860 of the Standard Specifications and the Manual on Uniform Traffic Control Devices, current edition.
- B. Provide painted parking stripes and other pavement markings, as indicated on the drawings. Apply paint with mechanical methods and templates to ensure uniform, straight lines and even line widths. Clean surface to totally eliminate all loose material and dust. Apply paint in strict compliance with manufacturer's instructions and recommendations. Allow for proper curing of substrates before application of paints. Apply number of coats and dry film thickness as recommended by paint manufacturer.
- C. Pavement markings shall be reapplied during the one-year guarantee period specified herein if the markings exhibit wear under normal use.

### 3.07 CLEANING, REPAIR AND PROTECTION

- A. Three days after rolling, the finished pavement shall be tested. Any section that shows ponding, indentation, rutting or picking up shall be resurfaced at the Contractor's expense.
- B. Provide temporary protection to ensure work is completed without dirt, stains, damage or deterioration at time of final acceptance. Clean up stains and spills as they occur. Remove protection and clean as necessary immediately before final acceptance review.

### 3.08 GUARANTEE/WARRANTY

- A. The Contractor shall be solely responsible for protecting surfaces until final acceptance of the project by the Owner and shall take all necessary precautions to

secure premises during the initial drying periods.

- B. The pavement shall be guaranteed against defects in workmanship or quality for a period of one (1) year after final acceptance. The Contractor shall replace, repair, recoat or otherwise make satisfactory to the Owner any unacceptable pavement and or coating at no additional cost to the Owner.

END OF SECTION

SECTION 32 13 13  
CONCRETE PAVEMENTS

**PART 1 - GENERAL**

1.01 GENERAL REQUIREMENTS

- A. The conditions of the Contract, including Division 00 and Division 01, apply to the work under this Section.
- B. The Contractor shall prior to any removal of surplus fill, excavated material, or debris from the site, furnish written evidence satisfactory to the owner or owner's representative that he has an approved dumping location for debris and/or spoil from his/her excavation activities.

1.02 WORK INCLUDED

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to furnish and install the following as indicated on the Contract Documents and as specified herein.
  - 1. Concrete Pavement vehicular and pedestrian
  - 2. Concrete Pads
  - 3. Accessible detectable warnings for curb ramps
  - 4. Concrete turf edger at synthetic turf
  - 5. Integral Color Concrete Pavements
  - 6. Surface finish
  - 7. Curing
  - 8. Penetrating sealer
- 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 within jurisdiction and coordinate all work under this Section.
- C. The following related items are included under the Sections listed below.
  - 1. Section 312000 – Earthwork
  - 2. Section 321216 - Asphalt Paving
  - 3. Section 321613 – Curbing
  - 4. Section 321813 – Synthetic Turf
  - 5. Section 323000 – Site Improvements
  - 6. Section 323100 – Fencing
  - 7. Section 323300 – Site Furnishings
- D. The following items shown on the Drawings and/or noted herein shall be furnished

and installed under their Sections of the Specifications:

1. Concrete for concrete footings under 033000 Cast in Place Concrete
2. Materials for grading and compacting subbase under 312000 Earthwork

### 1.03 SUBMITTALS

A. Submit manufacturer's product data for the following:

1. Preformed joint filler
2. Sealants
3. Detectable Warnings (including physical color samples if requested)
4. Reinforcement
5. Supports for reinforcement
6. Dowels and dowel caps
7. Concrete mix design
8. Non-shrink grout
9. Penetrating sealer

B. Shop drawings:

Submit shop drawings that include wall elevations, details and dimensions for all walls, slabs, curbs and any other concrete element. Identifying dimensions, sizes, finishes, of reinforcement, bending including bar schedules.

C. Construct Concrete Sample Panels: Samples shall not be constructed in an area of proposed finish work. Samples shall be constructed within the vicinity of the proposed finish work to facilitate comparisons during construction. The samples shall demonstrate the typical installation of concrete, including score lines, expansion joint and sealant, curing and finishing material, surface texture, color, and edge treatment. The accepted sample, upon approval, shall be maintained as the minimum standard of quality for approval of all new concrete pavement work required for the project. If the original sample panel is not approved, the Contractor shall provide additional sample panels, as required, at no additional cost to the Owner until a mock up sample is approved. Unacceptable sample panels shall immediately be removed from the site.

1. Pavement: construct 4 foot x 4 foot sample panels of finished 4 inch concrete pavement, for approval, at least 15 days prior to final concrete paving work. Mock up shall include formwork seam and include up to 3 samples to review the integral color admix.

### 1.04 LAWS, ORDINANCES, PERMITS AND FEES

A. The Contractor shall:

1. Give necessary notices, obtain all permits and pay all governmental taxes, fees and other costs in connection with this work, file all necessary plans, prepare documents and obtain all necessary approvals.
2. Obtain all required certificates of inspection for this work and deliver same to the Architect before request for acceptance and final payment for the work.
3. All concrete walks shall conform to the applicable regulations of the Massachusetts Architectural Access Board and the Americans with Disabilities Act.
4. Include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to contract drawings and documents) in order to comply with all applicable laws, ordinances, rules and regulations in Belmont and the Commonwealth of Massachusetts, whether or not shown on the Drawings and/or specified.

#### 1.05 1.5 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 Transportation, 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

#### 1.06 SUBSURFACE INFORMATION

A. The Owner assumes no responsibility for the Contractor's failure to make his own site investigation and makes no representation regarding the character of the soil or subsurface conditions which may be encountered during the performance of the work.

#### 1.07 FINISHED GRADES

A. The words "finished grades" as used herein mean the required final grade elevations indicated on the Drawings. Where not otherwise indicated, site areas shall be given uniform slopes between points, for which finished grades are shown, or between such points and existing grade except that vertical curves or roundings shall be provided at abrupt changes in slope.

#### 1.08 GRADES AND ELEVATIONS

A. The Drawings indicate, in general, the alignment and finished grade elevations. The Landscape Architect, however, may make adjustments in grades and alignment as are found to avoid interference and to adapt the grading to special conditions encountered.

#### 1.09 WORK IN THE PUBLIC WAYS

A. Notify the appropriate municipal officials at least seven calendar days in advance of commencing any work in the public ways to obtain all required permission to perform this work. Perform all work in the public ways in a manner required by the municipal authorities.

- B. Should there be any conflict between requirements specified in the Contract Documents and those of the municipality, the municipal requirements shall govern.
- C. Do not close or obstruct any streets or sidewalks unless and until they have been discontinued by the appropriate municipal authority or unless and until he shall have first secured all necessary or other permits therefor. No materials whatsoever shall be placed or stored in the streets. Conduct all operations to interfere as little as possible with the use ordinarily made of roads, driveways, sidewalks, or other facilities near enough to the work to be affected thereby.

#### 1.10 QUALITY ASSURANCES

- A. Unless otherwise specified, work and materials for construction of the reinforced Portland cement concrete paving shall conform to ACI 316R, and applicable portions of the following:
  - 1. MassDOT Specifications Section 476 Cement Concrete Pavement
- B. Surfaces of curb ramps and handicapped access ramps shall be stable, firm and slip resistant. Construct ramps so that water does not accumulate on ramp surfaces.
- C. Paving work and base course installation, shall be done only after excavation and construction work which might damage them have been completed. Damage caused during construction shall be repaired before acceptance.
- D. Existing paving areas shall, if damaged or removed during course of this project, be repaired or replaced under this Section. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work installed under this Contract.
- E. Pavement, base, or subbase shall not be placed on a muddy or frozen subgrade.

### **PART 2 - PRODUCTS**

#### 2.01 AGGREGATE BASE COURSE

- A. Base course shall be specified, provided, installed and paid for under EARTHWORK Specification Section.

#### 2.02 FORM MATERIALS

- A. Unless otherwise indicated, form work for concrete shall be as described under Section 03 11 00 CONCRETE FORMWORK.

#### 2.03 REINFORCING MATERIALS AND ACCESSORIES

- A. This section supplements Section 03 21 00 CONCRETE REINFORCEMENT.
- B. Reinforcing Bars: ASTM A615, Grade 60.
- C. Welded Wire Fabric (WWF): ASTM A185, welded steel wire fabric. Fabric reinforcement shall be furnished in flat sheets.
  - 1. Provide 6 inches x 6 inches W1.4 x W1.4 WWM for 4 inch thick concrete

pavement.

2. Provided 6 inches x 6 inches W2.9 x W2.9 WWM for 6 inch thick concrete pavement.
- D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise acceptable.
1. Supports shall be Lotel Mesh-ups reinforcing chairs or approved equal.
- E. Steel expansion dowels shall be hot-rolled plain steel rounds conforming to the requirements of AASHTO M31, Grade 60 and consisting of a one-half inch by twelve inches (5/16"x12") smooth steel dowel and compatible waxed tube sleeve, six inches (6") in length. Dowels and sleeves shall be as furnished by A.H. Harris & Sons, Inc., by U.S. Steel Corp., by Edgcombe Steel Corp., or approved equal. Dowels shall be epoxy coated.

#### 2.04 PORTLAND CEMENT CONCRETE

- A. Slabs-on-Grade: Proportion normal weight concrete mixture as follows:
1. Minimum Compressive Strength: 5000 PSI at 28 days.
  2. Maximum water – cementitious material ratio: 0.45.
  3. Slump limit: 4-in., plus or minus 1-in.
  4. Air Content: 6 percent, plus or minus 1 1/2 percent at point of delivery for 3/4-in. nominal maximum aggregate size. Do not allow air content of trowel-finished floors to exceed 3 percent.
- B. Exterior Paving Concrete: Proportion structural normal weight concrete mixture as follows:
1. Minimum Compressive Strength: 5000 PSI at 28 days.
  2. Maximum water – cementitious material ratio: 0.40.
  3. Slump Limit: 4-in., plus or minus 1-in.
  4. Air Content: 6 percent, plus or minus 1 1/2 percent at point of delivery for 3/4-in. nominal maximum aggregate size.
- C. Color Admixture: Provide liquid or powder integral color at the rates recommended by the approved product supplier. The standard of quality, design and function required is based on CHROMIX Admixtures for Color-Conditioned Concrete available from L.M. Scofield Company, (800) 800-9900. **Color shall be FRENCH GRAY or LANDMARKS GRAY.** Submit manufacturer's color chart for selection and approval by the Landscape Architect. Submittal shall include the manufacturer's technical data for recommended mixing, installation, curing, sealing and maintenance procedures.
1. Mixing, installation and curing concrete with Color Admixture shall conform to the approved manufacturer's recommendations. Curing material shall meet or

exceed ASTM C 309 Liquid Membrane-Forming Compounds for Curing Concrete.

2. LITHOCHROME Colorwax, or approved equal, shall be used for concrete curing in accordance with the manufacturer's instructions. Curing material shall meet or exceed ASTM C 309 Liquid Membrane-Forming Compounds for Curing Concrete.
3. Additional acceptable manufacturers include:
  - 1) Brickform Colors, Springfield, IL Tel: 800-624-0261
  - 2) Davis Colors, Los Angeles, CA Tel: 800-341-4780
  - 3) Or approved equal.

D. Cement shall be stored in a weather-tight structure and in such a manner as to prevent deterioration or intrusion of foreign matter. It shall be easily accessible for proper inspection and identification of each shipment. Cement that has hardened or partially set shall not be used.

## 2.05 CURING COMPOUNDS

- A. All curing compounds shall conform to requirements of ASTM Designation C-309, Type I, clear and C-156. No materials containing wax or saponifiable materials will be permitted.
- B. Curing compound shall be Master Builders "Master Seal", Symons "Cure and Seal", Sonneborn "Kure-N-Seal", "CS-309" by W.R. Meadows or equal, conforming to ASTM 309, Type 1 and 2.
- C. Color matched curing compound, base and tint shall be furnished by the same supplier as the integral color admixture.
  1. Schofield: Lithochrome Colorwax.
  2. Davis: Color Seal II.
  3. Brickform: Gemcure 1315-350 tint a seal pack

## 2.06 EXPANSION JOINTS

- A. Provide expansion joints, unless otherwise indicated on the Contract Documents, at 30 feet on-center, maximum.
- B. Expansion Joint Filler:
  1. Expansion joint filler shall be closed cell polymer foam meeting requirements of ASTM D1752, Sections 3.1 to 3.4, based on compression requirement of 10 psi minimum and 25 psi maximum. Recovery rate following 50-percent compression shall exceed 99-percent recovery, per ASTM D545. Foam shall be Ceramar foam filler manufactured by W.R. Meadows Co. or an approved equal. Joint sealant shall color match concrete refer to section 03300 for joint sealant requirements
  2. Expansion joint filler shall have a removable cap cover for the joint filler with



integral permanent plastic bond breaker such as Snap-Cap from Seal Tight manufactured by W.R. Meadows, Inc., or approved equal. Cover width shall be sized to match width of joint filler.

C. Expansion Dowels: refer to Reinforcing Materials in this Section.

## 2.07 JOINT SEALANT

A. Joint sealant and primer shall be polyurethane-based, one component, elastomeric sealants, complying with Fed. Spec. TT-S-00230C, Class A Type 1. Color shall be as selected by the Architect. Sealants shall be self-leveling pour grade type.

1. Vulkem 45, as manufactured by Mameko International, 4475 East 175th Street, Cleveland Ohio 44182, (800) 321-6412.
2. Urexpan NR-210, as manufactured by Pecora Corporation, 165 Wambold Road, Harleysville, PA 10348, (215) 723-6051
3. PSI 952, as manufactured by Polymeric Systems Inc., Phoenixville, PA, (800) 228-5548.

B. Provide only materials which are known to be fully compatible with the actual installation condition, as shown by the manufacturer's published data or certification. Use manufacturer's recommended joint primer.

## 2.08 DETECTABLE WARNING TILES

A. Shall be replaceable tactile/detectable warning surface tiles for cast in place concrete meeting or exceeding all ADA and MAAB requirements for tactile warning surfaces. Tiles shall be manufactured using a matte finish exterior grade homogeneous (uniform color throughout thickness of product) glass and carbon reinforced polyester based composite material. Truncated domes must contain fiberglass reinforcement within the truncated dome for superior structural integrity and impact resistance. Tiles shall feature a minimum of eight (8) embedded corrosion resistant concrete inserts with ½" x 1 ½" heavy duty steel bolts and washers. Bolts shall be covered with a structural water tight cap.

B. The basis of quality, design and function required is based on ADA Solutions Inc. of Chelmsford, MA 800-372-0519, [www.adatale.com](http://www.adatale.com), [info@adatale.com](mailto:info@adatale.com).

C. Approved products and sources:

1. Durateck heavy duty 1/2 inch thick replaceable detectable warnings from Detectile Corporation, Oak Brook, IL (630) 734-0277,
2. Armor Tile Replaceable Herculite Series from Armor Tile, Williamsville, NY, Tel: 800 682-2525,

D. Submit product data demonstrating conformance with the specifications and drawings.

E. Properties: polymer-composite tiles minimum 25,000 PSI compressive strength, 11,000 PSI tensile strength, 29,000 PSI Flexural Strength, coefficient of friction 0.80 when wet.

F. Raised Truncated Domes shall be a square grid pattern of raised truncated domes of

0.2” nominal height, base diameter of 0.9” and top diameter of 0.45”. The Federal Code of Regulations permits a truncated dome spacing range of 1.6”-2.4.” For superior wheelchair, walker and shopping cart mobility, the preferred truncated dome spacing shall have a center-to center (horizontally and vertically) spacing of 2.35”, measured between the most adjacent domes on square grid.

- G. Color: Shall be uniform integral color and shall meet or exceed the ADA recommended guideline of 70% contrast in light reflectance between detectable warning and adjoining surface. Color to be approved by Architect prior to ordering materials.
- H. Warranty: Shall be 5 year warranty to include replacement due to breakage or deformation of tactile warning surface material.

## 2.09 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.
- B. Submit written reports to Landscape Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by the Landscape Architect.
- C. Adjustments to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

## 2.10 CONCRETE MIX

- A. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd. or fraction thereof.
- B. Provide batch ticket for each batch discharged and use in work indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
- C. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified.
- D. Delete reference for allowing additional water to be added to batch for material with insufficient slump. Addition of water to the batch will not be permitted.
- E. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.

- F. When air temperature is between 85 Deg. F (30 deg. C) and 90 Deg. F (32 deg. C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 Deg. F. (32 deg. C), reduce mixing and delivery time to 60 minutes.

## 2.11 PENETRATING SEALER

- A. Penetrating clear sealer for exterior concrete shall be “MasterProtect H 1000” Penetrating Clear Sealer as manufactured by BASF, or approved equal from Euclid Chemical or Sika Corporation. Clear breathable, high-performance, 100 percent silane, water repellent sealer for protecting horizontal and vertical concrete surfaces. Penetrates deeply, sealing out water, chloride ions, and acids, preventing damage from freeze/thaw cycles.

## **PART 3 - EXECUTION**

### 3.01 PREPARATION OF SUBGRADE

- A. Areas to be paved shall be compacted and brought to subgrade elevation and all work specified, performed and paid under Section 312000 – Earthmoving. Prepared subgrade will be inspected by the Owner’s Representative. Contractor shall arrange to have the Owner’s Representative visit the site to inspect and approve subgrade.

### 3.02 AGGREGATE BASE COURSE

- A. Base course shall be specified, provided, installed and paid for under EARTHWORK Specification Section.

### 3.03 FORMWORK

- A. Forms shall conform to the lines, dimensions and shapes of concrete shown providing for openings, recesses, keys, slots, beam pockets and projections as required.
- B. Make forms clean and free of foreign material before placing concrete.
- C. Do not use earth cuts as forms for vertical surfaces, unless approved by the Architect.
- D. Design of Formwork
  1. Comply with ACI 301, Chapter 4, Paragraph 4.2. Formwork drawings shall bear the seal of licensed professional engineer.
  2. Form rods and tie wires of exterior surfaces shall slope down from the inside to outside of forms.
  3. Provide forms so that no discernible imperfection is in evidence in finished concrete surfaces due to deformation, bulging, jointing, or leakage of forms.

### 3.04 REINFORCEMENT MATERIAL

- A. Steel reinforcing shall be thoroughly cleaned of all foreign material which may reduce the bond between the concrete and reinforcing.
- B. Welded wire mesh shall be placed midway within the depth, and parallel to the finished concrete pavement surface. Do not pour concrete over top of reinforcement

unless it is supported underneath. Where mesh reinforcement is spliced, it shall be lapped at least 12 inches.

- C. Reinforcing steel anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed.
- D. Unless otherwise indicated on the Contract Documents, reinforcing shall extend within 2 inches of formwork and expansion joints.

### 3.05 EXPANSION JOINTS

- A. Expansion joints shall be as located on the Contract Documents. Expansion joint shall be formed in the concrete to required width with preformed joint filler in place. Joint filler shall extend the full depth of the slab.
  - 1. For concrete pavements, depth of joint filler shall be as required to form a 3/4 - inch deep sealant recess below finished concrete surface.
- B. Provide expansion joints as indicated on the Contract Documents. Unless otherwise indicated on the Contract Documents, expansion joints shall be located at 30 feet on-center, maximum.
  - 1. Expansion joints shall be placed where pavement meets flush foundations and footings, concrete vertical curb or other vertical structures, including light bases, hydrants, walls, buildings, piers and walls, and at other conditions as shown on the Contract Documents.
  - 2. Contractor shall request the presence of the Owner's Representative to review the layout of expansion joints prior to pouring the concrete.
  - 3. Follow the manufacturer's application recommendations for joint filler and sealer.
  - 4. Joint alignment shall be straight and true.
- C. Where the expansion dowel system is used in the expansion joints, steel plates and pocket former sleeves shall be set parallel with the top and bottom surfaces of the concrete slab and installed according to the manufacturer's installation instructions.

### 3.06 PORTLAND CEMENT CONCRETE

- A. Ready Mix Concrete
  - 1. Comply with ASTM C94.
  - 2. Add mixing water only at the site.
  - 3. Discharge the concrete completely at the site within 1-1/2 hours after the introduction of the cement to the aggregates. In hot weather reduce this time limit so that no stiffening of the concrete shall occur until after it has been placed.
  - 4. Begin the mixing operation within thirty minutes after the cement has been intermingled with the aggregates.
- B. Placing Concrete

1. Remove water and foreign matter from forms and excavations and, except in freezing weather or as otherwise directed, thoroughly wet wood forms just prior to placing concrete. Place no concrete on frozen soil and provide adequate protection against frost action during freezing weather.
2. Soil bottom for slabs and footings, reinforcing, inserts, and forms shall be reviewed by Architect or his designate before placing concrete.
3. To secure full bond at construction joints, surfaces of concrete already placed, including vertical and inclined surfaces, shall be thoroughly cleaned of foreign materials and laitance, roughened with suitable tools such as chipping hammers or wire brushed, and re-cleaned by stream of water or compressed air. Well before new concrete is deposited, joints shall be saturated with water. After free or glistening water disappears, joints shall be given thorough coating of neat cement slurry mixed to consistency of very heavy paste. Surface shall receive coating of at least 1/8 inch thick; this shall be scrubbed in by means of still bristly brushes. New concrete shall be deposited before neat cement dries.
4. Do not place concrete having a slump outside of allowable slump range.
5. Transport concrete from mixer to place of final deposit as rapidly as practical by methods that prevent separation of ingredients and displacement of reinforcement and that void rehandling. Deposit no partially hardened concrete. When concrete is conveyed by chutes, equipment shall be of such size and U-shaped design as to insure continuous flow in chute. Flat (coat) chutes shall not be employed.
6. During and immediately after depositing, concrete shall be thoroughly compacted by means of internal type mechanical vibrators or other tools, spading to produce required quality of finish.
7. Vertical lifts shall not exceed 18 inches. Vibrate through successive lifts to avoid pour lines. Vibrate first lift thoroughly until top of lift glistens to avoid stone packets, honeycomb and segregation.
8. Concrete shall be deposited continuously and in layers of such thickness that no concrete will be deposited on concrete that has hardened sufficiently to cause formation of seams and planes of weakness within section. If section cannot be placed continuously between planned construction joints, as specified, field joint and additional reinforcement shall be introduced so as to preserve structural continuity. Architect shall be notified in any such case.

#### C. Curing

1. It is essential that concrete be kept continuously damp from time of placement until end of specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so

applied shall be troweled or floated into surface.

2. Concrete surfaces shall be cured by completely covering with curing paper or application of a curing compound.
  - 1) Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Concrete surface shall not be allowed to become moistened between 24 and 36 hours after placing concrete. During curing period surface shall be checked frequently, and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.
  - 2) If concrete is cured with a curing compound, compound shall be applied at a rate of 200 square feet per gallon, in two applications perpendicular to each other.
  - 3) Curing period shall be seven days minimum.

### 3.07 CURING COLORED CONCRETE (CONCRETE CONTAINING INTEGRAL COLOR ADDITIVE)

- A. Colored concrete shall not, under any circumstances, be cured using water fog misting or ponding, burlap, plastic sheeting, or other wet covering.
- B. Apply Lithochrome Colorwax or Colorcure concrete sealers in accordance with manufacturer's written instruction. Have instructions on hand for review by the Owner's Representative.
- C. Curing material and method shall be in strict conformance with manufacturer's guidelines and recommendations.
- D. Only if additional protection is absolutely required, the surface should remain uncovered for at least 4 days, after which time new and unwrinkled non-staining reinforced waterproof kraft curing paper may be used.

### 3.08 FORM REMOVAL

- A. Do not remove forms until the concrete has thoroughly hardened and has attained sufficient strength to support its own weight and construction live loads to be placed thereon, without damage to the structure. In general, do not disturb forms for framing until the concrete has attained at least 40% of design strength for side forms and 80% of design strength for bottom forms. Remove no forms for 24 hours after placing concrete. Protect concrete walks from pedestrian traffic for a period of 3 days after placing. Damp cure as per standards above. Be responsible for proper form removal and replace any work damage due to inadequate maintenance or improper or premature form removal.
- B. Where use of metal form ties extending to within less than 1-1/2 in. of the face of permanently exposed concrete has been unavoidable, cut off such ties at least 1-1/2 in. deep in the concrete but not less than 72 hours after concrete has been cast. Remove forms by methods which will not spall the concrete or cause any injury whatsoever. Hammering or prying against concrete will not be permitted.

### 3.09 FIELD QUALITY CONTROL

- A. Sampling and testing for quality control during placement of concrete may include the following, as directed by the Landscape Architect.
- B. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
- C. Slump: ASTM C143, one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.
- D. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; one for each set of compressive strength test specimens.
- E. Concrete Temperature: Test hourly when air temperature is 40 deg. F (4 deg. C) and below, and when 80 deg. F (27 deg. C) and above; and each time a set of compression test specimens made.
- F. Compression Test Specimen: ASTM C31; one set of 6 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
- G. Compressive Strength Tests: ASTM C39; one set for each 100 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 2 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
- H. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
- I. Strength level of concrete will be considered satisfactory if average of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive by more than 500 psi.
- J. Test results will be reported in writing to Landscape Architect and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day test.
- K. Additional Tests: The testing service may make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

### 3.10 FINISHING

- A. General Requirements for Flatwork: Strike off top surfaces of finished fill and monolithic slabs true and level within a tolerance of 1/8 in. in 10 ft. and measured

with a 10 ft. straightedge placed in any direction at any location. Set edge forms and intermediate screed strips accurately and sufficiently rigid to support screeds and so that proper surface elevations and concrete thickness are achieved allowing for dead load deflection and camber of formwork. Take measurements and control tolerances by the use of transit instrument. Upon completion of leveling, remove screed and fill spaces with concrete. Concrete shall have a medium broom finish of parallel marks. Brooming shall be at right angles to the axis of walk or as shown on the Drawings.

1. Concrete surfaces for sub-base at unit pavement shall be woodfloated with a slightly rough surface, and finished true to line and grade per the Contract Documents.
- B. Control Joints in concrete paving shall be saw cut joints, sawn by using a diamond blade concrete power saw. To prevent random cracking, control joints shall be cut as soon as the concrete is hard enough that the edges abutting the cut do not chip from the saw blade. Sawn joints shall be true to layout indicated in the Contract Drawings.
  1. Control joint depth shall be a minimum 25 percent of slab depth.

### 3.11 PENETRATING SEALER

- A. Apply two coats of approved penetrating sealer to all exposed concrete surfaces in accordance with the manufacturers recommendations for complete uniform coverage after approval of sealer application on concrete paving mockup.

### 3.12 PROTECTION OF CONCRETE SURFACES

- A. Protection of Concrete: Under no circumstances shall the Contractor pour and leave the fresh concrete open to vandalism, while it is setting up. Damaged concrete shall be subject to rejection by the Landscape Architect.

### 3.13 ACCEPTANCE STANDARDS

- A. The following acceptance standards shall be applied to this Contract. Any portion of the concrete paving that does not meet these required acceptance standards shall be removed at the direction of the Owner's Representative. Saw cut pavement at nearest adjacent tooled joint, remove concrete pavement and discard off site in a legal manner and replace with new concrete pavement meeting the requirements of this Section.
  1. Pavement surfaces shall be free of all cracking.
  2. Pavement surfaces shall not pond water.
  3. Pavement surfaces shall be free of visible high and low spots.
  4. Steel mesh reinforcing shall not penetrate the surfaces or sides of the concrete slab.
  5. Sawcut joints and all expansion joints shall be straight, true, uniform in width and free from twists, bends, kinks and misalignments.
  6. Edges and the associated edging patterns shall be consistent, true, crisp and complete.
  7. Pavement shall show no graffiti. Pavement shall show no rubbed surfaces



indicative of attempts to erase graffiti.

8. Expansion joints and score joints shall be placed as required by the Contract Documents.
9. Concrete surfaces shall be free of all stains, including those created during the course of the construction by the Contractor, caused by natural events, or caused by vandalism.
10. All sawcut joints and expansion joints shall be flush.
11. Pours different in color as determined by the Owner's Representative.
12. Pours without expansion joints cast into them.
13. Pours not conforming to the Contract Documents.
14. All forms shall be removed from the site.

END OF SECTION

SECTION 32 15 40.13

STABILIZED STONE DUST PAVEMENT

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. The work to be done under this Section shall be the furnishing, placement and compaction of stabilized stone dust surfacing as shown on the drawings and as specified herein. The Contractor shall be responsible for supplying the material, labor, equipment and transportation necessary to do the work.

1.02 RELATED WORK:

- A. Section 01 33 23, SUBMITTALS
- B. Section 31 23 00, EXCAVATION, BORROW AND BACKFILL

1.03 SAMPLES:

- A. Prior to ordering and delivering materials to the site, (1) representative samples of stone dust shall be sent to the Engineer for approval. The material shall be analyzed by a certified testing laboratory and certified by the supplier as a byproduct of a stone quarry operation.
- B. The color shall be medium to dark gray when wet and consistent throughout. Samples must match that product which is to be installed.

PART 2 - PRODUCTS

2.01 STONE DUST:

- A. Stone dust shall be the product of a stone crusher and shall consist of inert materials that are hard, durable stone, free from surface coatings and deleterious materials.
- B. Gradation requirements shall be as follows:

| <u>U.S. Sieve No.</u> | <u>Percent Passing by Weight</u> |
|-----------------------|----------------------------------|
| # 4                   | 100                              |
| # 8                   | 96                               |
| # 16                  | 68                               |
| # 30                  | 43                               |

|       |    |
|-------|----|
| # 50  | 29 |
| # 100 | 17 |
| # 200 | 11 |

2.02 STABILIZER:

- A. Non-toxic, non-staining water-activated soil stabilizer.
- B. “STABILIZER” by Stabilizing Solutions, Inc. Phoenix, AZ 1-800-336-2468 or approved equal.

PART 3 - EXECUTION

3.01 PLACING AND COMPACTING:

- A. The stone dust shall be placed over a previously approved and installed compacted base of gravel as detailed and as specified under Section 31 23 00 of these Specifications.
- B. The stone dust shall be placed to the line and grades shown on the plans and shall consist of a minimum of the detailed thickness after watering and compacting to ninety-five percent (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 as determined by the Engineer.
- C. Compaction shall continue until the surface is even and true to the proposed lines and grades within a tolerance of three-eighths (3/8) inch above or below the required cross sectional elevations and to a maximum irregularity not exceeding three-eighths (3/8) inch under a ten (10) foot line longitudinally. Any specific area of material sub-base which, after being rolled, does not form a satisfactory, solid, stable foundation shall be removed, replaced and recompacted by the Contractor without extra compensation.

3.02 SOIL STABILIZER BLENDING:

- A. The soil stabilizer shall be carefully measured and shall be subsequently blended with the stonedust at the manufacturers recommended rate for three (3) inch compacted stabilized stonedust pathways. (If ‘STABILIZER’ brand stabilizer is used the blending ratio shall be as follows: One (1) pound of ‘STABILIZER’ powder per one and one-quarter (1 ¼) cubic feet of stonedust OR as otherwise stated; one (1) pound of ‘STABILIZER’ powder per five (5) square feet of surface area for three (3) inch compacted depth stone dust.)

END OF SECTION

## SECTION 32 16 00

### CURBING

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This section covers furnishing and installation of granite curb, hot mix asphalt curb and precast concrete curb, where required, as shown on the Drawings and herein specified.
- B. This section also covers replacement of curbing removed during construction.

##### 1.02 RELATED WORK:

- A. Required earthwork is specified under Section 31 00 00 EARTHWORK.
- B. Section 32 12 00, PAVING.
- C. Section 32 13 13, CONCRETE PAVEMENT
- D. Refer to Section 32 18 23 SYNTHETIC GRASS INFILL SYSTEM for Cast-In-Place concrete turf edger curb.
- E. Carefully examine all of the Contract Documents for requirements that affect the work of this Section. Other specification sections may directly relate to the work of this Section.

##### 1.03 REFERENCES:

The following standards form a part of these specifications, as referenced:

Massachusetts Department of Transportation (MassDOT) Standard Specifications  
for Highways and Bridges

##### 1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Shop drawings: The name of the Contractor shall be shown on the shop drawings. Finished work shall conform to approved samples and shop drawings:
  - 1. Provide large scale, detailed and complete shop drawings/placement drawings showing all curbing work including all dimensions, radii, straight and radial transition curbs for accessible curb cuts with lengths clearly indicated.
  - 2. Provide an itemized schedule of all curb pieces. Curbing shall be individually listed by type with radius and straight pieces noted with their lengths. Tapered, transition and corner curbs shall be individually listed.

- B. Product Data: Submit manufacturers' certifications stating that materials comply with requirements.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials and products adequately protected against damage. Handle in strict compliance with manufacturer's instructions and recommendations and store off the ground. Protect from all possible damage including, but not limited to, chipping, staining, cracking and other damage. Cracked, chipped, or stained units will be rejected and shall not be utilized in this work. Sequence deliveries to avoid delays, but minimize on-site storage:

PART 2 - PRODUCTS

2.01 GRANITE CURBING:

- A. Granite curbing shall be Type VAI conforming to Subsection M9.04.1 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges.
- B. Granite shall be "New England" structural granite conforming to ASTM C 615, Class I Engineering Grade, suitable for curbstone use.
- C. Curb shall be light gray, free from seams which impair structural integrity, and with percentage of wear less than 32 percent, as determined by ASTM C 131.
- D. Vertical Granite Curb: Furnish vertical granite curbing. All 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 appearance. The top surface shall be sawed to an approximate 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 projections on the back surface for 3 inches down from the top that would exceed a batter of 4" per foot. The front surface shall be at right angles to the planes of the top and ends and shall be smooth quarry split, free from drill holes. Minimum length shall be 6 feet unless otherwise shown on the Drawings.
  - 1. Radial type VA-4 curb shall be used on all curves with a radius of 100 feet or less, where vertical granite curb is called for on the Drawings.
- E. Vertical to Flush Transition Curb: Furnish vertical to flush transition curbs of same material as adjacent curb where shown on the drawings, to taper the reveal of the reveal of the curb from 6 inches to 0 inches. Transition curb along a curve shall be of the same radius. The curb shall be manufactured for the purpose intended at the plant and shall not be field cut.
- F. Special shapes and corners shall be supplied as required.

## 2.02 MORTAR

- A. Cement mortar shall conform to Section M4.02.15 of the Massachusetts Department of Transportation SSHB: Cement mortar shall be composed of 1-part Portland cement and 2 parts of sand by volume with sufficient water to form a workable mixture. Cement, sand, and water shall conform to M4.01.0: Portland Cement, M4.02.02 Aggregates, Paragraph B, and M4.02.04: Water respectively.
- B. Concrete for curb setting shall be as specified in Section 03 05 00 – FIELD CONCRETE.

## 2.03 HOT MIX ASPHALT CURB

- A. Curb shall conform to Subsection M3.07.0: HMA for Driveways, Sidewalks, Berm and Curb, of the latest edition of the MassDOT Standard Specifications for Highways and Bridges.
- B. Bituminous concrete curbs shall consist of Class I Bituminous Concrete, Type I-1, Top Course conforming with the Job-Mix Formula given in Section M, paragraph M3.11.03, SSHB and in accordance with the details of design as shown on the Drawings. Asphalt content of mix formula for bituminous berms shall be 6.0 – 9.0 percent by weight of total mix. SEE SECTION 32 12 16 - Asphalt Paving. Bituminous Concrete Curb and shall meet the dimensions as shown on the Contract Documents.

## PART 3 - EXECUTION

### 3.01 GRANITE CURBING:

- A. Removal and resetting and/or removal and replacing of granite curbing shall be in accordance with Subsection 580 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges.
- B. All curbing shall be installed after the installation of the Binder Course and prior to installation of the Top Course. Curb shall be set to the line and grade required and shall project above finished grade elevations in accordance with the Details.
- C. Except as modified herein or on the drawings, installation of curbing shall conform to Section 500 of the MassDOT Standard Specifications for Highways and Bridges. unless these specifications are more restrictive. In such cases these specifications will prevail.
- D. Preinstallation Examination Required: The installer shall examine previous related work, and conditions under which this work is to be performed and notify Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, previous work, and conditions

- E. Trench Preparation: Curb shall be set in a trench excavated to a width of 20 inches. The bottom of the trench shall be 6 inches deeper than the depth of the curbstone. The subgrade shall then be filled to proper levels with a minimum of 6 inches of compacted gravel borrow at the lines and grade shown on the plan to provide continuous support to the bottom of curb. Gravel borrow shall be thoroughly rammed or tamped until firm and unyielding.
- F. The curbing shall be set on edge and settled into place with a heavy wooden hand-rammer, to the line and grade required, straight and true for the full depth. vertical exposed curb faces plumb and with curb top surface parallel to adjacent surfaces. The joints of the stone curbing shall be pointed with mortar for the full depth of the curbing. The maximum space between joints shall not be more than 3/8 inch.
- G. Place concrete continuously along the front and back of the curb as indicated on the Detail. The curbing contractor shall confirm true vertical and horizontal alignment immediately after setting concrete and adjust curb sections as necessary to provide a true line. Joints as described under pointing below.
- H. At approximately 50-foot intervals, a 1/2-inch joint shall not be filled with mortar but left free for expansion. The ends of the stone curbing at driveways and intersections shall be cut at a bevel or rounded as required by the Engineer. After pointing, the curbstones or edging shall be satisfactorily cleaned of all excess mortar that may have been forced out of the joints and that may be on the exposed surfaces of the curb.
- I. The trench for the stone curbing shall be backfilled with approved material; the first layer to be 4 inches in depth, thoroughly rammed; the other layers to be more than 6 inches in depth and thoroughly rammed until the trench is filled.
- J. Where indicated on the plans, or as required, drainage openings shall be made through the curbing at the elevations and of the size required.
- K. Tolerances: The following installed tolerances are allowable variations from locations and dimensions indicated by the Contract Documents and shall not be added to allowable tolerances indicated for other work.
  - 1. Allowable Variation from True Plumb: 1/8-inch over exposed face.
  - 2. Allowable Variation from True Line: 1/4-inch in 20-feet.

### 3.02 HOT MIX ASPHALT CURB:

- A. Replacement of hot mix asphalt curbs shall be in accordance with Section 500 of the latest edition of the MassDOT Standard Specification for Highways and Bridges and all amendments thereto.
- B. Unless modified herein, installation shall conform to Section 501.64 of the MassDOT Standard Specifications for Highways and Bridges.
- C. The bituminous concrete mixture shall be machine formed by a self-powered curbing machine capable of extruding and compacting the mixture, free of honeycombs, to the line, grade and cross-section shown on the Drawings. The curbs shall be installed on the Binder Course prior to the installation of the Top Course.

### 3.03 REPAIR, CLEANING AND PROTECTION:

- A. Repair minor damage to eliminate all evidence of repair. Clean exposed surfaces using non-abrasive materials and recommended methods. Remove and replace damaged or unsuitable work that cannot be successfully cleaned or repaired.
- B. Provide temporary protection to ensure work is without damage or deterioration at time of final acceptance. Remove protections and re-clean as necessary immediately before final acceptance.
- C. After completion of the work in this Section, the Contractor shall remove all debris, materials, rubbish, etc. from the site and legally dispose of them. New or existing improvements that have been damaged in the work under this Contract shall be repaired to the satisfaction of the Architect.

END OF SECTION



SECTION 32 17 23  
SIGNAGE

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. The work of this Section consists of all park signage and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:
1. Traffic and Parking Sign
  2. Park Rules Signs
  3. Park Monument Sign
  4. Artificial Turf Rules Signs
  5. Playground Rules Sign
  6. Interpretive Signage
- B. Under work of this Section provide color finish for material items furnished under SITE FURNISHINGS Section.

1.02 RELATED WORK:

- A. The following items of related work, but not limited to, are specified and included in other Sections of the Specifications:
1. Section 03 30 00, Cast-in-Place Concrete
  2. Section 03 05 00, Field Concrete
  3. Section 11 68 13 Playground Equipment
  4. Section 32 13 13, Concrete Pavement
  5. Section 32 16 00, Curbing
  6. Section 32 18 13, Synthetic Grass Infill System
  7. Section 32 18 16, Playground Protective Surfacing

1.03 STANDARDS:

- A. The following standards including all current amendments form a part of these Specifications:
1. American Society for Testing and Materials (ASTM):
    - A36 Structural Steel
    - A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless

|      |  |
|------|--|
| A120 | Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses |
| A307 | Carbon Steel Externally and Internally Threaded Standard Fasteners                                 |
| A325 | High Strength Bolts for Structural Steel Joints  |
| A500 | Cold Formed Welded and Seamless Carbon Steel Structural Tubing Rounds and Shapes                   |

2. American Welding Society (AWS):  
D1.1 Structural Welding Code
3. Steel Structures Painting Council (SSPC):  
SSPC Surface Preparation Specifications

#### 1.04 SAMPLES AND SUBMITTALS:

- A. At least thirty days prior to intended use, the Contractor shall provide the following samples and submittals for approval in conformance with requirements this specification. Do not order materials until Landscape Architect's approval of samples, certifications or test results have been attained. Delivered materials shall closely match the approved samples.
  1. Shop Drawings: Submit detailed shop drawings for each item required to be fabricated or installed under work of this Section. Include plans, sections, and details as required to show completely materials, layout, jointing, clearances and connections for all items required. Submit shop drawings for the following:
    - a. Traffic Signage List with text, colors and dimensions noted.
    - b. Traffic Sign Post data.
    - c. Monument Sign
    - d. Site signs with text, colors and dimensions noted.
    - e. Interpretive sign layout, graphics and dimensions
  2. Manufacturer's Literature: Submit three (3) copies each of manufacturer's material descriptions and installation instructions for the following:
    - a. Non-shrink cement grout,
    - b. Sealant.

## PART 2 - PRODUCTS

### 2.01 CONCRETE FOOTINGS FOR SIGNS

- A. Construct concrete footings as indicated on the Drawings.

- B. Concrete for footings shall have 28 day compressive strength of 4,000 PSI as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

## 2.02 TRAFFIC AND PARKING SIGNS

- A. The contractor shall furnish and install all signs included in the schedule in the contract drawings. All park rules signs shall be furnished in English. Shop drawings for each sign shall be produced for review, comment, and approval prior to final manufacturing.
- B. Provide highest quality 3M Scotchlite (or approved equal) on aluminum traffic signs. Sign backgrounds, legends and borders shall be fabricated from high-intensity encapsulated lens reflective sheeting conforming to the Massachusetts Department of Transportation's Standard Specifications for Highways and Bridges and the Manual on Uniform Traffic Control Devices (MUTCD), latest editions. Provide signs with the following characteristics, and per Signage Legend on the Drawings:
  1. Mounting: Tamperproof stainless steel bolted fasteners to 12-gauge galvanized steel 2" square posts, except where shown mounted to light poles or otherwise noted on plan. Final locations to be determined in field. Mounting height shall conform to MUTCD standards. Concrete footings per Contract Documents.
  2. Sign panels shall be 16-gauge aluminum panels. Sizes, color and copy as indicated on the Drawings.
  3. Lettering and symbols shall be surface applied 3M Scotchlite reflective vinyl material Series #580 or approved equal. All lettering shall be executed in such manner that all edges and corners of the letterforms are true, clean, correctly spaced, and photographically precise. All lettering and graphics must accurately reproduce the letterform. Colors shall be consistent with highway standards.
  4. Letterform meeting referenced standards. Where no standard exists, letterform shall be as selected by the Architect.

## 2.03 SITE SIGNS

- A. The contractor shall furnish and install all Park Rules Signs included in the schedule in the contract drawings. All park rules signs shall be furnished in English. Shop drawings for each sign shall be produced for review, comment, and approval prior to final manufacturing.
- B. Sign panels shall be 16-gauge aluminum panels. Sizes, color and copy as indicated on the Drawings:
  1. Park Rules sign shall be 18" x 30" x 0.80 g Aluminum, Radius Corner Detail, White with screen printed black copy, Font: Footlight MT, Language: English.
  2. Artificial Turf Field Rules shall be 18" x 30" x 0.80 g Aluminum, HP vinyl graphics, White with screen printed black copy, Font: Footlight MT, Language: English.

3. Playground Rules Sign shall be 18" x 30" x 0.80 g Aluminum, HP vinyl graphics White with screen printed black copy, Font: Footlight MT, Language: English; or as provided by the Playground Equipment Manufacturer
- C. Mounting: Tamperproof stainless steel bolted fasteners to 12-gauge galvanized steel 2" square posts, except where shown mounted to light poles, fence panel, building exterior walls or otherwise noted on plan. Final locations to be determined in field.

#### 2.04 MONUMENT SIGN

- A. The contractor shall furnish and install a Monument Sign as shown in the Construction Documents. The Monument Sign shall:
1. The sign shall conform to the Town of Holden public building sign aesthetics.
  2. The sign shall be an elevated, timber posted sign with a painted wooden display panel. Graphics shall be vinyl applied graphics.
  3. Shop drawings for each sign shall be produced for review, comment, and approval prior to final manufacturing.

#### 2.05 INTERPRETIVE SIGNAGE

- A. Furnish and install permanent informational sign panels (Total of 2) and associated support post as indicated on the drawings.
- B. Basis of Design for Metal Sign/Post shall be Bluebird Graphic solutions ([www.bluebirdgs.com](http://www.bluebirdgs.com) ). Contact: Kyle Wolfe, [kwolfe@bluebirdgs.com](mailto:kwolfe@bluebirdgs.com)), Storywalk Solutions Framed Exhibit Panels by Barking Dog Exhibits (Contact 715-214-5862, Email: [ruth@bdexhibits.com](mailto:ruth@bdexhibits.com) ); or an approved equal.
- C. Shall be a powder coated aluminum mounting panel welded to aluminum posts. Graphic display shall be a custom, multi-colored panel with images, text and colored background. Panel shall be manufactured from High Pressure Laminate (HPL) with embedded phenolic resin. Panel shall be minimum 1/2" thick, self-supporting and able to be mounted on a frameless pedestal. HPL panel shall be covered under warranty to not delaminate, peel, blister, crack and/or fade for 10 years from time of installation
- D. Posts shall be either: permanently installed into a concrete footing, or, have a mounting plate for surface attachment.
- E. Locations of signs to be approved by Landscape Architect prior to final installation.

#### 2.06 MISCELLANEOUS HARDWARE

- A. Miscellaneous stainless steel hardware as required for the project shall be 18-8 stainless steel (AISI Type 304).
- B. Bolts: 3/8" Dia. SS Kwik Bolt II Expansion Anchor – Countersunk Version by

PART 3 - EXECUTION

3.01 SIGN POSTS

- A. Fabricate and install sign posts in conformance to details, and approved shop drawings. Measure on-site conditions to receive posts prior to preparing shop drawings.
- A. At sidewalks, pavements and at other locations as directed, install posts within cored holes. Grout posts to within one-half inch (1/2") of top surface and provide a sealant joint to finished grade. Sealant color to be approved by Landscape Architect.

3.02 MISCELLANEOUS HARDWARE

- A. Furnish dowels and other miscellaneous hardware items for work of other Sections as specified and/or as required on the Drawings.
- B. All anchoring systems employed shall be vandal-proof.

3.03 TOUCH-UP OF SURFACES

- A. After erection, all scratches or abrasions in posts and/or sign surface shall be repaired or replaced to the satisfaction of the Engineer.
- B. Repair minor damage to eliminate all evidence of repair. Remove and replace work that cannot be satisfactorily repaired.
- C. Provide temporary protection to ensure that the work will be without dirt, stains, damage or deterioration at time of final acceptance. Clean up stains and spills as they occur. Remove protections and clean as necessary immediately before final acceptance.
- D. Upon completion of the work and before acceptance, the Contractor shall remove and dispose of in an approved manner all surplus materials, rubbish, etc. which the Contractor may have accumulated during the course of the work and shall leave the site in a clean and orderly condition. The Contractor shall not abandon any material at or near the site regardless of whether or not it has any value.

**- END OF SECTION -**

## SECTION 32 18 13: SYNTHETIC GRASS INFILL SYSTEM

### PART 1 - GENERAL

#### 1.01 Work Included

- A. Provide all the materials necessary for the purchase of Synthetic Grass Infill System, over a graded stone base (by others) as outlined in these specifications and in strict accordance with the manufacturer's written specifications with a specially formulated resilient infill of rounded sand and SBR (recycled) rubber.
1. By Contractor: Furnish and Install a gravel base stone and finishing stone.
  2. By Contractor: Furnish and Install a drainage system consisting of a flat drains and collector piping.
  3. Furnished by the Owner: A Synthetic Athletic Sport Grass System as supplied By Sprinturf. The product is: Ultrablade DEF Extreme. The carpet is a 2.50" pile height, dual fiber system with a face weight of 50oz/sy and total weight of 80oz/sy.
    - i. Contractor to install the above materials.
  4. Furnished by the Owner: A resilient infill system, consisting of a course, rounded, uniformly sized silica sand and graded SBR (recycled) rubber. Infill shall be installed to provide no more than ½ inch exposed fiber.
    - i. Contractor to install the above materials.

#### 1.02 Qualifications and Submittals.

- A. Prospective Bidders of the turf installation shall be required to comply with the following:
1. The successful Turf Manufacturer and the Installation Contractor must be a member of the Synthetic Turf Council (STC) and Sports Turf Managers Association (STMA).
  2. Source limitations: All components of the Synthetic Turf system shall be provided from a single-source Synthetic Turf System Manufacturer.
  3. The installation contractor for the synthetic turf shall be a certified installer, certified by the manufacturer of the approved turf system. The preparation, construction and installation of the synthetic turf field system shall be completed by a contractor specializing in synthetic turf field construction.

4. The Turf Manufacturer must be experienced in the manufacture and installation of this specific type of sand and SBR (recycled) rubber infill synthetic grass system, for at least five (5) years and provide references of ten (10) specific installations in the last five (5) years.
5. The Turf Manufacturer shall have a minimum of ten (10) installations in the State of Massachusetts. The Manufacturer shall submit references from at least five (5) installations of the same specified system.
6. The installation contractor shall have completed ten (10) synthetic turf field projects, each 80,000sf or larger, utilizing a similar system proposed for this work, in the last five (5) years. Subcontracted labor and or supervisors are not acceptable. The installer must have at least three years of continuous business under the same name and or organizational structure. Business alliances, joint ventures or partnerships formed to comply with any of these qualification requirements shall not be accepted. The installation contractor shall submit references from all synthetic turf installations they have performed within the past five (5) years to include the Owner's contact name, address and phone number
7. To ensure quality control and workmanship, the installation company's supervisor for this project shall be the primary installation company's representative on-site, to oversee the complete installation work. Part-time or replacement personnel will not qualify as the installation supervisor during any part of the installation process, unless the contractor provides written qualifications for the replacement supervisor to the architect for approval. Approval from the architect must be received prior to the replacement personnel's involvement with this installation.
8. During the installation process, the manufacturer's representative shall be present (on site) during the installation process to approve the following system components. Approval of the subgrade preparation and subdrain installation; geotextile filter fabric; drainage stone installation; fine grading of the top of drainage stone and the installation of the synthetic turf.
9. All designs, marking, layouts, materials shall conform to current NFHS rules and other standards that may be applicable to this type of synthetic grass installation unless there is a specific exception identified. Submit a full color rendering/drawing indicating all field markings, including enlargements of line/sport overlaps and roll layouts/seaming plan for final approval prior to placing turf order. Shop drawings shall be at a scale of 1"=30'-0" or as needed to clearly and legibly show the pertinent information regarding the installation. Failure to do so shall be at the manufacturer's risk and cost.

- B. The turf manufacturer must submit to the Owner, for review by the Engineer, the following information.
1. Manufacturer shall submit to the Engineer a 3' x 2' minimum sample of the exact synthetic turf and infill system that is specified for this project. Product submittal shall include seaming method as note here within.
  2. Submit the full range of fiber colors for selection.
  3. A one (1) quart sample of the infill, at the proper mixing ration, material shall also be submitted.
  4. Seams between turf panels shall be glued, or approved equal. Manufacturer shall provide statement that their product can be seamed as noted.
  5. Submit a shop drawing plan at 1"=30' containing all pertinent information regarding installation. Provide a seaming plan at 1"=30', edge details.
  6. The Turf Manufacturer shall submit with the bid, a sample copy of the material warranty demonstrating compliance with the warranty requirements.
  7. Certified copies of independent (third-party) laboratory reports on ASTM tests as follows:
    - a) Pile Height, Face or Pile Weight & Total Fabric Weight, ASTM D418 or D5848
    - b) Primary & Secondary Backing Weights, ASTM D418 and D5848
    - c) Tuft Bind, ASTM D1335
    - d) Grab Tear Strength, ASTM D1682 or D5034
    - e) Infill Materials, ASTM F3188-16
    - f) Testing confirmation surpassing 200,000 Lisport Cycles as certified by a 3rd party independent testing agency.
  8. List of Ten (10) similar existing installations that have been installed in Massachusetts including, Owner representative and telephone number(s).
  9. The Turf Manufacturer shall provide evidence that their turf system does not violate any other manufacturer's patents, patents allowed or patents pending. Evidence shall be in the form of a written document stating such and signed by the Turf Manufacturers Corporate Headquarters.
  10. The Turf Manufacturer shall provide a sample copy of insured, non-pro-rated warranty and NON-CANCELABLE third-party warranty insurance policy with a policy minimum claim limits of at least \$350,000 and annual



aggregate limit of at least \$10,000,000 in order to fully cover the full replacement of the turf system in the event of total failure.

11. Letter stating the products anticipated lifespan.
12. A certified letter and specifications sheet certifying that the products in this section meet or exceed specified requirements including certification from the turf manufacturer that lead or lead chromate, or the 6 PFAS regulated by MassDEP (PFHxS, PFHpA, PFOA, PFOS, PFNA, PFDA) are not used in the manufacturing of the specified system. Including test results from the time the material leaves the plant indicating such.

Turf Manufacturer shall submit certified copies of independent (third party) laboratory reports on the **actual turf** system and its components manufactured for this specific project as follows:

- a. Lead Content – ASTM F2765-09
- b. Drainage capability of 10” minimum / hour
- c. EPA Method 533 Modified, EPA Method 537 Modified laboratory analysis with isotope dilution, DoD QSM 5.4 Table B-15, or Engineer approved equivalent showing non-detectable concentrations of all PFAS quantified by the analysis method utilized.

13. Warranty must cover full 100% of replacement value of total square footage installed. Minimum \$10.00 per square foot.

- C. The General Contractor / Site Contractor shall be defined as the contractor who is responsible for the construction of the site components related to and located beneath the turf product, inclusive of but not limited to all cuts and fills as needed to establish an approved subgrade, the dynamic stone drainage system, the flat drains, the perimeter collection system. The turf supplier / installer is a subcontractor to the general contractor. The General Contractor / Site Contractor shall have installed a minimum of five (5) Turf Fields in the last three (3) years and shall provide documentation and contact information for such.

#### 1.03 Shock Attenuation Evaluation:

- A. The synthetic turf system is designed to attenuate the criteria as noted below. The Turf Manufacturer shall provide evidence their product can meet the impact attenuation as listed below.
- B. Near the completion of the turf, hire an independent testing laboratory to perform ten (10) in place G max tests in compliance with ASTM F1936 and F355; and the ASTM F1292 Hemisphere Impact Attenuation (HIC) test results. If any test

results exceed 125GMAX and a HIC value of 1,000 at 1.4meters (per the IRB Reg 22 and One Turf Concept), modify the infill material ratios as necessary to achieve satisfactory results. Perform additional testing to verify the results as required by the Owner’s Representative.

- C. Guarantee: During the eight (8) year guarantee period, the G max rating shall remain less than 165 and the HIC value shall remain below 1,000 at 1.4 meters. The Contractor shall contract with an independent testing laboratory to perform three (3) in place G max and HIC tests each on site during the first, third, fifth, seventh and eighth years. If any test results meet or exceed 165 GMAX and 1,000 HIC, modify the infill material ratios as necessary to achieve satisfactory results. Perform additional testing to verify the results as required by the Architect. If the G max rating exceeds 165 and/or 1,000 HIC after three attempts to repair the high rating, replace the field within 90 calendar days at no cost to the Owner.

1.04 Quality Control.

- A. Upon delivery of the turf material to the project site, the Turf Manufacturer shall deliver to the Engineer three (3) copies of notarized letter addressed to the Owner certifying that all products provided by them for incorporation into the system do not contain PFAS quantified by EPA Method 533 Modified, EPA Method 537 Modified with isotope dilution, DoD QSM 5.4 Table B-15 or Engineer approved equivalent and do not contain any other hazardous materials exceeding current EPA and CPSC requirements. The PFAS testing method utilized must report at least 29 PFAS compounds including the 6 PFAS regulated by the MassDEP, and on the most current European Union REACH and California Proposition 65 compound lists:

| Compound        | CAS #      | Reference               |
|-----------------|------------|-------------------------|
| PFBS            | 375-73-5   | REACH                   |
| PFHxS           | 355-46-4   | REACH, MassDEP          |
| PFOA            | 335-67-1   | REACH, Prop 65, MassDEP |
| PFHpA and Salts | 375-85-9   | REACH, MassDEP          |
| PFOS            | 1763-23-1  | Prop 65, MassDEP        |
| PFOS precursors | various    | Prop 65                 |
| PFNA            | 375-95-1   | REACH, Prop 65, MassDEP |
| PFDA            | 335-76-2   | REACH, MassDEP          |
| PFUnDA          | 2058-94-8  | REACH                   |
| PFTTrDA         | 72629-94-8 | REACH                   |
| PFTDA           | 376-06-7   | REACH                   |

As of 3/17/23

- B. Separate samples of the turf can also be completed by a certified laboratory of the City’s choice.

C. 3<sup>rd</sup> party Testing: Where specified herein, an independent third party testing agency shall be retained by the Contractor to perform all required testing. Pre-approved testing agencies include.

1. Firefly Sports Testing – Hooksett, NH <tel:603-715-5453>.
2. Labosport – Dalton, GA <tel:706-529-9474>.
3. Sports Laboratories- Chattanooga, TN tel:423-617-6928.

#### 1.05 Pre-Installation Meeting.

A. Convene One (1) Week After Bid Opening

1. An interview shall take place at a time and date to be determined by the Engineer at the district office or other location determined by the Engineer and Owner. Present at this meeting shall be the Engineer, Owner's Representative(s), the Project Manager and Site Superintendent for the Prime Contractor and the Project Manager and Project Foreman for the Turf Installer. The purpose of this meeting will be to review turf product and installation means and methods, to interview and ascertain the experience and competence of the Turf Installer, as well as, the onsite Project Foreman for this project and to review the project schedule. The basis of choosing this particular product shall be in part due to the results of this interview process. Contractor shall submit all required submittals before this meeting.

B. Convene One (1) Week Prior to Stone Blanket Completion.

1. A second meeting shall take place at a location, time and date to be determined by the Engineer. Present at this meeting shall be the Engineer, Owner's Representative(s), and the Project Manager for the Site Contractor. The purpose of this meeting shall be to review and confirm schedule. (with particular attention on the turf installation) and to confirm that the turf product has been ordered by way of notarized copies of the original confirmed Purchase Order and guaranteed delivery date.

#### 1.06 Delivery, Storage, and Protection

C. Deliver products to project site in original packages with seals unbroken bearing manufacturers labels labels indicating brand name and directions for storing.

D. Store rolls of synthetic turf horizontally, elevated off the ground and on flat surfaces. Do not stand or stack rolls upright.

E. Store manufactured materials in a secure, clean and dry location protected from the weather, vandalism and deterioration, and complying with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

1.07 Warranties.

- A. The Turf Manufacturer shall provide a Warranty to the Owner that covers defects in materials and workmanship of the turf for a period of eight (8) years from the date of Substantial Completion. The turf manufacturer must verify that their onsite representative has inspected the installation and that the work conforms to the manufacturer's requirements. The turf fabric shall not lose more than an average 2% per year. The manufacturer shall guarantee the availability of replacement material for the synthetic turf system installed for the life of the warranty.
- B. The Manufacturer's Warranty shall include:
- a. Stating that all work executed under this Section will be free from defects in material and workmanship without limitations for a period of eight (8) years from the date of Substantial Completion, and that any defects will be remedied on written notice at no additional cost to the Owner.
  - b. Coverage of all materials and labor shall provide for all costs up to and including the full value of a complete re-installation of the synthetic turf system and all preparation and disposal costs.
  - c. This warranty shall include all components of the system in its coverage.
  - d. The manufacturer shall warrant that materials and their performance shall meet or exceed the product specifications.
  - e. The warranty shall not limit the types of sports and recreation activities or uses that are typical of similar soccer and football field installations.
  - f. The insurance premium for this coverage shall be paid in full for the entire length of the warranty.
  - g. Insurance coverage shall specifically provide for reimbursement to the warranty holder in the event of bankruptcy of the synthetic turf provider.
  - h. Insurance coverage shall apply to playing surface inclusive of infill, seaming, labor and colored inlays for event markings.
  - i. Provide the following documents with bid: Warranty Certificate, Accord Certificate, the actual Insurance Policy, and proof of A.M. Best Rating for the insured warranty provider.
  - j. Insurance coverage shall apply to the full 8 year period from completion date of project, with no uninsured periods or periods of self-insurance.
  - k. Insurance coverage shall not have exclusions for epidemic or catastrophic failure.
  - l. Insurance coverage shall not limit the hours of use.
  - m. Insurance coverage shall not exclude heavy trafficked areas or related uses such as team or band practices.
  - n. Insurance coverage shall not exclude any colored turf fibers.
  - o. Provide the actual executed Policy from the insurance carrier.
- C. The Turf Manufacturer's Warranty must be supported by an insurance policy of the

full eight (8) year period.

- D. The Turf Contractor shall provide a Warranty to the Owner that covers defects in the installation workmanship, and further warrant that the installation was done in accordance with both the Manufactures' recommendations and any written directives of the Manufacturer's onsite representative.
- E. The synthetic athletic grass turf, for the life of the Warranty, must maintain an ASTM F355 and ASTM F1936 G-max between 125-165; ASTM F1292 Hemisphere Impact Attenuation (HIC) of less than or equal to 1,000 at 1.4 meters.
- F. Any repairs or service to the field requested by the Owner or Owner's representative shall be addressed within 14 days from the date of written notification.
- G. The Turf Manufacturer shall be 100% responsible for and warranty all products installed as part of his system inclusive of the fibers whether the fibers are manufactured by the turf company or by others.

#### 1.08 Maintenance Service

- A. The Turf Manufacturer will train the Owner's facility maintenance staff in the use of the specified maintenance attachments and equipment to routinely groom and sweep the field. Equipment shall be in good working condition.
- B. Provide three copies of Maintenance Manuals and one (1) digital copy in PDF format, which include all necessary instructions for the proper care and preventative maintenance of the synthetic turf system, including painting and markings.
- C. Provide extra and additional materials to the Owner:
  - a. One contiguous green piece of synthetic turf 15' wide by 15' long from the same production run as the turf supplied to this project, as well as all salvageable remnants from the installation.
  - b. Two hundred pounds of specified sand.
  - c. Five hundred pounds of specified infill.
- D. Within the first 3 months after final acceptance, the turf installation contractor shall replenish the specified infill material to the required depth at no additional cost to the Owner if the depth of the infill is found to have settled to be less than the specified depth throughout the field surface during that timeframe. Only a + tolerance of 1/8" will be accepted for infill depths

#### 1.09 ADA Handicap Accessible

- A. Synthetic turf system shall be approved as ADA compliant as determined by Test-Method ASTM 1951-99.
- B. Proof of passing must be submitted for approval.

**PART 2 - PRODUCTS**

2.01 Base Stone and Drainage System (**Furnish and Install By Contractor**)

| Sieves | Base Stone-Type 1 | Base Stone-Type 2 | Finishing Stone |
|--------|-------------------|-------------------|-----------------|
| 3"     |                   |                   |                 |
| 2"     | 100               |                   |                 |
| 1 ½"   | 90-100            |                   |                 |
| 1"     | 75-100            | 100               |                 |
| ¾"     | 65-95             | 90-100            |                 |
| ½"     | 55-85             | 80-100            | 100             |
| ⅜"     | 40-75             | 70-100            | 85-100          |
| ¼"     | 25-65             | 60-90             | 75-100          |
| US#4   | 15-60             | 50-85             | 60-90           |
| US#8   | 0-40              | 30-65             | 35-75           |
| US#16  | 0-20              | 10-50             | 10-55           |
| US#30  | 0-10              | 0-35              | 0-40            |
| US#60  | 0-8               | 0-15              | 0-15            |
| US#100 | 0-6               | 0-8               | 0-8             |
| US#200 | 0-5               | 0-2               | 0-2             |

**PLEASE NOTE THAT THE BASE STONE AND DRAINAGE STONE SYSTEM IS A SPECIAL MANUFACTURED PRODUCT AND ANY DEVIATION FROM THIS MATERIAL SHALL REQUIRE WRITTEN APPROVAL FROM THE TURF**

**MANUFACTURER'S CORPORATE HEADQUARTERS. THE BASE STONE AND FINISHING STONE PRODUCT IS A 100% CLEANED WASHED QUARRY STONE MIXTURE. GRAVEL AND SAND MIX MATERIAL SHALL NOT BE ALLOWED (NO EXCEPTIONS)**

RESTRICTIONS:

- A. To ensure structural stability:  $D_{60}/D_{10} > 5$  and  $1 < D_{30}^2 < 3$   
 $D_{10} D_{60}$  Fragmentation must be 100%.
- B. To ensure separation of both stones:  $D_{85}$  of finishing stone  $> 2$   
 $D_{15}$  of base stone and  $3 < D_{50}$  of base stone  $< 6$   
 $D_{50}$  of finishing stone
- C. To ensure proper drainage: Permeability of base stone  $> 50$  in/hr ( $3.5 \times 10^{-2}$  cm/sec)  
Permeability of finishing stone  $> 10$  in/hr ( $7.0 \times 10^{-3}$  cm/sec)  
Porosity of both stones  $> 25\%$   
(When stone is saturated and compacted to 95% Proctor.)
- D. Soft aggregate materials such as sedimentary rock sources are not acceptable. Questionable materials shall be evaluated using a sulfate soundness test (ASTM C-88) and LA Abrasion Test (ASTM C-131).

2.02 Perimeter Edge: Cast-In-Place Concrete Nailer Curb – **(Furnish and Install By Contractor)**

- A. Refer to Details.
- B. Concrete for Cast-in-Place Nailer Curb shall have a 28-day compressive strength of at least 5,000 pounds per square inch. Higher minimum compressive strength indicated in the drawings and/or specifications for individual improvements shall govern see section 03 30 13 CAST IN PLACE CONCRETE.
- C. Provide smooth broom finish at all exposed turf edger.
- D. Fence posts shall be embedded directly within curb edger as indicated on the Drawings. Fence posts surfaces shall remain free and clear of dirt and debris as well as remain free of damage as a result of the concrete work.
- E. Sawn control joints at a maximum 20 feet spacing or as indicated in the Drawings shall be perpendicular to nailer curb and penetrate 1 inch minimum into edger. Care should be taken to avoid chipping or damage to turf concrete curb.

2.03 Filter Fabric **(Furnish and Install By Contractor)**.

A. Non-woven polypropylene geo-textile fabric shall be chemically and biologically inert and shall be equivalent to the following:

1. Mirafi 140N, TenCate Geosynthetics North America, Pendergrass, GA 706-693-2226.
2. 140EX, LINQ Industrial Fabrics, Inc. Summerville, SC 800-445-4675.
3. C45NW, CONTECH Construction Products Inc. West Chester, OH 800-338-1122.

2.04 Underdrain System (**Furnish and Install By Contractor**).

A. The quality of standard, design and function desired is based on AdvanEdge system, manufactured by ADS, 1-800-821-6710.

1. 1-inch by 12-inch flat drain wrapped in geotextile fabric and shall meet ASTM D7001.
  - a. The core collection system shall conform to the following physical properties:

**Perforations:**

|                   |          |
|-------------------|----------|
| Nominal Pipe Size | 12"      |
| Slot Length       | 1.125"   |
| Slot Width        | 0.125"   |
| Water Inlet Area  | 15" / ft |

**Filter Fabric**

|                       |                 |
|-----------------------|-----------------|
| Grab Tensile Strength | 112lbs          |
| Grab Elongation       | 50%             |
| Trapezoidal Tear      | 40 lbs          |
| Puncture              | 40 lbs          |
| Permittivity          | 0.5 / sec       |
| AOS                   | 60 (Sieve size) |
| UV Resistance         | 50              |

2. ADS AdvanEdge end connector with 4-inch ADS pipe.
3. 4" Inserta Tee Lateral Connection.
4. 4" Type C single wall pipe.
5. Collector drainpipe, refer to Section 33 41 13.22 CORRUGATED POLYETHYLENE [HDPE] PIPE.
6. Drainage structures, see Section 33 39 13 PRECAST MANHOLES AND CATCH BASINS.
7. Additional acceptable manufacturer:
  - a. Varicore Technologies, Inc. (800) 978-8007.
  - b. Invisible Structures, Inc. (800) (233-1510).
  - c. Approved equivalent



2.05 Synthetic Athletic Grass Infill System Materials (**Furnish by Owner, Install By Contractor**)

- A. The synthetic athletic turf system shall be considered “PFAS/PFOS free” according to REACH and PROP 65. Turf system shall be non-detect (ND) for 30 PFAS compounds tested via EPA Method 537 Modified and have a statement from the vendor that the turf does not contain and is not manufactured with PFAS/PFOA. Refer to the requirements listed in Part-1 of this section.
- B. The Synthetic Athletic Grass Material and SBR rubber infill shall be in strict accordance with the following:
1. The synthetic athletic sport grass system is supplied by Sprinturf. The product is: Ultrablade DEF Extreme. The fiber shall be a hybrid fiber combo with multi-structured monofilament and slit-film fibers tufted together in same or alternating needle construction.
  2. The carpet shall surpass 200,000 Lisport Cycles as certified by a 3<sup>rd</sup> party independent testing agency.
  3. The carpet shall be delivered in 15' wide rolls. The rolls shall be of sufficient length to go from edge of track to edge of track. Head seams will not be acceptable.
  4. Tufted and inlaid markings where required per drawings installed in accordance with the manufacturer’s recommendations. Lines shall be tufted within the 15-foot wide rolls to the maximum extent possible. All field lines, numbers and markings indicated on the plans shall be permanently installed or painted as indicated in the plans.
    1. As selected by the Town. For informational purposes the colors can be assumed to be:
    2. Soccer: All line/markings shall be WHITE.
    3. All tick marks shall be RED.
  5. The fiber shall be Field Green/Olive Green/Lime Green in color to simulate natural grass as closely as possible and treated with UV inhibitor, guaranteed a minimum of eight (8) years.
  6. Glued seams: Unless other seaming methods are approved by the Landscape Architect. Seaming tape and adhesive shall meet the approved synthetic turf manufacturer’s requirements and minimum performance characteristics specified herein.
    1. Adhesives for bonding tufted synthetic turf shall be one-component fast-set urethane adhesive obtained from a single manufacturer and be equivalent to Ultrabond Turf PU 1K as

manufactured by Mapei Corporation, Deerfield Beach, FL (800) 992-6273, or approved equal.

2. Tape for securing seams in the tufted synthetic turf and inlaid lines shall be high quality tape made with a minimum roll width of 12 inches.
  
7. The infill system shall consist of a homogeneous, non-compacting mixture of specifically graded, coarse, rounded, uniformly sized silica sand and coarse, recycled SBR rubber. SBR rubber shall conform to all STC regulation standards for safety. The contractor shall submit to the engineer for approval all SBR product data inclusive of material size and content. Failure to do so shall be at the contractor's risk and cost.

| Typ. Part. Size Distr.<br>*Mesh (ASTM E-11) |       | Typ. Part. Size Distr.<br>*Mesh (ASTM E-11) |       |
|---|-------|---|-------|
| 8   | ----- | 8   | ----- |
| 12  | 0.3%  | 10  | Trace |
| 16  | 57.8% | 12  | 20%   |
| 20  | 32.6% | 16  | 80%   |
| 30  | 5.1%  | 20  | 100%  |
| 40  | ----- | PAN   | 0%    |
| 50  | ----- | PAN   | 0.4%  |

Minimum total weight of infill to be 7 lbs./square foot with a 50/50 sand and rubber ratio, unless otherwise demonstrated by the manufacturer to meet or exceed the impact attenuation requirements.

\*Represents the typical mean percentage (%) retained on individual sieves.

8. Infill shall be free of pesticides, heavy metals, and all PFAS compounds quantified by EPA 533 Modified, EPA Method 537 Modified laboratory analysis with isotope dilution, DoD QSM 5.4 Table B-15 or ENGINEER approved equivalent.
  
9. Total depth of infill shall be a minimum 72% of the fiber height (1.80 inches in depth), with a + tolerance or 1/8" only; or as recommended by the manufacturer to meet the impact attenuation requirements.

2.06 Turf Data

Turf Fabric: Turf fabric with multicolored fiber and UV resistance, complying with the following:

|                        |                |
|------------------------|----------------|
| Pile Weight:           | Face: 50 oz/sy |
| Pile Height (Finished) | 2.50"          |

|                         |   |
|-------------------------|---|
| Color:                  | Field Green/Olive Green/Lime Green        |
| Construction:           | Broadloom Tufted                          |
| Total Product Weight:   | 80 oz/sy ( ± 2 oz ) Min.                  |
| Finished Roll Width:    | 15'                                       |
| Finished Roll Length:   | Up to 220'                                |
| Perforation (Outdoors): | 3/16" Holes on Staggered 4" (approximate) |
| Center Permeability:    | 20" ± Per Hour                            |

Turf manufacturer shall provide independent study data on permeability requirements

|                         |   |
|-------------------------|---|
| Infill Composition:     | Rounded, Uniformly-Sized Silica Sand and SBR Rubber Mixture (50% rubber / 50% sand by weight) |
| Field Lines & Markings: | Tufted, Inlaid and Painted  |

**Shall have no PFAS compounds quantified by EPA Method 533 Modified, Method 537 Modified laboratory analysis with isotope dilution, DoD QSM 5.4 Table B-15 or Engineer approved equal.**

2.07 Synthetic Turf Maintenance Equipment (**Furnish and Install By Contractor**)

A. Provide one (1) Synthetic Sports Turf Groomer with integrated Spring Tine Rake for routine maintenance of the synthetic turf field. Maintenance equipment shall be Model# 920SDE as provided by GreensGroomer WorldWide, Inc. PO Box 34151, Indianapolis, IN 46234. 888-298-8852, or equal as approved by the Landscape Architect.

1. Sports Turf Groomer shall be:
  - i. Towable product.
  - ii. Constructed of steel tube with powdercoat finish.
  - iii. Length shall be minimum of 48” and minimum width of 72”
  - iv. Groomer shall have an electric lifting mechanism to lift the brushes and spring tines off the field surface.
  
2. Spring Tine Rake Attachment shall be:
  - i. Attachable product compatible with the Turf Groomer product.
  - ii. Frame shall be constructed of steel with powdercoated finish.
  - iii. Width shall be minimum 72”.
  - iv. Tines shall be 3/16” diameter with a tip bend between 38-42 degrees.
  - v. Three (3) rows of tines with each row consisting of 12-14 tines. Tines shall be spaced 7/8” apart. Tines shall be offset from the other rows.
  - vi. Each row shall be independently adjustable for depth and allowed to be set in a forward or backward position for various levels of

aggressive raking.

- vii. Rake attachment shall be able to fully retract the tines allowing the rake to remain attached to the groomer when not in use.

B. Provide one (1) LitterKat Synthetic Turf Sweeper with Tow-magnet as provided by GreensGroomer WorldWide, Inc. PO Box 34151, Indianapolis, IN 46234. 888-298-8852, or equal as approved by the Landscape Architect.

- 1. Sports Turf Sweeper shall be:
  - i. Towable product.
  - ii. Steel Construction with powdercoat finish.
  - iii. Width shall be a minimum of 72”.
  - iv. Sweeper shall be direct drive gear drive.
  - v. Debris basket shall be removable.
  - vi. Sweeper shall have an electric lifting actuator to lift basket and sweeping brush off the field surface.

C. Magnet bar shall be.

- 1. Towable product.
- 2. Width shall be minimum of 72”, depth of minimum 5”, height of 2” minimum.

### **PART 3 - INSTALLATION**

#### **3.01 Coordination**

- A. The work of this Section shall be performed in full compliance with all approved submittals and certifications, and in conformance with the approved manufacturer’s recommendations and requirements.
- B. The synthetic turf manufacturer’s representative shall inspect all adjacent site conditions and verify that they are in proper condition to receive the work described within this Section. Notify the Engineer of any condition that may potentially affect proper execution of the work. Beginning work of this Section means acceptance of existing substrate surfaces and site conditions.

#### **3.02 Subgrade / Subbase Approvals**

- A. Prior to the installation of the Synthetic Grass Infill System, the General/Site Contractor shall provide written certification that all subgrade, subbase, leveling course and slopes and elevations are in compliance with the Contract Documents and meets or exceeds all manufacturer’s requirements. This certification shall be prepared by an approved Installer. The finished grade of the subbase shall not vary more than 3/16" in ten (10) feet. A laser grader must be used to meet the requirements.

- B. Written approval of the subgrade elevations by the manufacturer's representative is required prior to placement of geotextile and drainage base materials.
- C. The General/Site Contractor shall also provide an as-built survey of the finished subgrade and also finished leveling course with spot grades every 25 feet on center each way for approval.
- D. The General/Site Contractor shall prepare a minimum 25'x25' (twenty five foot by twenty five foot) mock-up of the approved materials for the subbase and leveling course system in order to evaluate porosity and stability prior to installing material over the entire field. If acceptable the mock-up may become part of the finished field.

### 3.03 Geotextile Filter Fabric

- A. Geotextile filter fabric shall be placed over the entire athletic grass surface of the approved subgrade, including under the sub drains. Overlap joints a minimum of twelve (12) inches. Prevent any soil contamination of the underdrains to provide a clean connection to the drainage layer under the synthetic turf field.
- B. Geotextile fabric is not required at the Synthetic Lawn Grass Infill System.

### 3.04 Drainage Stone and Subdrains.

- A. Install the sub drains within the bottom drainage layer as indicated on the Drawings. Bottom and top layers of drainage materials meeting the manufacturer's engineered criteria for this project, shall be placed and compacted in accordance with the manufacturer's installation requirements. A minimum of two (2) separate layers of drainage materials placement will be required.
- B. Drainage stone shall be placed as per requirements of Section 312000 Earthwork. To prevent segregation of different aggregate sizes handling of the base stone material shall be minimized. The finished surface of the top drainage stone layer shall be fine graded in preparation of measurement. The contractor shall measure the top drainage stone layer at a minimum of 100 evenly spaced points throughout the field area with a laser level to attain the required elevations. Surface tolerance shall not exceed 3/16 inch in ten feet. Infiltration of the Drainage Stone shall be no less than 40 inches per hour (40"/hr) or as noted with Section 31200 Earthwork, whichever is greater. Written approval of the drainage base by the manufacturer's representative is required prior to installation of the synthetic turf system.
- C. Placing, Spreading and Compacting Base Stone Material at Synthetic Athletic Turf Field:
  - 1. Fill materials are to be placed as designated herein and as indicated on the Contract Drawings.

2. Base Stone shall be placed as follows and compacted as specified herein:  
As a base course, compacted subgrade, as shown on the Drawings.
3. Finishing Top Stone shall be placed as follows and compacted as specified herein: Finishing Stone shall be 1" compacted depth above Base Stone as shown on the Drawings.
4. After each layer has been placed, it shall be thoroughly compacted to the specified density. Compaction shall be continuous over the entire area and the equipment shall make sufficient passes to ensure that the desired density is obtained. A minimum of four coverage's with acceptable compaction equipment is a requirement.

### 3.05 Compaction.

#### A. Compaction Requirements:

1. The degree of compaction as shown on the drawings shall be in accordance with section 312000 Earthwork.
2. Laser grading shall be used in the construction of the stone base material for the Synthetic Turf fields.

#### B. The contractor shall provide base stone and top stone testing by a 3<sup>rd</sup> party for infiltration, planarity and compaction by an approved testing agency specializing in synthetic turf fields.

### 3.06 Synthetic Athletic Grass Infill System.

#### A. Verification of Conditions (by Installer): Examine conditions under which synthetic athletic grass surfacing is to be installed in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractors and Engineer in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

#### B. The accepted synthetic athletic grass system shall be installed in accordance with the manufacturer's requirements and in coordination with the manufacturer's representative such that the manufacturer will certify the acceptability of the installation from subgrade to the finished synthetic turf system in writing.

1. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Architect written confirmation from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
2. Synthetic Athletic Grass Infill System: Provide manufacturer's inspection and certification that surface to receive synthetic turf is ready for installation of synthetic turf system, is perfectly clean in accordance with

manufacturer's standards, and will be maintained in acceptable clean condition throughout installation.

- C. Provide all materials, labor and equipment necessary to perform turf installation including, but not limited to, water and rollers to maintain stability and planarity of approved base.
- D. Installation: Install in strict accordance with manufacturer's written specifications and recommendations:
  - 1. After a final inspection of the prepared base by the Field Installer and the Owner's Representative, the synthetic turf installation shall begin.
  - 2. Unless otherwise recommended by turf and base manufacturer, lay turf loosely across field, stretched, and attached to perimeter edge detail with sufficient length to permit full cross-field installation without head or cross-seams. (Head and cross-seams shall not be permitted).
  - 3. Pile lay shall be in accordance with the approved shop drawings. No head seams shall be permitted.
  - 4. Per the manufacturer's recommendation, the installation of field lines shall be sewn in or cut and glued. All field line installation shall be covered under the warranty.
  - 5. All visible wrinkles shall be stretched out before seaming.
  - 6. Seams shall be flat, tight and permanent with no separation or fraying.
  - 7. Seams shall be glued without bulging in the backing material. Visible seams in the finished installation are not acceptable. Seaming tape shall extend a minimum of 6" in all directions from any material joint.
  - 8. The adhesive shall extend at its full application rate a minimum of 4" in all directions from any material joint.
  - 9. The adhesive shall be applied at the adhesive manufacturers' recommended application rate at 99% efficiency.
  - 10. All seams shall have a min. grab tear strength of 150 lbs and 5% elongation based on ASTM D5034-05.
  - 11. When all rolls of the playing surface have been installed, the sideline areas shall be installed perpendicular to the playing field.
- E. Attach the synthetic turf to the perimeter edge detail in accordance with the manufacturer's recommendations. The edges shall be secure and have a neat and smooth transition to adjacent surfaces.
- F. Install inlaid field markings to complete the tufted markings for the sports shown in accordance with the approved shop drawings and applicable standards.
- G. After all seaming and inlaid markings are complete, the infill shall be properly mixed on site and applied/spread evenly with a large drop/topdresser/fertilizer type spreader (minimum six (6) foot wide) in strict accordance with manufacturer recommendations.

1. Between each application of infill, the field area shall be brushed with a motorized rotary nylon broom.
2. Minimum infill depth shall be as noted in the sections above.
3. Comply with manufacturer's recommendations regarding environmental requirements for installation such as dryness and absence of moisture.
4. Please note that prior to final approval of the field the Engineer shall perform field infill height measurements and also infill weight tests throughout the field to ensure the proper infill height and weight have been met. The infill weight tests shall include removing a square foot of material and weighing accordingly, in the presence of the turf manufacturer / turf installer, at 8 chosen areas throughout the field of play. Upon completion of the test, the turf manufacturer shall replace the extracted material accordingly. If it is deemed the proper infill weight is not in compliance with the contract documents, the turf manufacturer, at his/her cost, shall import and install added infill material (in the presence of the Engineer) throughout the field until it has been deemed the infill weight is acceptable.
5. Presence of wrinkles in the synthetic turf and evidence of inadequate ballast will require additional sand.

- H. Synthetic Turf Perimeter Attachment: After final trimming of the turf, the turf shall be attached to the curb in accordance with the manufacturer's recommendations using mechanical fasteners and adhesive. The edges shall be secure and have a neat and smooth transition to adjacent surfaces.
- I. Provide final cleaning of synthetic grass surfacing installations and maintain area clean and free from debris during installation. Clean surfaces, recesses, enclosures, and similar areas as required leaving area of installation in clean, immaculate condition ready for immediate occupancy and using by Owner.
- J. Protect installed synthetic grass from subsequent construction operations. Do not permit traffic over unprotected surfacing.

### 3.07 Field Quality Control.

- A. Testing Agency: Prior to Owner acceptance of the synthetic turf installation, the Synthetic Turf Manufacturer/Installer shall engage an independent testing agency approved by the Landscape Architect to perform permeability, G-Max and HIC testing in accordance with the testing methods referenced herein and according to the Synthetic Turf Council's recommendations.
- B. Layout Verification: Prior to Owner acceptance of the synthetic turf installation, the Synthetic Turf Manufacturer/Installer shall engage a Professional Engineer or Registered Land Surveyor to verify the sizes and locations of the football and soccer field locations.



- C. Remove and replace or install additional materials as necessary where test results of measurements indicate non-conforming conditions to specified requirements or industry standards.

### 3.08 Maintenance and Warranty

- A. The turf installer and/or the turf manufacturer must provide the following.
  - 1. The turf manufacturer shall provide a warranty to the Owner that covers defects in materials and workmanship of the turf for a period of eight years from the date of Substantial Completion. The turf manufacturer must verify that their on-site representative has inspected the installation and that the work conforms to the manufacturer's requirements. The polyethylene yarn manufacturer shall provide an eight (8) year "UV stabilization" warranty.
  - 2. The manufacturer's warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism, acts of War and acts of God beyond the control of the Owner of the manufacturer.
  - 3. The turf contractor shall provide a warranty to the owner that covers defects in the installation workmanship, and further warrant the installation was done in accordance with both the manufacturer's recommendations and any written directives of the manufacturer's on site representative.
  - 4. All turf warranties shall be limited to repair or replacement of the affected areas and shall include all necessary materials, labor, transportation costs, etc. to complete said repairs. All warranties are contingent on the full payment by the Owner of all pertinent invoices.

### 3.09 Owner Training

- A. Upon completion of the synthetic turf installation, the synthetic turf manufacturer/installer shall provide training in person for the proper care and maintenance of the synthetic turf system at up to two (2) meetings with the Owner's maintenance personnel. Provide submittals in accordance with Part-1 herein.

### 3.10 Cleaning, Repair and Protection

- A. The turf installation contractor shall provide all labor, materials and equipment for cleaning, repair and protection of the installation to the satisfaction of the Landscape Architect.
- B. Within the first 3 months after final acceptance, the turf installation contractor shall replenish the specified infill material to the required depth at no additional

cost to the Owner if the depth of the infill is found to have settled to be less than specified throughout the field surface during that timeframe.

3.11 Closeout

- A. The synthetic turf representative must verify that a qualified representative has inspected the installation and that the finished field surface conforms to the Manufacturer's requirements.
- B. The synthetic turf manufacturer shall provide the warranty, training and maintenance manual specified herein.
- C. Extra materials: Contractor shall leave specified attic stock, surplus turf pieces of usable size, additional sand and plant-based infill with the Owner.

**-END OF SECTION 32 18 13-**

**SYNTHETIC GRASS INFILL SYSTEM  
(DIRECT PURCHASE BY OWNER)**

## SECTION 32 18 00

### PLAYGROUND PROTECTIVE SURFACING

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 apply to the work of this Section.

##### 1.02 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 Safety Surfacing
  - 2. Cleaning, Repair and Protection

##### 1.03 RELATED WORK

- A. Carefully examine the site and all of the Contract Documents for requirements that affect the work of this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions. Other specifications sections that directly relate to the work of this Section include, but are not limited to, the following:
- B. The following related items are included under the Sections list below:
  - 1. Section 11 68 13 – Play Equipment
  - 2. Section 31 00 00 – Earthwork
  - 3. Section 32 13 13 –Concrete Pavements
  - 4. Section 32 31 00 – Fencing
  - 5. Section 32 33 00 – Site Furnishings
  - 6. Section 33 41 13.22 Corrugated Polyethylene (HDPE) Drainage Pipe
- C. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of all work of the Contract.

##### 1.04 REFERENCES

- 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.
- B. American Society of Testing and Materials (ASTM)

1. 355 Shock Absorbing Properties of Playing Surface Systems and Materials (GMAX)
2. F1292 Impact Attenuation of Surface Systems Under and Around Playground Equipment
3. F1951 Determination of Accessibility of Surface Systems Under and Around Playground Equipment

#### 1.05 SUBMITTALS

A. Submit Poured-in-Place Rubber manufacturer's Product Literature including IPEMA certification, Specification Data and installation instructions.

1. Provide color samples (12" x 12" square, up to 12 samples) to Owner/Landscape Architect.
2. Field layout of color and pattern of surfacing to be approved by Owner's Representative prior to installation.
3. Submit test results for impact attenuation in accordance with ASTM F 1292 Standard Specification and accessibility in accordance with ASTM F1951.
4. Provide Manufacturer's Warranty for Owner's acceptance.
5. Submit test results for impact attenuation in accordance with ASTM F 1292 Standard Specification and accessibility in accordance with ASTM F1951. Submit evidence of IPEMA (International Playground Equipment Manufacturer's Association) certification.
6. A certificate of insurance must be provided by the supplier which shall provide a coverage of products liability with limit of liability not less than \$1,000,000.
7. Post-installation testing results as described in 1.09.C of this Section.

B. Submit installer qualifications (Manufacturer-certified installer of system).

1. Installers of the rubber safety surface system shall have five (5) years experience, minimum, and shall provide three (3) local references where installation can be inspected.

C. The General Contractor shall verify by field inspection that all items within this section conform to the specified requirements and approved submittals prior to installation.

#### 1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products and provide adequate protection against damage. Handle in strict compliance with manufacturer instructions and recommendations and store off the ground. Protect from all possible damage including, but not limited

to chipping, staining, cracking and other damage. Sequence deliveries to avoid delays, but minimize on-site storage.

#### 1.07 COORDINATION

- A. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work as necessary to assure the steady progress of the work of this Contract.
- B. B. 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.
- C. Substrates: Proceed with work only when substrate construction and penetrating work is complete. Maintain the sub-base in satisfactory condition and properly drained until surface improvement is placed.

#### 1.08 GUARANTEE

- A. The Contractor shall deliver standard written manufacturer's guarantee in the Owner's name covering all materials and workmanship. In addition to the specific guarantee requirements of the GENERAL CONDITIONS and SUPPLEMENTARY GENERAL CONDITIONS, the Contractor shall provide the manufacturers' standard written warranty for each product within this specification. All of these guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law or other provisions of the Contract Documents.

#### 1.09 QUALITY ASSURANCE

- A. Surface Installer Qualifications: Company specializing in outdoor resilient surfaces in the USA and certified members of NPCAI. The applicator shall be approved and trained, with a minimum of five years' documented experience and have completed 5 public playgrounds in the past 5 years. Conditions of all surface substrates with respect to structural performance shall be evaluated and approved by the surface installer prior to application of surface system.
- B. Performance requirements
  - 1. All safety surfacing within playground equipment use zones shall meet or exceed the performance requirements of the CPSC, ADA and Fall Height Test ASTM F 1292 and IPEMA certified for the highest playing point of each piece of play equipment.
  - 2. Surfaces intended to serve as accessible routes of travel shall be firm, stable and slip resistant and shall be meet the requirements of ASTM F 1951 and ASTM F 1292
- C. Post-installation testing
  - 1. Impact attenuation testing shall be performed by a National Recreation and Parks Association/National Playground Safety Institute (NRPA/NPSI) Certified Playground Safety Inspector (CPSI) and trained in the proper operation of the Triax test equipment.

2. The Contractor is responsible for securing a Certified Playground Safety Inspector to ensure ASTM and CPSC compliance. A certificate of compliance will be issued to the Owner prior to final inspection.
3. Impact attenuation testing shall be performed according to ASTM 1292 in presence of the owner within 30 days of installation. As a precondition of surfacing acceptance, the Contractor shall provide the testing results in writing. Up to 10 drop test locations will be required at each separate play area.
4. If the surfacing does not meet the safety standards or impact attenuation performance requirements, the contractor will be required to bring the surfacing up to compliance within 30 days or less. The extent of failure and determination of replacement will be at the discretion of the Owner. Should they be found during or after installation, any violations of the C.P.S.C. Guidelines, ASTM, ADA or impact attenuation performance requirements shall be corrected to the satisfaction of the owner, any proposed corrective work shall be reviewed and approved by the Landscape Architect before corrective work begins.
5. Impact attenuation requirements: Gmax test results shall be less than 150 and HIC test results shall be less than 850.
  - a. Please refer to the falling fall height zones for suggested safety surfacing minimum depths. Actual depths shall be adjusted (thickened) as needed by the contractor, based upon the approved playground equipment and the fall heights, to accommodate the final Gmax and HIC requirements.

| FALL HEIGHT |             |
|-------------|-------------|
| PIP DEPTH   | FALL HEIGHT |
| 2.5"        | 4'          |
| 3"          | 5'          |
| 3.5"        | 6'          |
| 3.5"        | 7'          |
| 4"          | 8'          |
| 4.5"        | 9'          |
| 5"          | 10'         |
| 6"          | 12'         |

- D. The Contractor shall deliver standard written manufacturer's guarantee in the Owner's name covering all materials and workmanship. In addition to the specific guarantee requirements of the project.

## PART 2 - PRODUCTS

### 1.10 GRADING AND COMPACTION OF SUB-BASE

- A. Do all necessary grading in addition to that specified under Section 31 20 00 - EARTHWORK to bring subgrade or foundation after final compaction to required grades and sections to obtain a foundation of uniform bearing surface. In absence of specific requirements, compact foundation by such means as will provide firm base and insurance against settlement of superimposed work.
- B. Sub-base preparation, including material, shall be of properly approved quality as specified under Section 31 00 00 - EARTHWORK. 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 additional cost to the Owner.
- C. Concrete base material under sloped poured-in-place rubber conditions shall be as specified under Section 32 13 13 of these Specifications, or as otherwise indicated on the details.

### 1.11 POURED-IN-PLACE RUBBER SAFETY SURFACING.

- A. Furnish and install Poured-in-Place Rubber Safety Surface complete with gravel base, subdrainage and concrete edging per the Contract Documents.
- B. Poured-in-Place material shall be "Playbound" 2-layer poured-in-place by Surface America, [www.surfaceamerica.com](http://www.surfaceamerica.com), PO Box 157, Williamsville, NY 14231; Telephone: (800) 999-0555, Fax: (716) 632-8324, "Everguard" poured-in-place rubber as manufactured by Evergreen Surfacing Inc., 550 Main Street, Westbury, Ny 11590, (516) 864-0550, [www.everguardsurfacing.com](http://www.everguardsurfacing.com), "Perma-Play" by Pro-Techs Surfacing, LLC. 2072 Coon Road, Akron, OH 4432, (303) 576-6058. <https://pro-techssurfacing.com/>, or an approved equal.
  1. Primer shall be as per manufacturer's system, and recommended by manufacturer.
  2. Cushion Course: A monolithic poured-in-place cushion pad, consisting of a blend of 100% recycled SBR (Styrene Butadiene Rubber) and aromatic polyurethane binder. Cushion course thickness per the Contract Documents, and final poured-in-place surfacing depth shall be in accordance with fall height CPSC safety requirements. Required mix proportions by weight: as ratio 14% aromatic urethane divided by 86% rubber.
  3. Top Surface: The Top Surface shall be a monolithic poured-in-place top surface, thickness shall a minimum of ½" or as noted per the Contract Documents. Made from a blend of ethylene propylene diene monomer (EPDM) colored rubber particles. Top surface shall have a tensile strength of two hundred (200) psi. Required mix proportions by weight: as ratio 18% urethane divided by 82% rubber. The urethane binder shall be an aliphatic non-yellowing type.

4. In high wear areas (base of slide, beneath swings, and as determined by Landscape Architect), the top EPDM color surface shall be thickened to 1" per the Drawings. High wear areas shall be a minimum of 4'x4'. Prefabricated shock tiles will not be considered an equal.
  5. There will be up to SEVEN separate colors and each shall include a custom combination of FOUR colors with NO BLACK to be chosen by the owner's representative during the submittal process. For each color, the contractor shall supply up to 3 different samples of 4" x 4" tiles, for a total of up to 21 color tiles for the Owner's Representative to make final selection during submission process.
- C. All colors shall be submitted by the contractor, and approved by Landscape Architect.
  - D. Materials shall not contain hazardous substances, such as toluene, lead, or mercury compounds or cadmium coloring pigments.
  - E. The finished surface shall be slip-resistant; supply ASTM-E-303 slip characteristic test results.
  - F. Material shall be ignition-resistant; supply passing ASTM-D 2859 test results.
  - G. Material shall be water-permeable, and wear and weather-resistant. Sealants shall be low odor and non-yellowing.
  - H. Binders utilizing latex or emulsion type binder will not be accepted. Pre-fabricated shock pads will also not be considered equal.

#### 1.12 EDGING

- A. Refer to Contract drawings for edging locations and details and Section 03 30 00 CAST-IN-PLACE CONCRETE.
- B. Where the rubber surfacing meets bituminous concrete or landscaped areas, 6" wide concrete mow curb shall be installed per plans, details and specifications.

### PART 3 - EXECUTION

#### 1.13 SUBBASE, EDGING AND DRAINAGE

- A. Install edging system in accordance with the drawings and per the manufacturer's recommendations. Install the subdrains as indicated on the Drawings. Install gravel base where indicated on the drawings and in accordance with Section 31 00 00 Earthwork.

#### 1.14 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 150 G-max and 850 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). Surface must comply with Massachusetts Architectural Access Board accessibility requirements and ASTM F1951.
- C. The Base Mat shall exhibit a minimum installed thickness necessary to provide the required absorbency for the maximum potential fall from the proposed play equipment. At playlot edges, place a board between the end of the poured-in-place base pour and the concrete edge and remove the board after the base has sufficiently cured. Pour the top course of poured-in-place surfacing and allow material to fill the void created by the board.
- D. The Top Surface shall be installed following installation of the cushion course, in accordance with the manufacturer's instructions. The contractor is responsible for insuring that no foot traffic is allowed on the surface before the curing is complete.
- E. Contractor shall provide a written five (5) year performance guarantee from date of substantial completion. 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 in compliance with the manufacturers' warranty requirements.
- F. Safety surfacing shall be free of defects due to workmanship or material for a minimum of two (2) years from date of installation. Any defective elements shall be replaced in part or whole by the Contractor at no cost to the Owner.
- G. The Contractor and the manufacturer shall hold the Owner and Owner's Representative harmless from any and all damages or liability resulting from negligent acts and omissions on the part of the Contractor or manufacturer, or resulting from defective parts, or improper resilient safety surface installation. Contractor shall be responsible for securing site from pedestrian traffic or vandalism while poured-in-place safety surface dries.
- H. Install material per manufacturer's specifications.

#### 1.15 CLEANING, REPAIR AND PROTECTION

- A. Repair minor damage to eliminate all evidence of repair. Remove and replace work that cannot be satisfactorily repaired.
- B. Provide temporary protection to ensure that the work will be without dirt, stains, damage or deterioration at time of final acceptance. Clean up stains and spills as they occur. Remove protections and clean as necessary immediately before final acceptance.
- C. Upon completion of the work and before acceptance, the Contractor shall remove and dispose of in an approved manner all surplus materials, rubbish, etc. which the Contractor may have accumulated during the course of the work and shall leave the site in a clean and orderly condition. The Contractor shall not abandon any material

at or near the site regardless of whether or not it has any value.

END OF SECTION

**SECTION 32 31 00**  
**FENCING**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 apply to the work of this Section.

1.02 DESCRIPTION OF WORK

- A. The work of this Section includes, but is not limited to the following:
  - 1. Grading and Compaction of Sub-base.
  - 2. Concrete Footings for Fencing.
  - 3. Black Vinyl Coated Chain Link Fence and Gates.
  - 4. Baseball Chain Link Backstops.
  - 5. Ornamental Picket Fence.
  - 6. Steel vehicular barrier swing gates.
  - 7. Wooden Split-Rail Fence.
  - 8. Cleaning, Repair and Protection.

1.03 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements that affect the work of this Section. Other specification sections that directly relate to the work of this Section include, but are not limited to, the following:
  - 1. Section 033000 – Cast In Place Concrete.
  - 2. Section 116833 – Athletic Field Equipment
  - 3. Section 312000 - Earthwork
  - 4. Section 321200 - Asphalt Paving
  - 5. Section 323000 – Site Improvements
  - 6. Section 321313 – Concrete Pavements
  - 7. Section 321813 –Synthetic Grass Infill System

1.04 SUBMITTALS

- A. Refer to individual site improvements for additional submittal requirements.

- B. At least thirty days prior to intended use, the Contractor shall provide the following samples and submittals for approval in conformance with requirements this specification. Do not order materials until approval of samples by Owner's Representative, certifications or test results have been attained. Delivered materials shall closely match the approved samples.
- C. Provide manufacturer's product material information and system performance data along with material and system samples for each item specified in this Section for the Landscape Architect's review and approval prior to ordering materials.
- D. The General Contractor shall verify by field inspection that all items within this section conform to the specified requirements and approved submittals prior to installation.
- E. Shop Drawings:
  - 1) Submit fully detailed shop drawings for each item required to be fabricated or installed under work of this Section. Include layout plans, dimensioning plans, sections, and details as required to show completely materials, layout, jointing, clearances and connections for all items required. Submit shop drawings for the following:
    - a) Fencing. Chain link fences and ornamental picket fences
    - b) Gate Assemblies (including panic bars, handles, locking mechanisms, etc.
- F. Material Samples: Submit samples for each material for the following:
  - 1. Ornamental Picket Fence material and finishes – submit one (1) sample.
  - 2. Gate Assemblies (including panic bars, handles, locking mechanisms, etc.
  - 3. Chain link fence material:
    - 1) 12"x12" sample of fence fabric.
    - 2) 12" section of each type of fence pipe required.
    - 3) Provide 1 of each type of fitting required.
    - 4) Provide a 6" sample of fabric tie material.
    - 5) Provide 1 gate latch and 1 gate hinge (to be returned to the fence contractor upon completion of the installation.
- G. Manufacturer's Literature: Submit copies each of manufacturer's material descriptions and installation.
- H. Finishing Schedule: Submit a complete schedule outlining all items to be color finished under work of this Section together with a breakdown of surface preparation techniques and primer and color finish materials to be applied.
- I. The Contractor shall certify that all dimensions are correct prior to fabrication.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products adequately protected against damage. Handle in strict compliance with manufacturer's instructions and recommendations and store off the ground. Protect from all possible damage including, but not limited to, chipping, staining, cracking and other damage. Cracked, chipped, or stained units will be rejected and shall not be utilized in this work. Sequence deliveries to avoid delays, but minimize on-site storage.

#### 1.06 COORDINATION

- A. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work as necessary to assure the steady progress of the work of this Contract.
- B. Substrates: Proceed with work only when substrate construction and penetrating work is complete.

#### 1.07 REFERENCE STANDARDS

- A. Chain Link Fence Manufacturers Institute (CLFMI).
- B. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- C. ASTM A392 - Zinc Coated Steel Chain Link Fence Fabric.
- D. ASTM F668 - Poly Vinyl Chloride (PVC) - Coated Steel Chain-Link Fence Fabric.
- E. American Society of Testing and Materials (ASTM).
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
- G. ASTM B308 - Aluminum Alloy Standard Structural Shapes, Rolled or Extrude.

#### 1.08 GUARANTEE

- A. In addition to the specific guarantee requirements of the GENERAL CONDITIONS and SUPPLEMENTARY GENERAL CONDITIONS, the Contractor shall provide the manufacturers' standard written warranty for each product within this specification. All of these guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law or other provisions of the Contract Documents.

### **PART 2 - PRODUCTS & EXECUTION (Combined)**

#### 2.01 GRADING AND COMPACTION OF SUB-BASE

- A. Do all necessary grading in addition to that specified under Section 312000 – Earthwork to bring subgrade or foundation after final compaction to required grades and sections to obtain a foundation of uniform bearing surface. In absence of specific requirements, compact foundation by such means as will provide firm base and insurance against settlement of superimposed work.

- B. Sub-base preparation, including material, shall be of properly approved quality as specified under Section 312000 - EARTHWORK. 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 additional cost to the Owner.

## 2.02 CONCRETE FOOTINGS FOR FENCING ITEMS

- A. Construct concrete footings where shown on the Drawings.
- B. Concrete for footings shall be 4,000 lb. concrete as specified in Section 03 30 00 –CAST-IN-PLACE CONCRETE.
- C. Place concrete on moist subgrade or against prepared footings in continuous operation between transverse joints or individual sections. Vibrate all concrete. Do not place concrete in freezing temperatures or on frozen base.

## 2.03 VINYL COATED CHAIN LINK FENCE AND GATES

- A. Submittals:
  - 1. Shop Drawings: Supply shop drawings at an approved scale for location, installation and erection of all components of the chain link fence and gates.
  - 2. Product information: Provide manufacturer's product data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation.
  - 3. Material Selection and Samples: Submit samples as note above in part 1.04:
- B. Scope:
  - 1. This specification covers colored chain link fence and gates, including chain link fabric, framework, and fittings. Fence heights / gate heights and widths shall be shown on the drawings.
- C. PVC Coating: Fence fabric and framework shall be thermally-fused vinyl coating over galvanized steel. "A Bonded or extruded and glued" fabric will not be accepted.
- D. Color: All fence material including fabric, framework, fittings and hardware shall be black.
- E. Fabric: Fabric for all fences shall be a 2" diamond mesh unless otherwise noted. Fabric shall be #6 gauge core wire unless otherwise noted (0.192" nominal wire diameter) with a minimum breaking strength of 2170 pounds, thermally fused in accordance with ASTM F668-2b. The weight of the zinc coating on the steel wire shall be 0.3 oz. per square foot minimum. Chain link fabric shall be color matched with framework materials. Fabric shall be knuckled at both selvages.
- F. Framework: Shall consist of terminal posts, line posts, top rail, bottom rail, mid rail, truss rods at end and corner posts and gate frames.

G. Posts and rails shall be steel pipe, Type 1: ASTM F 1083, standard weight, schedule 40, minimum yield strength of 25,000 psi, sizes as indicated below. Before color is applied, all materials shall be given a minimum 1.8 ounce per s.f. coating of zinc. PVC-coated finish shall be applied in accordance with ASTM F 1234, apply supplemental color coating of 12 mils (0.254-0.356 mm) of thermally fused PVC.

1. Sizes of Framework:

a) Fences less than 5' Height

| Post or Rail           | Outside Diameter | Pounds/Foot |
|------------------------|------------------|-------------|
| End Corner & Pull Post | 2.375"           | 3.65        |
| Line Post              | 1.900"           | 2.72        |
| Top and Bottom Rail    | 1.660"           | 2.27        |

2. Fences greater than 5' Height but less than 8' Height

1) Provide mid rail braces\* between all end/corner posts and adjacent line posts at all fences 5' – 8' in height.

| Post or Rail           | Outside Diameter | Pounds/Foot |
|------------------------|------------------|-------------|
| End Corner & Pull Post | 2.875"           | 3.65        |
| Line Post              | 2.375"           | 2.72        |
| Top and Bottom Rail    | 1.660"           | 2.27        |
| Mid Rail Braces*       | 1.660"           | 2.27        |

3. Fences equal to or greater than 8' Height:

1) Provide continuous mid rails\* for all fences 8'-12' in height.

| Post or Rail           | Outside Diameter | Pounds/Foot |
|------------------------|------------------|-------------|
| End Corner & Pull Post | 4.0"             | 9.10        |
| Line Post              | 2.875"           | 5.79        |
| Top and Bottom Rail    | 1.660"           | 2.27        |
| Mid Rail Braces*       | 1.660"           | 2.27        |

\* Mid rails and mid rail braces at fences in front of players benches at baseball and softball dugouts shall be set at 3-feet above grade so as not to obstruct line of sight when seated on players benches.

- H. Top rail couplings 6-inch minimum in length shall be spaced at maximum 20-foot centers and 9 gauge minimum fabric tie wires shall be spaced at 18-inch maximum centers.
- I. Swing Gates: Gate openings shall be as indicated on the drawings. Gate height shall conform to the height of the fence unless otherwise indicated. Gate frames shall be fabricated with welded corners and braces. Frames shall be filled with chain link fabric of the same gauge and size as the fence. Gate post hinges shall be heavy-duty offset type furnished of adequate size and strength for the gate size specified and to allow a minimum 180-degree swing. Braces and trusses shall be furnished as specified as indicated below.. Gate shall include a heavy duty galvanized and vinyl coated positive latching device that will accommodate a padlock and secure the gate in a closed position. Gate post sizes shall be as described below:

- 1. Swing gate post sizes: (per ASTM F900)

| Gate height up to and including 6 ft. (1.2m) |                       |
|--|-----------------------|
| Gate leaf width                              | Post Outside Diameter |
| up to 4 ft.                                  | 2.375 in              |
| over 4 ft. to 10 ft.                         | 2.875 in              |

| Gate height over 6 ft. to 12 ft. (1.2 to 2.4m) |                       |
|--|-----------------------|
| Gate leaf width                                | Post Outside Diameter |
| up to 6 ft.                                    | 4.000 in              |
| over 6 ft. to 12 ft.                           | 4.000 in              |
| over 12 ft. to 18 ft.                          | 6.625 in              |

- 2. Braces and truss rods at gates
  - a) Include midrail brace in welded gate frame if gate is 5' height or greater.
  - b) Include truss rods for all gate leaves that are 7' width or wider.

- J. Accessories:



1. Chain link fence accessories: ASTM F 626, Provide items required to complete fence system. Galvanize each ferrous metal item in accordance with ASTM A 153 and finish to match framing (Black Vinyl Coating).
  2. Post Caps: Formed steel, weather tight dome-shape closure cap. Provide one cap for each post. Caps shall be affixed to the post securely so as to prevent removal.
  3. Stretcher Bars: One piece lengths equal to 2-inches less than full height of fabric with a minimum cross section of 3/16 inch x 3/4-inch. Provide stretcher bars where chain link fabric meets terminal posts.
  4. Tie Wire: 9 gauge vinyl coated galvanized steel wire for attachment of fabric to line posts.
- K. General: Certain components not adaptable to the here in specified coating process may be color coated by other means. All fittings shall be pressed steel or malleable iron. Tie wires shall be minimum 9 gauge PVC coated steel or 6 gauge aluminum. Line and terminal posts to be of sufficient length to be set to the full depth of concrete footing indicated on the Drawings. Maximum spacing of line posts shall be 10-feet.
1. Each fence panel shall be constructed such that it will pass the following test. Deflection of the fence fabric shall be no greater than 2 inches when a force of 30 pounds is applied in the center of a framed panel, perpendicular to the plane of the fence fabric. Fabric shall return to original position true to the plane of the fence when force is released.

#### 2.04 SOFTBALL BACKSTOP

- A. Shop drawings: Layout of fences and gates with dimensions, details, and finishes of components, accessories, and post foundations.
- B. Product data: Manufacturer's catalog cuts indicating material compliance and specified options.
- C. Chain link fabric:
  1. Thermally fused vinyl coating, 6 mil to 10 mil thickness, thermally fused to zinc-coated steel core wire: Per ASTM F 668 Class 2b. Minimum core wire tensile strength of 75,000 psi
  2. Roof fabric: 2" diamond mesh of 9-gauge core wire with a diameter of 0.148" and a break load of 1290 lbs. Color midnight black ASTM F 934.
  3. Side Fabric: Woven to height of 16 ft., or as indicated on drawings, with 2" diamond mesh of 6 gauge core wire with a diameter of 0.192" and a break load of 2170 lbs. Color midnight black ASTM F 934
  4. Selvage of fabric knuckled at top and knuckled at bottom.

#### D. Steel Framing

1. Thermally fused vinyl coating
2. Steel pipe - Type I: ASTM F 1083, standard weight schedule 40; minimum yield strength of 30,000 psi ; sizes as indicated. Hot-dipped galvanized.
3. End and Corner Post: 4" OD, 9.11 lbs per/ft. Line (intermediate) Post: 4" od, 9.11 lbs per/ft
4. Horizontal rails and roof members 1.9" od, 2.72 lbs per/ft

#### E. Accessories

1. Chain link fence accessories: ASTM F 626, Provide items required to complete fence system. Galvanize each ferrous metal item in accordance with ASTM A 153 and finished to match framing.
2. Post caps: Formed steel or cast malleable iron weather tight closure cap for tubular posts. Provide one cap for each post, except where barbed wire supporting arms are indicated. "C" shaped line post without top rail or barbed wire supporting arms do not require post caps. (Where top rail is used, provide tops to permit passage of top rail.)
3. Top rail and rail ends: Pressed steel per ASTM F626, for connection of rail and brace to posts.
4. Top rail sleeves: 7" (178 mm) expansion sleeve with minimum .137" wire diameter and 1.80" length spring, allowing for expansion and contraction of top rail.
5. Tie Wire: 9gauge vinyl coated galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge for rails and braces. Hog ring ties of 12-1/2 gauge for attachment of fabric to tension wire.
6. Brace and tension (stretcher bar) bands: Pressed steel, minimum 300-degree profile curvature for secure fence post attachment. At square post provide tension bar clips.
7. Tension (stretcher) bars: One piece lengths equal to 2" (50 mm) less than full height of fabric with a minimum cross-section of 3/16" x 3/4" (4.76 mm x 19 mm). Provide tension (stretcher) bars where chain link fabric meets terminal posts.

8. Tension wire: Zinc coated steel wire: Per ASTM F 1664 Class 2 b, 6 gauge, [0.192" (4.88 mm)] diameter core wire with tensile strength of 75,000 psi (517 MPa).
9. Truss rods & tightener: Steel rods with minimum diameter of 5/16" (7.9 mm). Capable of withstanding a tension of minimum 2,000 lbs.
10. Nuts and bolts are galvanized.

## 2.05 ORNAMENTAL METAL PICKET FENCE AND GATE

- A. Provide and install a metal ornamental picket fence and gate as shown on the Drawings. The system shall include all components (i.e., pickets, posts, rails, gates, and hardware) required. The fence shall be supported by galvanized steel posts. Provide complete material and layout shop drawings to scale for review and approval by the Landscape Architect prior to ordering material.
- B. The basis of design for the ornamental picket fence shall be:
  - 1) Ameristar's Echelon aluminum ornamental fencing, Style: Majestic, 3-rail style manufactured by Ameristar Perimeter Security USA Inc., in Tulsa, Oklahoma.
  - 2) Or an approved equal.
- C. Materials.
  - 1) The fence shall be fabricated from Aluminum. The material for fence framework (i.e., tubular pickets, rails, and posts) shall conform to the requirements of ASTM B221. The aluminum extrusions for posts and rails shall be Alloy and Temper Designation 6005-T5. The aluminum extrusions for pickets shall be Alloy and Temper Designation 6063-T6.
  - 2) Pickets shall be 5/8" square x .050" thick. Horizontal rails shall be 1" x 1-1/8" channel with .055" thick top & internal web wall, and .072" thick side walls and shall be punched to allow picket to pass through the top of the rail. The rail shall be constructed with an internal web insert providing a raceway for the pickets to be retained with a 1/8" retaining rod.
  - 3) Fence posts and gate posts shall be 2"x2" square tube with 0.060" wall thickness. Maximum post spacing is 72" or as recommended by the manufacturer.
  - 4) Swing gates shall be fabricated using tubular aluminum material, 1.25" sq. x .125" gate ends, and 5/8" sq. x .050 pickets. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding.
  - 5) All ornamental picket fence gates shall have self-closing and latching hardware.

- 6) Accessories: Aluminum castings shall be used for all post caps, scrolls, finials, and other miscellaneous hardware. Hinges and latches shall be fabricated from aluminum, stainless steel, or composite materials.

D. Fabrication.

- 1) Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets. Grommets shall be inserted into the pre-punched holes in the rails and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal upper raceway of the rails.
- 2) The manufactured framework shall be finished with a thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including, a pretreatment/wash, and an electrostatic spray application of a polyester finish. The topcoat shall be a “no-mar” TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be **Black**.
- 3) .

2.06 HOT DIPPED GALVANIZED STEEL VEHICULAR BARRIER GATE

A. Furnish and install hot-dipped galvanized fabricated steel barrier gates as indicated on the drawings.

B. Acceptable manufacturer:

1. Newgate Limited (Barriers Heavy Duty Manual Swing Arm), Newark, UK, 0808-156-1561.
2. Hoover Fence Co. (V-series), Newton Falls, Ohio, 800-355-2335.
3. Or approved equal.

C. Submittals:

1. In addition to any submittal requirements listed above in part 1.04, provide the following.
2. Approved manufacturer’s shop drawings shall become the basis for factory-finished surfaces and must therefore be submitted prior to installation.
3. The Contractor shall submit detailed shop drawings for footings for approval prior to installation. Drawings shall be prepared and sealed by a professional structural engineer (P.E.) experienced in design of similar structures and licensed in Massachusetts.

D. Materials:

1. Barrier gate and posts shall be manufactured from tubing, channels and rods, meeting the requirements of ASTM A 500-93 with an in line hot dipped Galvanized exterior zinc coating. The tubing finish will have an in-line hot dipped Galvanized Zinc coating, with a clear organic exterior coating and gray interior rust preventing coating. This material will have a minimum yield of 46,000 psi.
2. The manufacturer will supply gate hardware of sufficient size and capacity to support the specified gate.
3. Finish shall be an eight-stage pre-treatment and a four-stage corrosion resistant powder coating process. The finish shall conform to local environmental air quality standards. The landscape architect shall select the color from the fabricators list of standard colors, 6 minimum offerings, shall include Black and Deep Green.

E. Fabrication:

1. New prime material/galvanized steel, conforming to specified ASTM standards, shall be used in the manufacture of gates and posts.
2. Gates and posts shall be of welded construction by the gas metal arc method. The layout and welding shall be carried out by experienced craftsmen making sure all welds are neat, clean and of sizes matching those indicated on the drawing. Any and all flush welds shall be ground smooth.
3. After fabrication all posts, panels and gates shall be pre-treated to insure optimum coating adherence to the metal.

## 2.07 WOODEN SPLIT-RAIL FENCE

A. Furnish and wooden split-rail as indicated on the drawings.

B. Materials:

1. Timber shall be northern red-cedar or other non-chemically treated timber of a natural decay resistance.
2. All timbers shall be free from loose knots, cracks and other imperfections.
3. Posts shall be approximately 78-inches tall (78") or of sufficient length to accounts for a 30" minim in-ground burial and a top rail height of 48" above-grade, or as shown on the Drawings.
4. Posts shall provide for a three (3) rail notching.
5. Rails shall be split-rail style with tenion style ends to be inserted into the posts, or as shown on the Drawings.

## PART 3 - EXECUTION

### 3.01 CHAIN LINK FENCE INSTALLATION

- A. Erect chain link fencing only after final grading is complete. Install fence fabric and bolt heads on one side of fence and bolt nuts on the other side.
1. Level: Install all fence work, including fences over irregular terrain, with posts plumb and top of fence fabric and rails level, except as indicated otherwise and except at regular slopes and hills, install top of fence fabric and rails to follow slope.
  2. Posts Set in Ground: Accurately space posts at approximately (8) feet on center, unless otherwise indicated or required, and excavate neat, circular holes at least four times the diameter of the post and at least 6 inches below post. For all other posts set posts at least (3) feet below finish grade or as shown on the details and center align posts in hole with 6 inches of concrete beneath posts. Fill holes with concrete and vibrate and consolidate around posts. Maintain true vertical and top alignment and alignment along the fence line. Extend concrete footings to (2) inches below finish grades and slope to shed water away from posts. Align posts and fence fabric to permit paving to continue around fence posts so that concrete fence post footing does not show.
  3. Rails: Provide top and bottom rails continuously with expansion couplings as recommended by fence manufacturer. Install intermediate rails, where used, flush with face fabric using offset fittings if necessary. Provide intermediate rails for all fences over (6) feet high.
  4. Fabric: Thread tension bars through fabric and clamp to fabric at 4 inches on center. Band stretcher bars to end posts at (12) inches on center. Stretch fabric tightly and securely anchor fabric to framing and tension wires leaving about (1) inch clearance above grade. Anchor and tie so that fabric remains in tension after pulling force is released. Form joints of splices in fabric only at posts. Tie fabric to line posts at (12) inches on center, to rails and braces at (24) inches on center, and to tension wires at (24) inches on center with U-shaped tie wires double turned with ends bent into fence for safety.
  5. PVC Coated Work: Generally comply with requirements for galvanized work. Take extreme care to prevent removal of or damage to PVC coatings. Touch-up all cut and abraded surfaces with PVC tough-up paint to prevent corrosion and to make tough-up invisible.

### 3.02 ORNAMENTAL METAL PICKET FENCE AND GATE INSTALLATION

- A. installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels rails shall be inserted into punched posts and affixed with fasteners. Posts shall be set in concrete footers per manufacturers recommended. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

- B. When cutting/drilling rails or posts adhere to the following steps to seal the exposed surfaces; 1) Remove all metal shavings from cut area. 2) Apply custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1 & 2 above will negate warranty. Spray cans or paint pens shall be used to finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-manufacturer approved parts or components will negate the manufactures' warranty.
- C. Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application, weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations.

### 3.03 HOT DIPPED GALVANIZED STEEL VEHICULAR BARRIER GATE INSTALLATION

- A. Posts shall be set according to the spaces shown on the shop drawings. All posts shall be set plumb and level. Footing sizes shall be as indicated on the shop drawings as well as posts caps.
- B. Gates, where indicated on the Drawings, shall be installed according to the style and sizes indicated on the shop drawings and shall be installed plumb and level. Any required gate stops will be installed by the Contractor. To assure alignment of any padlock provisions or strikes, gate attachment will be done in the field. When installation is complete the Contractor will be responsible for lubricating the hinges, rollers and other gate hardware.

### 3.04 WOODEN SPLIT-RAIL FENCE INSTALLATION

- A. Posts shall be set according to the spaces shown on the shop drawings. All posts shall be set plumb and level.
- B. Posts do not require concrete footings. Posts shall be direct burial into an excavated hole three times (3x) the post size. Backfill with compacted gravel borrow; or as shown on the Drawings.
- C. Rails shall be installed into the posts. No permanent fasteners required unless as directed by the manufacturer.
  - a. If required, all fasteners shall be stainless steel or other non-corroding material.

### 3.05 CLEANING, REPAIR AND PROTECTION

- A. Repair minor damage to eliminate all evidence of repair. Remove and replace work that cannot be satisfactorily repaired.

- B. Provide temporary protection to ensure that the work will be without dirt, stains, damage or deterioration at time of final acceptance. Clean up stains and spills as they occur. Remove protections and clean as necessary immediately before final acceptance.
- C. Upon completion of the work and before acceptance, the Contractor shall remove and dispose of in an approved manner all surplus materials, rubbish, etc. which the Contractor may have accumulated during the course of the work and shall leave the site in a clean and orderly condition. The Contractor shall not abandon any material at or near the site regardless of whether or not it has any value.

**END OF SECTION**



SECTION 32 32 23

SEGMENTAL BLOCK RETAINING WALL

**PART-1. GENERAL**

A. General Provisions

1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the specifications.

B. Work Included:

1. Work shall consist of designing, furnishing all materials, labor, equipment, and installation of the segmental retaining wall system in accordance with these specifications and to the lines, grades, and dimensions shown on the plans.

C. Related Work:

1. Section 01 33 00, SUBMITTALS
2. Section 31 00 00, EARTHWORK

D. Reference Standards:

1. The Massachusetts Highway Department Standard Specifications for Highways and Bridges Construction.
2. Current edition of the Massachusetts State Building Code (Code).
3. OSHA Regulations, 29 CFR Part 1926.
4. Segmental Retaining Wall Units
  - a. ASTM C 1372- Standard Specification for Segmental Retaining Wall Units.
  - b. ASTM C 140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.
  - c. ASTM C 1776 – Standard Specification for Wet-Cast Segmental Retaining Wall Units.
5. Geosynthetic Reinforcement

- a. ASTM D 4595 - Tensile Properties of Geotextiles by the Wide-Width Strip Method
  - b. ASTM D 5262 - Test Method for Evaluating the Unconfined Creep Behavior of Geosynthetics
  - c. GRI:GG1 - Single Rib Geogrid Tensile Strength
  - d. GRI:GG5 - Geogrid Pullout
6. Soils
- a. ASTM D 698 - Moisture Density Relationship for Soils, Standard Method
  - b. ASTM D 422 - Gradation of Soils
  - c. ASTM D 424 - Atterberg Limits of Soil
7. Drainage Pipe
- a. ASTM D 3034 - Specification for Polyvinyl Chloride (PVC) Plastic Pipe
  - b. ASTM D 1248 – Specification for Corrugated Plastic Pipe
8. Engineering Design
- a. “NCMA Design Manual for Segmental Retaining Walls”, Second Edition
  - b. Where specifications and reference documents conflict, the Engineer shall make the final determination of applicable document.

E. Design Criteria:

- 1. The following soil parameters shall be assumed for the final design unless otherwise shown on the plans or specified by the Engineer:

|                 | Unit Weight<br>(pcf) | Internal Friction<br>Angle, degrees | Cohesion |
|-----------------|----------------------|-------------------------------------|----------|
| Reinforced Fill | 120                  | 30                                  | 0        |
| Retained Soil   | 120                  | 30                                  | 0        |
| Foundation Soil | 120                  | 30                                  | 0        |

2. The minimum factor of safety for global stability calculations shall be 1.5 under static conditions for the proposed retaining wall wherever its retained height is 8 feet or greater. For these walls, the minimum dimensions of the reinforced zone stated in the table below shall be used for the design. For other retaining walls, the minimum factor of safety for global stability calculations shall be 1.3.

| Height Range (feet) | Minimum Benching Distance (feet)                           |
|---------------------|--|
| 10 -14              | 14   |
| 8 - 10              | 10   |
| 0 - 8               | No minimum benching distance required for global stability |

3. The minimum lateral earth pressure shall be 250 pounds per square-foot (psf). The walls shall be designed to support post-construction surcharge loading of 250 psf at the ground surface, or construction loadings as required by the Contractor's operations, whichever is greater. Stability computations shall be made neglecting passive earth pressure in front of the retaining wall. The minimum factor of safety against overturning shall be 1.5, and the minimum factor of safety against sliding shall be 1.5 under static conditions.
4. Allowable stress criteria and design and analysis procedures shall be in conformance with the latest edition of the manufacturer's respective specification for their wall systems. The wall material shall, as a minimum, be designed to support lateral pressures computed from earth pressure, surcharge loads, compaction equipment and seismic earthquake pressures determined by using the design criteria shown on the Contract Drawings and as specified herein.
5. A maximum allowable design bearing pressure of 1 ksf shall be used.
6. Precast sections shall be designed to withstand earth loads due to soil plus live loads due to vehicular traffic (H20 loading). Design and construction of each section shall meet the requirements of ACI 318 and the AASHTO Load Factor.
7. Should the actual soil conditions observed during construction differ from those assumed for the design, design shall be reviewed by the Wall Design Engineer at the Engineer's direction.
8. The design for the final retaining wall plans shall be prepared and sealed by a professional Civil Engineer licensed in the Commonwealth of Massachusetts.

The design analysis shall consider the external stability against sliding and overturning, internal stability, facial stability of the reinforced soil mass, and external global stability and shall be in accordance with acceptable engineering practice and these specifications. The internal and external stability analysis shall be performed in accordance with the “NCMA Design Manual for Segmental Retaining Walls”, using the recommended minimum factors of safety in this manual.

- 9. The design of the geosynthetic reinforcement shall take into consideration the effects from obstructions.
- 10. Minimum embedment: the minimum wall embedment shall be the greater of 0.5 feet or the following:

|                      |         |
|----------------------|---------|
| Level Slope in Front | $H'/20$ |
| 3H:1V Slope in Front | $H'/10$ |
| 2H:1V Slope in Front | $H'/10$ |

where H' is the exposed height of the wall.

- 11. While vertical spacing between geosynthetic reinforcement layers may vary, it shall not exceed 2.0 feet maximum in the wall design.
- 12. The geosynthetic reinforcement placement in the wall design shall have 100 percent continuous coverage parallel to the wall face. Gapping between horizontally adjacent layers of geosynthetic (partial coverage) will not be allowed.

F. Submittals: In accordance with requirements of General Specifications, submit the following:

- 1. Material Submittals: The Contractor shall submit six (6) sets manufacturers' literature and certifications two weeks prior to start of work stating that the SRW units and geosynthetic reinforcement meet the requirements of Section 2 of this specification.
- 2. Submit for review and comment at least 21 days prior to delivery of retaining wall materials to the Site and prior to the start of Site retaining wall construction the following:
  - a. Experience.
    - i. Provide at least three (3) examples of segmental retaining walls successfully constructed by the Contractor. Examples shall be of

similar type, height and length and be constructed in similar soil conditions. Provide Owner's name and telephone number for each example.

- ii. Provide documentation that Contractor's Engineer has at least five (5) years' experience designing selected wall types under similar conditions. Provide references for at least three (3) projects.

b. Permanent Retaining Wall System.

- i. A complete set of design calculations and shop drawings which shall include, but not be limited to, the following items for the Site Retaining Walls.
  - 1. Legible, complete, and organized design computations indicating soil parameters, design criteria, pressure diagrams, allowable stresses, stability computations, and other details necessary to clearly demonstrate the rational basis for design.
  - 2. Drawings showing all material specifications and details for the structural elements and sequences of assembly including backfilling materials and procedures.
  - 3. The Site retaining walls shall be shown in plan, elevation, and section.
  - 4. The elevation and location of any structure or utilities affecting or affected by any retaining wall shall be shown in plan and section.
  - 5. Detailed construction procedures and sequencing for the installation of the retaining wall system shall be provided.
  - 6. Calculations documenting internal and global stability. Calculations should include special conditions such as included utilities, guard rails and railings.
  - 7. Drawings and computations shall bear the stamp and signature of a Professional Engineer who is licensed in the Commonwealth of Massachusetts and who is experienced in the design of retaining walls of the type proposed.

8. Latest edition of manufacturer's standards and specifications for proposed materials, method of installation, and list of material proposed for use.
9. Detail of fence post installation in or near top of wall (if proposed).
  - a. The Contractor shall remain solely responsible for the wall design and the adequacy and safety of materials and methods used in construction.

G. Delivery and Storage:

1. Contractor shall check materials upon delivery to assure that specified type and grade of materials have been received and proper color and texture of SRW units have been received.
2. Contractor shall store and handle materials in accordance with manufacturer's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping or other causes.
3. Contractor shall protect materials from damage. Damaged materials shall not be incorporated into the retaining wall.

**PART-2. PRODUCTS**

A. Concrete Segmental Retaining Wall Units

1. The basis of design SRW units shall be Ledgestone as produced by Redi-Rock and represented by Casey Scavone, 617-620-1667, or approved equal. Portland cement concrete blocks specifically designed for reinforced retaining wall application, or approved equal.
2. The concrete wall modules shall be 18 x 46 x 28 inches with a maximum tolerance of plus or minus 1/8 in. for each dimension. The retaining wall modules shall be solid units and have a minimum weight of 1520 lbs. per unit. The concrete wall modules shall have an integral shear key connection that shall be offset to permit a minimum wall batter of 5.2 degrees.

3. Color of SRW units shall be selected by the Landscape Architect from the approved manufacturer's standard colors.
4. SRW units shall provide a minimum weight of 120 psf of wall face area.
5. If connectors are used by the SRW supplier to interconnect the SRW units, they shall meet the requirements of the manufacturer.
6. SRW units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit or significantly impair the strength or permanence of the structure. Cracking or excessive chipping may be grounds for rejection. Units showing cracks longer than 1/2" shall not be used within the wall. Units showing chips visible at a distance of 30 feet from the wall shall not be used within the wall.
7. Concrete used to manufacture SRW units shall have a minimum 28 days compressive strength of 4,000 psi and a maximum moisture absorption rate, by weight, of 8% as determined in accordance with ASTM C1372. Compressive strength test specimens shall conform to the saw-cut coupon provisions of ASTM C140.
8. SRW units' molded dimensions shall not differ more than + 1/8 inch from that specified, in accordance with ASTM C1372.
9. Retaining wall shall allow coring and direct embedment of fence posts in top of wall.
10. Wall cap adhesive shall be a flexible, high-strength concrete adhesive in accordance with the wall manufacturer's recommendations.

#### B. Geosynthetic Reinforcement

1. Geosynthetic reinforcement shall consist of geogrids or geotextiles manufactured as a soil reinforcement element. The type, strength, and placement location of the reinforcing geosynthetic shall be determined by the Engineer providing the wall design and as shown on the approved segmental retaining wall plans.
2. Detailed test data shall be submitted to the Engineer for approval and shall include the following:
  - a. Tensile strength in accordance with ASTM D 4595 or GRI GG-1.
  - b. Creep in accordance with ASTM D 5262.
  - c. Site damage and durability in accordance with GRI GG-4.
  - d. Pullout in accordance with GRI GG-5 or GRI GT-6

- e. Connection test data in accordance with NCMA SRWU-1.

#### C. Leveling Pad

1. Material for the leveling pad shall consist of crushed stone meeting the requirements of Section M2.01.3 or M2.01.4 of the Massachusetts Highway Department Standard Specifications for Highways and Bridges Construction and shall be a minimum of 6 inches in depth unless otherwise shown on the Contract Drawings. The leveling pad must extend a minimum of 6 inches from both the front and back faces of the block unless otherwise shown on the Contract Drawings. Lean concrete with a strength of 200-300 psi and three inches thick maximum may also be used as a leveling pad material with approval by the Engineer.

#### D. Drainage Aggregate

1. Drainage aggregate shall be crushed stone meeting the requirements of Section M2.01.4 of the Massachusetts Highway Department Standard Specifications for Highways and Bridges Construction.

#### E. Drainage Pipe

1. The drainage collection pipe shall be a perforated or slotted PVC, or corrugated HDPE pipe. The drainage pipe may be wrapped with a geotextile to function as a filter.
2. Drainage pipe shall be manufactured in accordance with ASTM D 3034 and/or ASTM D 1248.

#### F. Reinforced Backfill

1. The reinforced backfill shall be free of debris. Unless otherwise noted on the approved segmental retaining wall plans prepared by the Civil Engineer, the reinforced material shall consist of Type B Gravel Borrow in accordance with Section M1.03.0 of the Massachusetts Highway Department Standard Specifications for Highways and Bridges Construction.

#### G. Geotextile Fabric

1. Geotextile fabric shall meet the requirements of Type II in accordance with Section M9.50.0 of the Massachusetts Highway Department Standard Specifications for Highways and Bridges Construction.



## **PART-3. EXECUTION**

### **A. Inspection**

1. Contractor shall have demonstrated experience and be qualified to direct all work at the site.

### **B. Excavation**

1. Contractor shall excavate to the lines and grades shown on the project grading plans. Contractor shall take precautions to minimize over-excavation. Over-excavation shall be filled with compacted backfill material as directed by the Engineer, at the Contractor's expense.
2. Contractor shall verify location of existing structures and utilities prior to excavation. Contractor shall ensure all surrounding structures are protected from the effects of wall excavation. Excavation support, if required, is the responsibility of the Contractor

### **C. Foundation Preparation**

1. Following the excavation, the foundation soil shall be examined by the Engineer to assure actual foundation soil strength meets or exceeds the assumed design bearing strength. Soils not meeting the required strength shall be removed and replaced with material, as directed by the Engineer.
2. Foundation soil shall be proof rolled and compacted to 95% standard Proctor density and inspected by the Engineer prior to placement of leveling pad materials.

### **D. Leveling Pad Construction**

1. Leveling pad shall be placed as shown on the final, approved P.E. sealed retaining wall drawings. The leveling pad shall have a minimum thickness of 6 inches. The leveling pad should extend laterally at least a distance of 6 inches from the toe and heel of the lower most SRW unit unless shown otherwise on the Contract Drawings.

### **E. SRW Unit Installation**

1. All SRW units shall be installed at the proper elevation and orientation as shown on the final, approved P.E. sealed wall drawings or as directed by the Wall Design Engineer. The SRW units and geosynthetic reinforcement shall be installed in accordance with the manufacturer's recommendations.

2. First two courses of SRW units shall be placed below finish grade on the leveling pad with the aesthetic surface facing out. The units shall be leveled side-to-side, front-to-rear and with adjacent units, and aligned to ensure intimate contact with the leveling pad.
3. Prior to placement of next course, the level and alignment of the units shall be checked and corrected, where needed.
4. Layout of corners shall be installed in accordance with the wall plan details or in general accordance with SRW manufacturer's installation guidelines. Walls meeting at corners shall be interlocked by overlapping successive courses.
5. Broken, chipped, stained or otherwise damaged units shall not be placed in the wall unless they are repaired and the repair method and results are approved by the Engineer.

#### F. Geosynthetic Reinforcement Placement

1. All geosynthetic reinforcement shall be installed at the proper elevation and orientation as shown on the final, approved P.E. sealed retaining wall drawings, or as directed by the Wall Design Engineer.
2. At the elevations shown on the final plans, (after the units, drainage material, and backfill have been placed to this elevation) the geosynthetic reinforcement shall be laid horizontally on compacted infill.
3. Geosynthetic reinforcement layers shall be one continuous piece for their entire embedment length. Overlapping of the geosynthetic in the design strength direction (perpendicular to the wall face) shall not be permitted. Along the length of the wall, horizontally adjacent sections of geosynthetic reinforcement shall be butted in a manner to assure 100 percent coverage parallel to the wall face.
4. Tracked construction equipment shall not be operated directly on the geosynthetic reinforcement. A minimum of 6 inches of backfill is required prior to operation of tracked vehicles over the geosynthetic. Turning should be kept to a minimum. Rubber-tired equipment may pass over the geosynthetic reinforcement at slow speeds (less than 5 mph).
5. The geosynthetic reinforcement should be installed under tension. The nominal tension shall be applied to the reinforcement and secured in place with staples, stakes or by hand tensioning until reinforcement is covered by six inches of fill.

#### G. Drainage Materials

1. Drainage aggregate shall be installed to the line, grades, and sections shown on the final P.E. sealed retaining wall drawings. Drainage aggregate shall be placed to the minimum thickness shown on the Contract Drawings between and behind units.
2. Drainage collection pipes shall be installed to maintain gravity flow of water outside the reinforced soil zone. The drainage collection pipe shall daylight at an elevation lower than the lowest point of the pipe within the aggregate drain.
3. The main collection drain pipe, just behind the block facing, shall be a minimum of 3 inches in diameter. The secondary collection drain pipes should be sloped a minimum of 2% to provide gravity flow into the main collection drain pipe. Drainage laterals shall be spaced at a maximum 50 feet spacing along the wall.

#### H. Backfill Placement

1. The reinforced backfill shall be placed as shown in the final, approved wall drawings in the maximum compacted lift thickness of 10 inches and shall be compacted to a minimum of 95% of standard Proctor density (ASTM D 698) at a moisture content within 2% of optimum. The backfill shall be placed and spread in such a manner as to eliminate wrinkles or movement of the geosynthetic reinforcement and the SRW units.
2. Only hand-operated compaction equipment shall be allowed within 3 feet of the back of the wall units. Compaction within the 3 feet behind the wall units shall be achieved by at least three (3) passes of a lightweight mechanical tamper, plate, or roller.
3. At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing and reinforced backfill to direct water runoff away from the wall face.
4. At completion of wall construction, backfill shall be placed level with final top of wall elevation. If final grading, paving, landscaping, and/or storm drainage installation adjacent to the wall is not placed immediately after wall completion, temporary grading and drainage shall be provided to ensure water runoff is not directed at the wall nor allowed to collect or pond behind the wall until final construction adjacent to the wall is completed.

#### I. Construction Adjacent to Completed Wall

1. The Contractor is responsible for ensuring that construction adjacent to the wall does not disturb the wall or place temporary construction loads on the wall that

exceed design loads, including loads such as water pressure, temporary grades, or equipment loading. Care should be taken by the Contractor to ensure water runoff is directed away from the wall structure until final grading and surface drainage collection systems are completed.

END OF SECTION

SECTION 32 32 53

STONE RETAINING WALLS REINFORCED SOIL SLOPES

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. Work shall consist of subsurface explorations, designing, furnishing all materials, labor, equipment, and installation of the reinforced soil slopes (RSS) with boulder and riprap facing in accordance with these specifications and to the lines, grades, and dimensions shown on the plans.
- B. The contractor shall perform or subcontract a subsurface exploration program for the design of the two RSS's consisting of soil borings and rock cores per Section 02 32 13.13, SOIL BORINGS. The subsurface investigation shall be performed prior and for the design of the RSS's.

1.02 RELATED WORK:

- A. Section 00 31 32, SUBSURFACE DATA
- B. Section 01 33 23, SUBMITTALS
- C. Section 02 32 13.13, SOIL BORINGS
- D. Section 31 00 00, EARTHWORK
- D. Section 31 23 19, DEWATERING
- E. Section 31 50 00, SUPPORT OF EXCAVATION

1.03 REFERENCE STANDARDS:

- A. Geosynthetic Reinforcement
  - 1. ASTM D 4595 - Tensile Properties of Geotextiles by the Wide-Width Strip Method
  - 2. ASTM D 5262 - Test Method for Evaluating the Unconfined Creep Behavior of Geosynthetics
  - 3. GRI:GG1 - Single Rib Geogrid Tensile Strength
  - 4. GRI:GG5 - Geogrid Pullout
- B. Drainage Pipe

1. ASTM D 3034 - Specification for Polyvinyl Chloride (PVC) Plastic Pipe
  2. ASTM D 1248 - Specification for Corrugated Plastic Pipe
- C. Engineering Design
1. Publication No. FHWA-CFL/TD-06-006 “Rockery Design and Construction Guidelines”, November 2006
  2. Publication No. FHWA-NHI-10-024 “Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes - Volume I”, November 2009
  3. Publication No. FHWA-NHI-10-025 “Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes - Volume II”, November 2009
- D. Where specifications and reference documents conflict, the Engineer shall make the final determination of applicable document.

#### 1.04 DESIGN CRITERIA:

- A. Refer to Section 00 31 32 SUBSURFACE DATA for information on site and subsurface conditions.
- B. Refer to plans for details and location of proposed stormwater infiltration system in relationship to the RSS’s and hydrostatic conditions for design.
- C. RSS’s shall be designed to support earth pressures, unrelieved hydrostatic pressures, HS20-44 traffic loads (as applicable) and any adjacent structure surcharge loads, utility loads, stockpile, equipment and construction loads. Design and construction of each section shall meet the requirements of ACI 318 and the AASHTO Load Factor.
- D. Soil and bedrock conditions utilized in the design shall be based upon subsurface explorations by the Contractor performed in accordance with Section 02 32 13.13, SOIL BORINGS.
- E. Should the actual soil and/or bedrock conditions observed during construction differ from those assumed for the design, design shall be reviewed by the contractor’s RSS Design Engineer at the Engineer's direction.
- F. The design for the RSS’s plans shall be prepared and sealed by the Contractor’s RSS Design Engineer. The design analysis shall consider the external stability against sliding, deep-seated overall instability, local bearing capacity failure, and settlement, internal stability, facial stability of the reinforced soil mass, and external

global stability and shall be in accordance with acceptable engineering practice and these specifications. The analysis shall be performed in accordance with the publications in Section 1.03.D of these specifications.

- G. The design of the geosynthetic reinforcement shall take into consideration the effects from obstructions.
- H. Minimum embedment: the minimum RSS embedment shall be 2 feet.
- I. While vertical spacing between geosynthetic reinforcement layers may vary, it shall not exceed 2.0 feet .
- J. The geosynthetic reinforcement placement in the RSS system design shall have 100 percent continuous coverage parallel to the slope and wall face. Gapping between horizontally adjacent layers of geosynthetic (partial coverage) will not be allowed.

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 32 23 SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Contractor's RSS Design Engineer: At the time of the bid, the Contractor shall submit a list containing at least five (5) comparable project which the RSS Design Engineer has installed RSS. A brief description of key project features; time period (dates) when design work and construction was performed; ultimate client's name, address, telephone number, and email address for each project. The RSS Design Engineer may not use consultants or manufacturer's representatives to meet the requirements of this section.
- B. Contractor's Qualifications: At the time of the bid, the Contractor shall submit:
  - 1. A list containing at least five (5) comparable installations on which the Contractor and the Superintendent have installed RSS. A brief description of key project features; time period (dates) when work was performed and ultimate client's name; direct client contact name, address, telephone number and email address shall be included for each project. The Contractor may not use consultants or manufacturer's representatives to meet the requirements of this section.
  - 2. Resume of Project Superintendent including pertinent project experience.
- C. Material Submittals: Manufacturers' literature and certifications two weeks prior to start of work stating that the facing and geosynthetic reinforcement meet the requirements of Section 2 of this specification.
- D. Shop Drawings:
  - 1. The Contractor's RSS Design Engineer shall submit for approval separate geotechnical design calculations and drawings for the proposed RSS with boulder

facing and RSS with rip rap, sealed by a Registered Professional Engineer currently licensed in the Commonwealth of Massachusetts. As a minimum the RSS design calculations shall include:

- a. Detailed summary of design assumptions
- b. Applicable code and design references
- c. Geotechnical engineering parameters for existing site soil and bedrock, and proposed fill.
- d. Analysis results, including but not limited to, external stability against sliding, external global stability, local bearing capacity and settlement, internal stability, and facial stability of the reinforced soil mass.
- e. Plan and profile views indicating the type, spacing, and length of geosynthetic reinforcement.

#### 1.06 DELIVERY AND STORAGE:

- A. Contractor shall check materials upon delivery to assure that specified type and grade of materials have been received.
- B. Contractor shall store and handle materials in accordance with manufacturer's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping or other causes.
- C. Contractor shall protect materials from damage. Damaged materials shall not be incorporated into the RSS and reinforced rockery wall system.

#### 1.07 QUALITY CONTROL:

- A. The Contractor shall engage an RSS Design Engineer who is a Registered Professional Engineer in the Commonwealth of Massachusetts. The Contractor's RSS Design Engineer shall have at least five (5) years of experience in design of RSS or slope stabilization using geosynthetics and rockery walls similar to those required for this project and have completed a minimum of three projects with similar specialty work.
- B. The Contractor shall engage a contractor with at least five (5) years of experience in construction of RSS or slope stabilization using geosynthetics and rockery walls similar to those required for this project and have completed a minimum of three projects with similar specialty work.

## PART 2 - PRODUCTS

#### 2.01 GEOSYNTHETIC REINFORCEMENT:



- A. Geosynthetic reinforcement shall consist of geogrids or geotextiles manufactured as a soil reinforcement element. The type, strength, and placement location of the reinforcing geosynthetic shall be determined by the Contractor's RSS Design Engineer.
- B. Detailed test data shall be submitted to the Engineer for approval and shall include the following:
  - 1. Tensile strength in accordance with ASTM D 4595 or GRI GG-1.
  - 2. Creep in accordance with ASTM D 5262.
  - 3. Site damage and durability in accordance with GRI GG-4.
  - 4. Pullout in accordance with GRI GG-5 or GRI GT-6
  - 5. Connection test data in accordance with NCMA SRWU-1

2.02 DRAINAGE AGGREGATE:

- A. Drainage aggregate shall be determined by the RSS Design Engineer.

2.03 DRAINAGE PIPE:

- A. The drainage collection pipe shall be a perforated or slotted PVC, or corrugated HDPE pipe. The drainage pipe may be wrapped with a geotextile to function as a filter.
- B. Drainage pipe shall be manufactured in accordance with ASTM D 3034 and/or ASTM D 1248.

2.04 REINFORCED BACKFILL:

- A. The reinforced backfill shall be free of debris and shall meet the gradation and compaction requirements provided by the Contractor's RSS Design Engineer.

2.05 GEOTEXTILE FABRIC:

- A. Geotextile fabric shall meet the requirements provided by the Contractor's RSS Design Engineer.

2.06 FACING:

- A. Slope facing for the RSS with Riprap facing shall consist of rip rap meeting the requirements in MassDOT Specification Section M2.2.0, Riprap. Riprap shall be laid and not dumped.

- B. Slope facing for the RSS with Boulder facing shall meet the requirements provided by the Contractor's RSS Design Engineer. The rockery wall facing shall be designed in accordance with Publication No. FHWA-CFL/TD-06-006 "Rockery Design and Construction Guidelines", November 2006.

## PART 3 -EXECUTION

### 3.01 INSPECTION

- A. Contractor's field construction supervisor shall have demonstrated experience and be qualified to direct all work at the site.

### 3.02 EXCAVATION:

- A. Contractor shall excavate to the lines and grades shown on the approved Drawings. The Contractor shall excavate unsuitable materials to stable natural ground where encountered at proposed excavation subgrade, as required by the Engineer, unless otherwise indicated on the drawings. Unsuitable material includes undocumented fill, topsoil, loam, peat, other organic materials, pre-construction fill, snow, ice, and trash.
- B. Contractor shall take precautions to minimize over-excavation. Over-excavation shall be filled with compacted backfill material as required by the Engineer, at the Contractor's expense.
- C. Contractor shall verify location of existing structures and utilities prior to excavation. Contractor shall ensure all surrounding structures are protected from the effects of excavation. Excavation support, if required, is the responsibility of the Contractor.

### 3.03 FOUNDATION PREPARATION:

- A. Following the excavation, the foundation soil shall be examined by the Engineer to assure actual foundation soil strength meets or exceeds the assumed design bearing strength. Soils not meeting the required strength shall be removed and replaced with material, as required by the Engineer.
- B. Prior to fill placement, the Contractor shall compact the exposed subgrade to a firm and unyielding condition with at least 5 passes by a 12-ton smooth drum vibratory roller over the subgrade or other acceptable compaction equipment subject to the approval of the Engineer.
- C. Fill placed outside the RSS shall consist of compacted material per the Drawings and Section 31 00 00.

### 3.04 GEOSYNTHETIC REINFORCEMENT PLACEMENT:

- A. All geosynthetic reinforcement shall be installed at the proper elevation and orientation as shown on the approved shop drawings, or as required by the Contractor's RSS Design Engineer.
- B. At the elevations shown on the approved shop drawings, (after the units, drainage material, and backfill have been placed to this elevation) the geosynthetic reinforcement shall be laid horizontally on compacted infill.
- C. Geosynthetic reinforcement layers shall be one continuous piece for their entire embedment length. Overlapping of the geosynthetic in the design strength direction (perpendicular to the RSS face) shall not be permitted. Along the length of the RSS, horizontally adjacent sections of geosynthetic reinforcement shall be butted in a manner to assure 100 percent coverage parallel to the RSS face.
- D. Tracked construction equipment shall not be operated directly on the geosynthetic reinforcement. A minimum of 6-inches of backfill is required prior to operation of tracked vehicles over the geosynthetic. Turning should be kept to a minimum. Rubber-tired equipment may pass over the geosynthetic reinforcement at slow speeds (less than 5 mph).
- E. The geosynthetic reinforcement should be installed under tension. The nominal tension shall be applied to the reinforcement and secured in place with staples, stakes or by hand tensioning until reinforcement is covered by six inches of fill.

### 3.05 DRAINAGE MATERIALS:

- A. Drainage aggregate shall be installed to the line, grades, and sections as shown on the approved shop drawings. Drainage aggregate shall be placed to the minimum thickness shown on the approved shop drawings.
- B. Drainage collection pipes shall be installed to maintain gravity flow of water outside the reinforced soil zone. The drainage collection pipe shall daylight at an elevation lower than the lowest point of the pipe within the aggregate drain.
- C. The main collection drain pipe shall be a minimum of 3-inches in diameter.

### 3.06 BACKFILL PLACEMENT:

- A. The reinforced backfill shall be placed as shown on the approved shop drawings in the maximum compacted lift thickness of 10-inches and shall be compacted to a minimum of 95% of Modified Proctor density (ASTM D 1557) at a moisture

content within 2% of optimum. The backfill shall be placed and spread in such a manner as to eliminate wrinkles or movement of the geosynthetic reinforcement.

- B. At the end of each day's operation, the Contractor shall slope the last level of backfill away from the facing and reinforced backfill to direct water runoff away from the slope face.
- C. At completion of RSS construction, backfill shall be placed level with final top of RSS elevation. If final grading, paving, landscaping, and/or storm drainage installation adjacent to the RSS's is not placed immediately after completion, temporary grading and drainage shall be provided to ensure water runoff is not directed at the slope face nor allowed to collect or pond behind the slope face until final construction adjacent to the RSS and reinforced rockery wall system is completed.

### 3.07 CONSTRUCTION ADJACENT TO COMPLETED RSS AND REINFORCED ROCKERY WALL SYSTEM:

- A. The Contractor is responsible for ensuring that construction adjacent to the RSS's does not disturb the RSS systems or place temporary construction loads on the RSS system that exceed design loads, including loads such as water pressure, temporary grades, or equipment loading. Care should be taken by the Contractor to ensure water runoff is directed away from the RSS and reinforced rockery wall system until final grading and surface drainage collection systems are completed.

END OF SECTION

## SECTION 32 33 00

### SITE FURNISHINGS AND ACCESSORIES

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. This section is only a portion of the Contract Documents. All of the Contract Documents, including Conditions of the Contract and Division 1 General Requirements, apply to this section.

##### 1.02 DESCRIPTION OF WORK

- A. The work of this section includes, but is not limited, furnishing and installing the following:

1. Benches.
2. Picnic Table with Bench seating.
3. Trash /Recycling Receptacles.
4. Bicycle Racks.
5. Drinking Fountain.
6. Electric Charging Station
7. Security Camera
8. Blue Safety Light
9. Building Mounted Blue Safety Light

- B. The following items shown on the Drawings and/or noted herein shall be furnished and installed under their Sections of the specifications:

1. Concrete for concrete footings under 03 30 00 CAST-IN-PLACE CONCRETE.
2. Concrete for pavement under 32 13 13 – CONCRETE PAVEMENT.

##### 1.03 RELATED WORK

A. Carefully examine all the Contract Documents for requirements that affect the work of this Section. Other specification sections that directly relate to the work of this Section include, but are not limited to the following:

1. Section 31 00 00 - Earthwork
2. Section 32 12 16 – Asphalt Paving
3. Section 32 13 13 – Concrete Paving
4. Section 32 16 00 – Curbing
5. Section 32 18 16.13 – Playground Protective Surfacing
6. Section 32 31 00 – Fencing
7. Section 32 90 00 – Planting
8. Section 32 91 00 – Loam and Planting Preparation
9. Section 32 92 00 – Turf and Grasses

#### 1.04 SUBMITTALS

- A. Shop Drawings: Refer to individual site furnishings for submittal requirements.
- B. Provide manufacturer's product material information and system performance data along with material and system samples for each item specified in this Section for the Architect's review and approval prior to ordering materials.
- C. The General Contractor shall verify by field inspection that all items within this section conform to the specified requirements and approved submittals prior to installation.
- D. Provide color samples of the actual specified material for approval (no photo representations).

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products and provide adequate protection against damage. Handle in strict compliance with manufacturer instructions and recommendations and store off the ground. Protect from all possible damage including, but not limited to chipping, staining, cracking and other damage. Sequence deliveries to avoid delays, but minimize on-site storage.

#### 1.06 COORDINATION

- A. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work as necessary to assure the steady progress of the work of this Contract.
- B. Substrates: Proceed with work only when substrate construction and penetrating work is complete.

- C. Coordinate mounting requirements of the equipment and products listed within this section with finished grade materials or structures.

#### 1.07 GUARANTEE

- A. In addition to the specific guarantee requirements of the GENERAL CONDITIONS and SUPPLEMENTARY GENERAL CONDITIONS, the Contractor shall provide the manufacturers' standard written warranty for each product within this specification. All of these guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law or other provisions of the Contract Documents.

### PART 2 - PRODUCTS AND EXECUTION (Combined)

#### 2.01 BENCHES

- A. The basis of design for the site benches is DuMor, or an approved equal. [www.dumor.com](http://www.dumor.com), contact John McConkey at M.E. O'Brien & Sons, Inc. Tele:508-359-4200. Email:johnmccconkey@obrienandsons.com.
- B. Backed Bench: Model# 472-60I-2AR – as offered by DuMor. Bench locations are shown on the plans. Bench shall be the following, or an approved equal.
  1. Benches shall be, 72.25" x 22.5 x 17.5 inches (LxWxH).
  2. Dimension of seating and backing slats shall be 2"x 6".
  3. Bench slats shall be Ipe hardwood, with natural finish.
  4. Bench shall have arm rests at the ends of the bench.
  5. The frame of the bench shall be of cast steel. All steel members shall have be hot-dipped galvanized.
  6. Finish of the steel members shall be powder coated. Color: Textured Silver.
  7. Bench shall be free-standing and surface mounted.

#### 2.02 PICNIC TABLE AND SEATING BENCH

- A. The basis of design for the site benches is DuMor, or an approved equal. [www.dumor.com](http://www.dumor.com), contact John McConkey at M.E. O'Brien & Sons, Inc. Tele:508-359-4200. Email:johnmccconkey@obrienandsons.com.

B. Picnic Table and Seating Bench: Model# 475-60I – as offered by DuMor. Bench locations are shown on the plans. Table and Bench shall be the following, or an approved equal.

1. Table shall be, 72.25” x 30” x 30” (LxWxH).
2. Dimension of the table and seating slats shall be: Edge slats-2“x6” ; Interior slats-2”x 3”.
3. Slats shall be Ipe hardwood, with natural finish.
4. The frame of the bench shall be of cast steel. All steel members shall have be hot-dipped galvanized.
5. Finish of the steel members shall be powder coated. Color: Textured Silver.
6. Bench shall be free-standing and surface mounted.
7. One (1) bench shall be ADA accessible. Provide one Table option that is end accessible.

## 2.03 TRASH RECEPTACLE.

A. The basis of design for the site trash receptacles is DuMor, or an approved equal. [www.dumor.com](http://www.dumor.com) , contact John McConkey at M.E. O’Brien & Sons, Inc. Tele:508-359-4200. Email:johnmccconkey@obrienandsons.com.

B. Trash Receptacle: Model# 474-32I-BT – as offered by DuMor. Bench locations are shown on the plans. Receptacle shall be the following, or an approved equal.

1. Receptacle shall be, 38.75” tall and 24.5” diameter.
2. Receptacle shall have a hinged bonnet cover top.
3. Receptacle shall be a 32-gallon size with a plastic container bin.
4. Exterior slats shall be Ipe hardwood, with natural finish.
5. The frame of the bench shall be of cast steel. All steel members shall have be hot-dipped galvanized.
6. Finish of the steel members, including the bonnet top, shall be powder coated. Color: Textured Silver.
7. Receptacle shall be free-standing and surface mounted.



## 2.04 BIKE RACK.

- A. The basis of design for the site bike racks are DuMor, or an approved equal. [www.dumor.com](http://www.dumor.com), contact John McConkey at M.E. O'Brien & Sons, Inc. Tele:508-359-4200. Email:johnmccconkey@obrienandsons.com.
- B. Bike Rack: Model# 292-00-S2 – as offered by DuMor. Bike Rack locations are shown on the plans. Bike Rack shall be the following, or an approved equal
  - 1. Bike Rack shall be fabricated from 2” Schedule-40 steel tubing.
  - 2. All steel members shall have be hot-dipped galvanized.
  - 3. Color: Black.
  - 4. Bike Rack shall be surfaced mounted.

## 2.05 DRINKING FOUNTAIN

- A. The basis of design for the drinking fountain is Elkay Outdoor water fountain, or an approved equal. [www.elkay.com](http://www.elkay.com).
- B. Drinking Fountain: Elkay outdoor bottle filling station Model# LK4408BF. Installed in locations noted on the site plan.
  - 1. Drinking fountain shall be a wall mounted unit manufactured for outdoor conditions.
  - 2. The fountain shall have two (2) serving stations. One shall be a bottle filling station and the other a standard drinking fountain.
  - 3. The units shall be mechanically operated.
  - 4. Dimensions shall be 21” x 22” x 33”
  - 5. Finish shall be: BLUE.

## 2.06 ELECTRIC CHARGING STATION

- A. The electric charging station shall be the dual port, pedestal mounted charging station, model # CP6021B-50A-L5.5-CHIP as manufactured by ChargePoint, Inc., 240 East Hacienda Avenue, Campbell, CA 95008-6617 USA, or an approved equal.
- B. The charging station shall include the following:
  - 1. Two (2) 18-foot cables

2. 8” interactive display with full color, UV protection, gesture touch controls and multi-language support.
3. LED charging status indicators
4. EMV chip reader
5. Custom signage. Graphics shall be provided during the submittal process.

C. The electric charging station shall be Energy Star Certified

## 2.07 SECURITY CAMERA

A. The PTZ security camera shall be DVTEL Quasar CP-4221-301 HDPTZ by Flir Systems Inc. or an approved equal.

| <b>VENDOR</b> | <b>PART#</b> | <b>DESCRIPTION</b>         |
|---------------|--------------|----------------------------|
| DVTEL         | CX-POLE-0    | Pole Mount Adapter Bracket |
| DVTEL         | CP-3102-01-I | DVTEL PTZ 30X              |
| DVTEL         | LAT-NT-CHAN  | (1) CHANNEL LICENSE        |
| UBIQ          | NSM5 US      | Ubiquity ANTENNA           |
| UBIQ          | ROCKETM5-US  | Ubiquity ANTENNA           |
| HP            |              | 6 Port Switch / 4 POE      |
| ALTRONIX      | T2428175     | 24V TRANSFORMER            |
| DVTEL         | CX Armx 1    | Long Arm Bracket           |

## 2.08 BLUE SAFETY LIGHT

A. The blue safety light shall be RED ALERT 120 Vac Standard Analog Tower model # 234 as manufactured by GAI-TRONICS, Toll Free: 1 (800) 492-1212 Tel: (610) 777-

1374 Fax: (610) 796-5954, www.gai-tronics.com email: [customerservice@gai-tronics.com](mailto:customerservice@gai-tronics.com), and shall include the following,

1. Tower Installation Kit (required for tower), Model # 84504-301
2. Flush-mount Emergency Phone, Single Button, SS, Model # 397-001
3. 120 VAC L.E.D. Strobe, Model #540-001
4. Tamperproof Screwdriver T-25 Size Torx, Model # 233-001

B. Or an approved equal.

## 2.09 BUILDING MOUNTED BLUE SAFETY LIGHT

A. The building mounted blue safety light shall be RED ALERT Emergency Hands-free Telephone Model # 397-001 as manufactured by GAI-TRONICS, Toll Free: 1 (800) 492-1212 Tel: (610) 777-1374 Fax: (610) 796-5954, www.gai-tronics.com email: [customerservice@gai-tronics.com](mailto:customerservice@gai-tronics.com), or an approved equal.

## 2.10 INSTALLATION.

A. Install the site furnishing and accessories listed per the manufacturer instructions.

## 2.11 CLEANING, REPAIR AND PROTECTION

- A. Repair minor damage to eliminate all evidence of repair. Remove and replace work that cannot be satisfactorily repaired.
- B. Provide temporary protection to ensure that the work will be without dirt, stains, damage or deterioration at time of final acceptance. Clean up stains and spills as they occur. Remove protections and clean as necessary immediately before final acceptance.
- C. Upon completion of the work and before acceptance, the Contractor shall remove and dispose of in an approved manner all surplus materials, rubbish, etc. which the Contractor may have accumulated during the course of the work and shall leave the site in a clean and orderly condition. The Contractor shall not abandon any material at or near the site regardless of whether or not it has any value.

**END OF SECTION**

SECTION 32 34 13  
PREFABRICATED STEEL BOARDWALK

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. This section is only a portion of the Contract Documents. All of the Contract Documents, including Conditions of the Contract and Division 1 General Requirements, apply to this section.

1.02 DESCRIPTION OF WORK

- A. The work of this section includes, but is not limited, to the following:
1. Prefabricated galvanized structural steel framed elevated Boardwalk all supported on helical piles.
  2. Cleaning, Repair and Protection

1.03 RELATED WORK

- A. Carefully examine all the Contract Documents for requirements that affect the work of this Section. Other specification sections that directly relate to the work of this Section include, but are not limited to the following:
1. Section 012300 - Alternates
  2. Section 311000 – Site Clearing and Preparation
  3. Section 312000 – Earthwork
  4. Section 321313 – Concrete Paving
  5. Section 321200 - Asphalt Paving
  6. Section 323100 - Fencing
  7. Section 329100 – Loam and Planting Preparation

1.04 BOARDWALK DESIGN

- A. Structural design of the boardwalk structure(s) shall be performed by or under the direct supervision of a licensed Professional Engineer and done in accordance with recognized engineering practices and principles. The design Engineer shall be a registered Structural Engineer in the **Commonwealth of Massachusetts** utilizing AASHTO LRFD Specifications for Pedestrian Bridges (Latest edition).
- B. General Design Loads. In considering design and fabrication issues, this structure shall be assumed to be statically loaded. No dynamic analysis shall be required, nor shall fabrication issues typically considered for dynamically loaded structures be considered for this boardwalk. A vehicle impact allowance is not required:

1. Dead Load.

The boardwalk structure shall be designed considering its own dead load only. No additional dead loading need be considered.

2. Uniform Live Load - Pedestrian Live Load.

Main Members: Main supporting members shall be designed for a pedestrian live load of 90 pounds per square foot of walkway area. The pedestrian live load shall be applied to those areas of the walkway to produce maximum stress in the member being designed.

Secondary Members: Decking and supporting floor systems, including secondary stringers, floor beams and their connections to main supporting members shall be designed for a live load of 90 pounds per square foot, with no reduction allowed.

3. Concentrated Loads.

The boardwalk main supporting members, floor system and decking shall be designed for an AASHTO H5 vehicular load.

## 1.05 SUBMITTALS

### A. Shop Drawings:

1. Provide scaled shop drawings for all components and connections of the steel frame and deck system. Stamped by a professional Structural Engineer registered in the **Commonwealth of Massachusetts**.
2. Structural calculation for key boardwalk elements stamped by a professional Structural Engineer registered in the **Commonwealth of Massachusetts**.

### B. Provide manufacturer's material data sheets.

### C. Certification of steel origin (United states).

### D. Provide installation process and requirements including proposed vehicles and/or equipment.

### E. Provide structural calculations for key boardwalk elements.

### F. Business Data:

1. Proof of business in good standing with all agencies including, reporting agencies, banks, and the state for which it operates.
2. Proof of business operations greater than 7 years.
3. Affidavit of employed American Welding Society certified welders.
4. Three references for similar scale projects.

### G. Provide manufacturer's product material information and system performance data along with material and system samples for each item specified in this Section for the Architect's review and approval prior to ordering materials.

H. The General Contractor shall verify by field inspection that all items within this section conform to the specified requirements and approved submittals prior to installation.

#### 1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products and provide adequate protection against damage. Handle in strict compliance with manufacturer instructions and recommendations and store off the ground. Protect from all possible damage including, but not limited to chipping, staining, cracking and other damage. Sequence deliveries to avoid delays but minimize on-site storage.

#### 1.07 COORDINATION

- A. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work as necessary to assure the steady progress of the work of this Contract.
- B. Substrates: Proceed with work only when subgrade preparation work is complete.

#### 1.08 GUARANTEE

- A. In addition to the specific guarantee requirements of the GENERAL CONDITIONS and SUPPLEMENTARY GENERAL CONDITIONS, the Contractor shall provide the manufacturers' standard written warranty for each product within this specification. All of these guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law or other provisions of the Contract Documents.
- B. Warranty.
1. Workmanship of the frames is warranted against defect for the life of the boardwalk. During this period, if the product is covered by the warranty and fails under normal use, manufacturer will repair or replace at original owners' discretion. The decking and other non-frame elements of the boardwalk are excluded. "Lifetime" is defined as the lifetime of the product in use.
  2. Material warranty of all non-boardwalk frame material is that of the original manufacturer. Non-boardwalk material includes but is not limited to decks, handrail, curb rail, benches, or other fixtures.

### **PART 2 - PRODUCTS**

#### 2.01 GRADING AND COMPACTION OF SUB-BASE

A. Do all necessary grading in addition to that specified under Section 312000 - EARTHWORK to bring subgrade or foundation after final compaction to required

grades and sections to obtain a foundation of uniform bearing surface. In absence of specific requirements, compact foundation by such means as shall provide firm base and insurance against settlement of superimposed work.

- B. Sub-base preparation, including material, shall be of properly approved quality as specified under Section 312000 - EARTHWORK. 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 323413, Prefabricated Steel Boardwalk, at no additional cost to the Owner.

## 2.02 HELICAL PILE FOOTINGS FOR RAISED BOARDWALK

- A. Helical pile shall be designed to support the load and geotechnical requirements noted herein this specification or as determined by a professional Structural Engineer registered in the **Commonwealth of Massachusetts**.
- B. Helical piles shall have a central shaft that is cold formed welded and seamless galvanized structural steel, round tubing with a minimum yield of 65KSI and meeting the dimensional and workmanship requirements of ASTM A500 with an ultimate resistance capacity of 40,000psi; or as determined by the Structural Engineer.
- C. All coupling connection thru bolts shall be ¾" Dia and conform to SAE J429 Grade 8 or equivalent.
- D. All piling sections and brackets shall be coated with a polymer alloy thermoplastic powder coating or equal, in compliance with ICC-ES acceptance criteria AC228 for corrosion resistance.

## 2.03 ELEVATED BOARDWALK

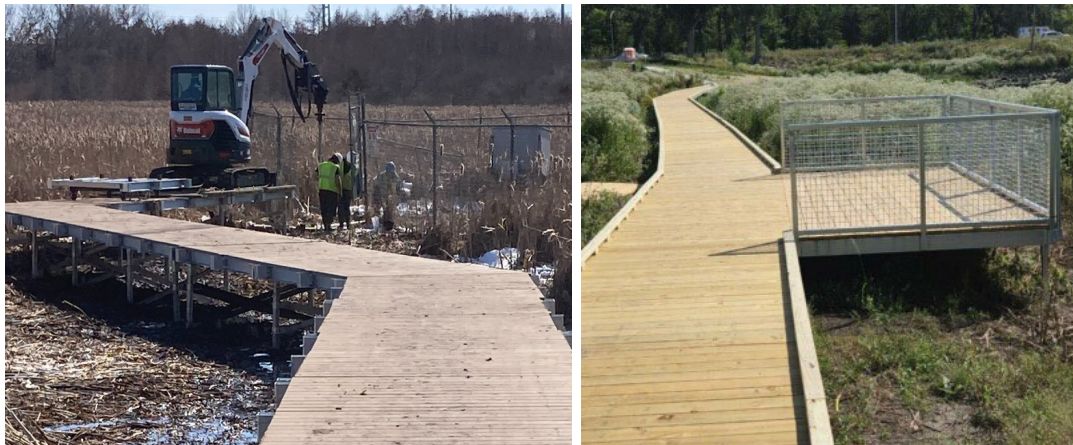
- A. Basis of design for Elevated Boardwalk is by Modular Trail Structures. PO Box 7383 Madison, WI 53707. (<https://www.modulartrailstructures.com/>). Contact Brian Kuehn, email: [brian@modulartrailstructures.com](mailto:brian@modulartrailstructures.com) tel: 608-609-9277.
  - a. Additional Approved Manufacturers:
    - i. Wickcraft Company, Inc. 2317 Daniels Street, Madison, WI 53718. ([www.wickcraftboardwalks.com](http://www.wickcraftboardwalks.com)). Contact: Patrick Walters, email: [patrick@wickcraft.com](mailto:patrick@wickcraft.com) Tel: 608-496-1082.
    - ii. Custom Metal Fabrication.
  - b. Qualified Equals. The use or substitution of a qualified equal boardwalk supplier, design, or material must be pre-approved prior to submitting bid and satisfy all pre-qualification criteria below:
    - i. Contractor/Supplier shall show evidence that all structural welding must be performed by American Welding Society (AWS) certified welders.
    - ii. Contractor/Supplier shall show evidence that no structural fabrication is performed by other sub-contractors or transferred to other entities

not approved under this contract.

- iii. Contractor/Supplier shall show evidence of at least five (5) years of experience or evidence of comprehensive experience in their construction discipline and (3) years management experience of their respective business or related managerial equivalent experience.
- iv. Contractor/Supplier shall list the last five (5) construction projects completed including the names, addresses, and phone numbers of project contacts. Provide a brief description of each project and their respective contract amount.
- v. Contractor/Supplier shall provide an inventory of trade specific equipment owned and show evidence of equipment and facilities necessary to perform the work.
- vi. Contractor/Supplier shall provide evidence of five (5) years of financial stability. Submittals can be the most recent audited financial statement, current balance sheet, annual report, or a letter of credit from the Contractor/Supplier's bank which includes the duration of professional relationship, lending experience, and average balance.

B. Refer to drawing details for dimensions and installations.

C. See below for precedent images of elevated boardwalk system.



D. The general specifications for the boardwalk is as follows:

- a. Pre-Engineered elevated boardwalk system.
- b. System to be prefabricated and test assembled off-site at the manufacturing plant.
- c. Boardwalks shall be shipped to the site and assembled into place. Boardwalks shall be installed overtop of existing terrain with minimal disturbance to the ground plane.
- d. Boardwalks shall have railings infill panels that meet all regulations and applicable codes. Boardwalks and shall have a minimum 75-year warranty on



the metal framing, unlimited workmanship warranty and a 40-yr warranty on the decking material

E. Materials:

- a. All frames must meet or exceed International Building Code requirements of 100psf load capacity.
- b. Galvanized structural steel frame sections constructed from ASTM A500 Structural Steel.
- c. Frame connections to be fabricated from 1/4" A36 Structural Steel.
- d. Legs and leg-sleeves to be fabricated from ASTM A500 Structural Steel pipe.
- e. Entire post-fabrication frame assembly to be hot dipped galvanized (HDG) with a minimum of 3.9 mill thickness of zinc based galvanizing.
- f. All post-galvanized frame assemblies must be hand rasped and free of any sharp edges without compromising the galvanized integrity.
- g. All decking must meet or exceed International Building Code requirements of 100psf load capacity.
  - i. Plastic Decking - high-density polyethylene (HDPE) continuous construction plastic. Size either 2" x 6" or 5/4" x 6" HDPE from 100% recycled plastic.
  - ii. Decking shall be designed such that deflection is limited to L/300 (where L is the distance between supports). Decking shall span perpendicular to the bridge span and shall project to the outer face of the bridge rail.
- h. Frame sections are to be adjustable and leveling. Height adjustments are to be constrained with a 3/8 set bolt and 2-1/4 self-tapping screws per leg.
  - i. All fasteners to be zinc plated.
  - j. All boardwalk surfaces are to be ADA compliant

F. Walkway:

- a. Walkways assembled from prefabricated modular sections that are 74.5" long by varying widths per plan. Each modular section consists of a frame and deck section that are pre-fabricated according to project specifications and ready to install upon delivery. Frames are pre-fabricated galvanized structural steel and supported by non-penetrating adjustable leg.
- b. Complete deck panels are pre-fabricated to match specific frames and are constructed from (2"x6" plastic deck boards or other as specified).
- c. Each adjustable leg, two per frame section, consists of a steel leg sleeve and steel leg plate that attaches to a ground penetrating helical-pile based on specific ground bearing capacity, to support a minimum live load capacity of 100 lbs/sq. ft.

## G. Locking System

- a. The locking system consists of two sets of complementary lugs; a male set on the back end of an installed frame and a female set on the front of a frame being added to the walkway.
- b. Once two frames are connected to each other with the locking system, the hinged connection point provides the strength and stability of one contiguous system. Hinged connection must remain flexible enough to follow the contours of the terrain and to accommodate terrain changes up to ADA slope allowances or during freeze/thaw cycles.
- c. The locking system must allow for a top-down installation method in which crews use an installed, modular walkway section as a platform for moving materials and installing the next section.
- d. Hinge system must be removable post installation to allow for maintenance or right-a-way access.
- e. Frame section headers are each supported by a two truss systems to provide redundancy for frame-to-frame deflection. Truss plates are made from ¼ HSS, A36 structural steel.

## **PART 3 - EXECUTION**

### 3.01 INSTALLATION

- A. The CONTRACTOR shall be solely responsible for all installation permits, safety, and environmental concerns.
- B. The installation shall be handled directly by the manufacturer or by a factory certified installation subcontractor.
- C. All materials and construction practices for foundation, railing, and decks, are to be installed per local codes and industry standards.
- D. Installed products are to be done so in accordance with manufacturer's instructions and recommendations to maintain warranty.
- E. Leg/pile locations must be determined suitable and adequate before installation. Supporting piles must have attained their design capacity prior to leg/frame installation. See project drawings and specifications for soil and pile information, locations, and requirements.

### 3.02 CLEANING, REPAIR AND PROTECTION

- A. Repair minor damages to eliminate all evidence of repair. Remove and replace work that cannot be satisfactorily repaired. All site improvements damaged by the contractor will be restored to their original state at their own cost.
- B. Provide temporary protection to ensure that the work will be without dirt, stains, damage or deterioration at time of final acceptance. Clean up stains and spills as they occur. Remove protections and clean as necessary immediately before final acceptance.
- C. Upon completion of the work and before acceptance, the Contractor shall remove and dispose of in an approved manner all surplus materials, rubbish, etc. which the Contractor may have accumulated during the course of the work and shall leave the site in a clean and orderly condition. The Contractor shall not abandon any material at or near the site regardless of whether or not it has any value.

**END OF SECTION**

## SECTION 32 71 00

### WETLANDS PROTECTION AND REPLICATION

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This section consists of providing all plants, labor, equipment, materials, tools, and required professional services in connection with the protection, replication, and provision of specific mitigation measures to minimize and compensate for impacts to existing wetland areas.

##### 1.02 RELATED WORK:

- A. Section 01 57 19, ENVIRONMENTAL PROTECTION
- B. Section 32 93 00, TREES, PLANTS, AND GROUND COVERS

##### 1.03 QUALITY ASSURANCE:

- A. This Contract requires construction adjacent to environmentally sensitive resource areas including flood plains and wetlands. The Wetlands Protection Act ("Act") G.L. Chapter 131 Sec. 40 governs work in these areas and the Contractor shall be required to comply with this and all other applicable Federal, State and local statutes, regulations, and ordinances, and with the Order of Conditions issued by the Conservation Commission.
- B. The Contract Drawings show the extent of the Bordering Vegetated Wetlands (BVW) and Buffer Zone (BZ). Work within the BVW or BZ shall also comply with the requirements of this section.

#### PART 2 - PRODUCTS

##### 2.01 BACKFILL:

Loam and Organic Mixture - This section describes the specification for preparing a loam and organic mixture to be used as suitable backfill within the wetlands restoration and enhancement areas.

1. Loam shall be a natural, fertile, friable soil, typical of productive soils in the vicinity. Loam shall be free of admixture of subsoil and foreign matter or objects (gravel, roots, debris) larger than 2-inches in diameter.

2. Loam shall be uncontaminated and free of toxic substances or any materials harmful to plant growth, regeneration or reproduction. The pH of the loam shall range between 6.0 and 8.0.
3. Peat (if used) shall be supplied from an authorized peat supplier or nursery. Peat shall have an organic content ranging from 75 to 100%. Peat shall be uncontaminated and free of toxic substances or any materials harmful to plant growth, regeneration or reproduction.
4. The loam and organic mixture shall be mixed onsite to achieve a 5% organic content. This will be determined through laboratory analysis or organic content by the loss of weight by ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F. The final pH of the loam-peat mixture shall range from 5.8 to 8.0.

#### 2.02 FERTILIZER:

Fertilizer shall be 10-6-8 controlled release, commercial grade granular free flowing, and uniform in composition and shall conform to applicable state and federal regulations. Fertilizer shall be delivered in manufacturer's standard container printed within manufacturer's name, material, weight, and guaranteed analysis.

#### 2.03 MOISTURE ENHANCER:

A suitable moisture enhancer containing at least 99% Copolymer Acrylamide Acrylate shall be obtained and used for each planted shrub and sapling. This moisture enhancer shall be SuperSorb-C, TerraSorb or approved equal.

#### 2.04 MULCH:

- A. Hay Mulch - Hay mulch shall consist of mowed and properly cured grass, clover and other acceptable plants. Hay mulch shall be free of weeds, twigs, debris or other deleterious material.
- B. Straw Mulch - Straw mulch shall consist of stalks or stems of grain after threshing.
- C. Wood Fiber Mulch - Wood fiber mulch shall consist of wood fiber produced from clean, whole, uncooked wood, formed into resilient bundles having a high degree of internal friction and shall be dry when delivered to the project.

#### 2.05 PROPAGULES:

- A. The wetlands restoration and enhancement areas shall be vegetated with indigenous wetlands shrubs, saplings, and emergent species. Individual species to be planted are indicated on the final design plans.

- B. Propagules shall be nursery or plantation stock and shall be supplied from a bonded source. Nursery stock shall conform to the requirements and recommendations of American National Standards Institute (ANSI) Z60.1.
- C. Plants, propagules or cultivars other than those listed in this section will not be accepted unless specifically approved by the wetlands restoration specialist and accepted by the U.S. Environmental Protection Agency.
- D. Propagules shall be dug and prepared for shipment in a manner that will not cause significant damage to branches, roots, shape and future growth and development after planting.
- E. Balled and burlapped plants shall have ball sizes and ratios conforming to ANSI Z60.1. Plants shall be balled with firm, natural balls of soil. Balled and burlapped plants shall be wrapped firmly with burlap, strong cloth, or plastic and tied.
- F. Planting stock shall be well-branched and well-formed, sound, vigorous, healthy, and free from disease, sun-scald, windburn, abrasion and harmful insect eggs and shall have healthy normal and unbroken root systems.
- G. Plants shall have been grown under climactic conditions similar to those in the vicinity of the site. Plants budding into leaf or having soft growth shall be sprayed with an antidesiccant at the nursery prior to delivery.
- H. Sapling minimum and maximum heights are as follows: a minimum of 3 feet and a maximum of 5 feet.
- I. Shrub minimum and maximum heights are as follows: a minimum of 18-inches and a maximum of 36-inches.
- J. Emergent propagules shall be rootstock.

2.06 HYDROSEED:

- A. Hydroseed shall be supplied by an authorized hydroseed contractor. The Hydroseed mixture shall include annual grasses and seed stock from *Juncus spp.* and *Carex spp.* The wetlands restoration specialist shall approve the final hydroseed mixture.

2.07 WATER:

Water shall not contain elements toxic to plant life.

## PART 3 - EXECUTION

### 3.01 GENERAL:

- A. Every effort shall be made to use existing wetland species. At the discretion of the Engineer, the Contractor may, at its option, dig up, store and maintain existing wetland species trees, shrubs and plants from the excavation area for use in the replication area. Trees shall be a minimum of 1-inch caliper and shrubs shall be a minimum of 24-inches in spread or height. All plants shall be vigorous and well formed specimens.
- B. All plant materials dug for this purpose shall be dug by hand, hydraulic tree spade specifically designed for this purpose or other suitable equipment of sufficient size to remove an adequate rootball.
- C. American Association of Nurserymen, Inc., American Standard for Nursery Stock (latest edition) for each species. For hand dug plants, a suitable burlap or other wrap or container shall be provided to keep the rootball intact.
- D. All plants dug for reuse shall be immediately moved to a protected storage area approved by the Engineer. Plants shall be set plumb on grade or in prepared holes and guyed as necessary. The area or holes shall be backfilled with suitable topsoil to cover rootballs entirely and mulched to prevent erosion. All stored vegetation shall be maintained in a damp condition by regular watering. Contractor shall utilize all cultural measures necessary for survival of collected plants.
- E. When work has been completed, stockpiled plants shall be replanted in prepared pits in locations in the replication area designated on the Contract Drawings. Planting, backfilling, fertilizing, staking, mulching, watering and all other cultural methods, including season for planting, maintenance and warranties shall be as per Section 32 93 00.
- F. Costs for digging, moving, storage, maintenance and transplanting shall be considered part of the wetland replication item.
- G. In order to protect the wetlands from siltation caused by excavation in the replication area and by roadway construction, a silt fence and a continuous line of staked hay bales shall be placed as detailed in the Contract Drawings. Hay bales and silt fence are specified in Section 01 57 19.
- H. The organic, top layer of wetlands soils (generally, the top 12-inches) contains the rootstock and seeds for many wetland plant species. As excavation in the wetlands areas commences, the Contractor shall separate the top 12-inch layer of wetland soils (topsoil) within the delineated wetland areas (flagged wetlands) from other soil types and stockpile the wetland soils within an upland area adjacent to the replication area. At no time will stockpiling of excavated soils within wetland areas be allowed. The wetland soil shall be carefully maintained in a wet condition by adequate watering and shall be protected by

installing a siltation fence around the entire stockpiled area. Stockpiles shall be completely covered with a filter fabric and whenever possible, located in the shade.

- I. Suitable soil which is excavated, not including the top layer referred to in the paragraph above, shall be carefully removed for use as subgrade material beneath wetland topsoil and if it is not immediately used, shall be stored in a designated stockpile area, to be reused. All soils to be reused shall be carefully stockpiled and protected with appropriate drainage and erosion control.
- J. Once the replication area has been excavated, backfilling of the excavation with wetland soil can occur. Prior to the spreading of the wetland soil, the subsoil within the replication area shall be inspected and approved by the Engineer. The elevation and slope of the backfilled subgrade are critical elements in assuring proper replacement of wetlands soils and the function of the wetland. When backfilled with the soil discussed in the paragraph above, elevation and slopes of backfilled areas shall be consistent with the Contract Drawings minus 1-foot to allow for replacement of wetlands (BVW) soils.

### 3.02 WETLANDS (BVW) SOILS:

- A. Wetlands topsoil shall be deposited to a minimum depth of twelve (12) inches. Wetlands topsoil shall be deposited so as to minimize travel and subsequent compression of the underlying material and the replaced wetland topsoil. In the event that the Contractor fails to remove and stockpile sufficient wetlands topsoil to cover the replication area, or in the event sufficient wetlands topsoil is not present, the Contractor shall provide, at no additional cost to the Owner, replacement wetlands topsoil. Replacement wetlands topsoil, if required, shall be provided by a licensed nursery and shall be similar in composition, texture, fertility, and as described in Section 2.01 BACKFILL. The final grading of the replacement wetlands topsoil shall be completed so as to result in no discontinuities in elevation upon removal of any siltation barrier or erosion control materials.
- B. Upon completion of final grading, the surface of the new wetlands topsoil shall be shallowly harrowed (depth 3-inches), prior to planting.
- C. Upon completion of grading, a final condition survey of the wetlands restoration and enhancement areas shall be performed by a licensed surveyor. Elevations shall be checked in numerous random locations, and shall be within 0.1 feet of the final planned surface elevation. Areas that do not meet the 0.1 foot criteria shall be regraded.

### 3.03 PLANTING SCHEDULE:

- A. Spring planting of saplings and shrubs shall occur between 30 April and 15 June. Fall planting shall occur as dormant planting between 15 September and 30 October for saplings, and 15 September and 15 November for shrubs. If special conditions warrant a variance from the above planting schedules or conditions, and if in concurrence with the wetlands restoration specialist, the above dates can be modified only if recommended by the nursery and if all warranties still apply.



- B. Planting and hydroseeding shall not occur when the ground is frozen, snow covered or in an unsuitable condition for planting.
- C. All saplings, shrubs and emergent propagules shall be planted in the wetlands restoration and enhancement areas in accordance with a planting plan and schedule as indicated on the Final Plans. All saplings and shrub mixtures (within the wetlands restoration and enhancement areas) shall be planted randomly as indicated on the Final Plans. Sapling and shrub mixtures shall be planted randomly under the direction of the wetlands restoration specialist, with all planting locations no closer than 10 feet on center. Saplings and shrubs shall not be planted within ponds or standing water areas. No machinery or vehicles shall be allowed within the existing adjacent wetlands. Soil disturbances shall be kept to the minimum necessary to accommodate planting. Any extra soil (from pits) shall be removed from the wetland.
- D. All balled and burlapped and container grown plants shall be handled and moved only by the root ball or container.
- E. Pits for planting shall be dug to produce vertical sides and flat bottoms. The depth of pits shall be 6-inches deeper than the root ball. The diameter of the pits shall allow a minimum distance between the ball and the sides of the hole of 6-inches for shrubs and 10-inches for saplings. The bottom 4-inches of the pit shall be loosened with a shovel prior to planting.
- F. Saplings and shrubs shall be set plumb and manually held in position until sufficient soil has been firmly placed around roots or ball. Saplings and shrubs shall be set at the same depth at which they were grown in the nursery or container.
- G. Balled and burlapped stock shall be backfilled with soil to approximately half the depth of the ball and watered. Burlap and tying materials shall be carefully removed or folded back at the recommendation of the nursery. Plastic wrap shall be completely removed before placement of backfill. The remainder of backfill shall be tamped and watered.
- H. Emergent plantings shall be planted by hand in random locations under the direction of the wetlands restoration specialist in locations designated by the Final Plans. Plantings shall be planted no closer than 2 feet on center.
- I. Guying and staking of saplings shall only be required on taller individuals (5 feet), if recommended by the nursery.

#### 3.04 HYDROSEEDING:

Hydroseeding shall accomplish seeding, fertilizing and mulching. Hydroseeded areas shall be seeded at a rate of 400 pounds per acre. Hydroseed application shall be conducted between 15 April and 15 June or 15 September to 30 October, or as recommended by the hydroseed contractor.

3.05 FERTILIZER APPLICATION:

Saplings and trees shall be fertilized at a rate of 0.25 pound of fertilizer per plant, or as recommended by the nursery. Fertilizer shall be worked 2- to 3-inches into the soil.

3.06 MOISTURE ENHANCER:

The moisture enhancer specified in Section 2.03 of this specification shall be applied to each planted shrub and sapling at a rate of 8 ounces per propagule and shall be broadcast around the root ball 3- to 4-inches below the surface.

3.07 MULCH:

Saplings and shrubs shall be mulched to a depth of 2-inches around the base of the pit, at the discretion of the wetlands restoration specialist.

3.08 WATERING:

All saplings and shrubs shall be watered by flooding the backfilled hole within the same working day of planting. Additional soil shall be added around each plant as required to compensate for settling.

3.09 PROTECTION:

Upon completion of construction activities within the wetlands restoration and enhancement areas, barricades or snow fencing shall be erected along upland areas adjacent to the wetland to prevent unauthorized access.

3.10 REPLANTING OF WETLANDS VEGETATION IN THE REPLICATION AREA:

- A. In all wetlands, replication of the disturbed areas shall require replanting with indigenous wetland species. The Contractor shall have the option of digging, storing, and replanting existing trees, shrubs and groundcover and respreading stockpiled wetlands soil from the reservoir excavation area or, alternatively, providing and planting new wetland species at no additional cost to the Owner. The intent of this Section is to insure that at least 75 percent of the surface area of all disturbed wetlands is reestablished with indigenous wetland plant species within two growing seasons of their planting in accordance with the Massachusetts DEP Wetlands Protection Act Regulations. The growing season for wetlands revegetation areas shall be April 15 to October 15. Attention is called to the fact that wetlands to be replicated within the project site have been identified as shrub-scrub or shrub-sapling swamps. The wetland planting zones are schematically shown on the plans. Purple Loosestrife and Phragmites species shall not be planted in any wetland. If after 180 growing season days it is evident in the opinion of the Engineer that it is unlikely that the 75 percent reestablishment requirement will be achieved, the Contractor shall supplement the plantings as necessary to achieve the required coverage at no additional cost to the Owner. If at the end of two growing seasons, 75 percent

reestablishment has not been achieved, the Contractor shall provide and plant additional new plant material to achieve 75 percent reestablishment at no additional cost to the Owner.

- B. Wetland species are divided into planting groups (designated below) according to their moisture requirements during the growing season. Plantings are done at specified elevations based on the assumed mean water table. (These elevations to be adjusted by the Engineer based on the mean water table as determined during one growing season April 15 to October 15).
  - C. Wetland plantings shall be performed as designated on the Contract plans.
  - D. On average, for each 100 square feet of replication area, provide and plant a total of 2 shrubs, and for each 625 square feet of replication area to be revegetated, provide and plant one tree. Shrubs and trees will be spaced according to the Contract Plans.
  - E. New trees and shrubs shall be balled and burlapped or container grown Nursery Stock.
  - F. New trees shall be 1- to 1-1/2-inch caliper minimum. All plants selected for replanting shall be of the size specified on the Contract Drawings.
  - G. New shrubs shall be 24-inches in spread, minimum.
  - H. For each 100 square feet of replication area to be revegetated with replacement soil, provide and plant a total of 45 plants. New plants shall be a minimum size of 1-3/4-inch peat potted nursery stock, dormant rhizome, dormant tuber, dormant bulb, or bare root plant, as appropriate for the species and planting season. Plants shall be spaced according to Contract Plans.
  - I. All planting shall be supervised by a licensed nurseryman, qualified to do this work. At least four weeks prior to any wetland planting, the Contractor shall submit details of proposed planting methods, plant layout, and personnel qualifications for approval by the Engineer.
  - J. Wetland planting materials, operations, maintenance, inspection, and preliminary acceptance shall be as specified in Section 02930. Warranty and final inspection of all wetland plantings shall be a minimum of one year from the date of preliminary acceptance.
  - K. Maintenance shall be provided until final acceptance. Final acceptance shall be obtained as stipulated in the attached Order of Conditions.
- 3.11 EROSION CONTROL SEEDING FOR WETLANDS:
- A. After wetland soil is respread, no further preparation for seeding is required or allowed. No fertilizer, limestone, superphosphate or other amendment shall be added to wetland soils. Seed mixture and application rates for this work shall follow the contract plans.

- B. A wetland seed mixture containing a wide variety of seeds native to New England and which do not include any invasive plant species prohibited in the latest edition of the “Performance Guidelines and Supplemental Information on the Checklist for Review of Mitigation Plan”, published by the U.S. Army Corps of Engineers New England Division. Application rates shall be one pound per 5000 square feet when used in an understory seeding and two pounds per 5000 square feet when used in a wet meadow seeding.
- C. Where required by the Engineer, for reasons of excessive soil moisture, the wetland seed mixture shall be modified by the addition of an approved portion by weight of Winter Rye seed to provide soil stabilization cover in the fall.

3.12 WORK IN THE BUFFER ZONE (BZ):

- A. When any work occurs in the Buffer Zone (BZ) within 100 feet of bordering vegetated wetlands (BVW), certain measures, as indicated on the Contract Drawings, shall be taken to protect the integrity of the wetlands.
- B. A siltation barrier consisting of a continuous row of staked hay bales and a silt fence shall be placed between the BVW and the work area to prevent soil materials from entering the BVW from the BZ as shown on the Contract Drawings. This siltation barrier shall be inspected and maintained on a daily basis. Hay bales and silt fence are specified in Section 01570.
- C. In general, storage of equipment or materials in BVW or BZ areas shall not be permitted. Storage of oil products or the repairing of vehicles and/or maintenance operations shall not be permitted in the BVW or BZ areas. Should the Engineer deem that the Contractor's activities are unnecessarily detrimental to the wetlands, the Engineer reserves the right to order the Contractor to immediately cease all activities on-site until the situation is resolved to the satisfaction of the Engineer.

END OF SECTION

SECTION 32 91 00  
LOAM AND PLANTING PREPARATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 apply to the work of this Section.

1.02 DESCRIPTION OF WORK

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all planting work and related items as indicated on the Contract Documents and as specified in this Section and includes, but is not limited to, the following:

1. Subgrade preparations.
2. Loam from off-site, if on-site loam is insufficient.
3. Sampling and testing of on-site and off-site loam.
4. Sand.
5. Modifying, screening, placing, spreading and grading of loam.
6. Fine grading.
7. Erosion control matting.
8. Inspection and acceptance.
9. Cleaning and protection.

1.03 RELATED WORK

- A. Carefully examine the site and all of the Contract Documents for requirements that affect the work of this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions. Other specifications sections that directly relate to the work of this Section include, but are not limited to, the following:

1. Section 03 30 00 – Cast-In-Place Concrete
2. Section 05 50 00 – Metal Fabrications
3. Section 11 68 00 – Playground Equipment
4. Section 31 00 00 – Earthwork
5. Section 31 25 00 – Erosion and Sedimentation Controls
6. Section 32 12 16 – Asphalt Paving
7. Section 32 13 13 – Exterior Concrete
8. Section 32 16 00 – Curbing
9. Section 32 18 16.13 – Playground Protective Surfacing
10. Section 32 31 00 – Fencing
11. Section 32 90 00 – Planting
12. Section 32 92 00 – Turf and Grasses
13. Section 33 10 00 – Water Utilities
14. Section 33 30 00 – Sanitary Sewerage Utilities
15. Section 33 40 00 – Storm Drainage Utilities

- B. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of all work of the Contract.

#### 1.04 REFERENCES

- A. American Society for Testing and Materials (ASTM):

|          |  |
|----------|--|
| D 75     | Practice for Sampling Aggregates   |
| D 422    | Test Method for Particle-Size Analysis of Soils  |
| D698-00a | Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> ) |
| D1557    | Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb rammer and 18-in. drop                             |

- B. O.A.C.: Association of Official Agricultural Chemists.

- C. State of Massachusetts, Standard Specifications for Highways and Bridges, Department of Public Works, latest edition.

- D. American Association of Nurserymen, American Standards for Nursery Stock, (ANSI Z60.1), latest edition, published by the American Association of Nurserymen, 1250 I Street, N.W., Suite 500 Washington, D.C. 20005.

#### 1.05 SUBMITTALS

- A. At least 30 days prior to ordering materials, the Contractor shall submit to the Architect representative samples, certifications, manufacturer's product data and certified test results for materials as specified below. No materials shall be ordered or delivered until the required submittals have been reviewed and approved by the Architect. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Architect reserves the right to reject, on or after delivery, any material that does not meet these Specifications.

- B. Existing On-Site loam: Sample and test existing on-site loam. The Contractor shall sample the existing loam soils of the construction site in the following manner:

1. The Contractor shall provide a one cubic foot representative sample per each 1,000 cubic yard on-site stockpile of existing loam for testing. All stockpile sampling shall be per ASTM D 75 and Appendixes for securing samples from stockpiles.
2. Preparation of Samples: Contractor shall place these soil slices into a large, clean plastic container and mix thoroughly. Contractor shall take one cup of soil mixture and dry it at room temperature (do not dry samples in an oven or on a stove or radiator). Once soil is dry, place soil in sandwich size zip-type plastic bag and close it tightly. Label each sample on outside of bag, identifying sample by soil type and acre. Provide an approved site plan showing locations of stockpiles cross referenced to soil samples and test results.

- C. Loam from off-site, if on-site loam is insufficient: The Contractor shall provide a one cubic foot representative sample per each 1,000 cubic yard proposed stockpile of loam borrow for testing. All stockpile sampling shall be per ASTM D 75 and Appendixes for securing samples from stockpiles.
- D. Testing will be at the Contractor's expense. Contractor shall deliver all samples to testing laboratories via overnight courier and shall have the testing report sent directly to the Architect. Perform all tests for gradation, organic content, soil chemistry and pH by UMASS Soil and Plant Tissue Laboratory, West Experiment Station, North Pleasant Street, University of Massachusetts, Amherst, MA 01003, (413) 545-2311. Testing reports shall include the following tests and recommendations:
  - 1. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System.
  - 2. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples minus #10 material shall be oven-dried to a constant weight at a temperature of 450 degrees Fahrenheit (752 degrees Centigrade).
  - 3. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, extractable Aluminum, Lead, Zinc, Cadmium, Copper, Soluble Salts, and pH and buffer pH. A Conductivity Meter shall be used to measure Soluble Salts in 1:2 soil/water (v/v). Except where otherwise noted, nutrient tests shall be for available nutrients.
  - 4. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish lawn and planting work as specified.
- E. Compost: Submit supplier's certification of contents.
- F. Limestone: Submit supplier's certification that the limestone being supplied conforms to these Specifications.
- G. Acidulant: Submit supplier's certification that the acidulant being supplied conforms to these Specifications.
- H. Fertilizer:
  - 1. Submit product data of seeding/sodding and planting fertilizer and certificates showing composition and analysis. Submit fertilization rates for fertilizer product based upon soil testing, analysis, and recommendations as specified, performed and paid for under in this Section.

#### 1.06 REGULATORY REQUIREMENTS

- A. Strictly comply with all applicable codes, regulations and requirements having jurisdiction.

- B. All fertilizer applications shall be performed by a licensed applicator in strict conformance with all local, state and federal regulations. Notify the Owner's Project Representative at least two (2) weeks prior to scheduled date of application.

1.07 EXAMINATION OF CONDITIONS

- A. The Contractor and any sub-Contractor responsible for the execution of the Work of this Section, shall review the subgrades and elevations to verify that the subgrades have been prepared as required by the Contract Documents, prior to proceeding with the spreading of the planting loam. Carefully review the requirements of this Section, to understand the requirements of percolation testing, compaction, slope and absence of debris of the subgrade prior to spreading of the loam borrow.
- B. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to sampling and testing of all materials prior to final planting installation.

1.08 DEFINITIONS/QUALITY ASSURANCE

- A. The following definitions shall apply to the work of this Section.

The following size distributions of mineral particles by diameter and sieve size shall apply to the following conventional names of soil types:

| <u>Conventional Name</u> | <u>Retained on U.S. Sieve No.</u> | <u>Diameter (mm)</u> |
|--------------------------|-----------------------------------|----------------------|
| Very coarse sand         | #18                               | 1 - 2                |
| Coarse sand              | #35                               | 0.5 - 1              |
| Medium sand              | #60                               | 0.25 - 0.5           |
| Fine sand                | #140                              | 0.10 - 0.25          |
| Very fine sand           | #270                              | 0.05 - 0.10          |
| Silt                     | by hydrometer                     | 0.002 - 0.05         |
| Clay                     | by hydrometer                     | Less than 0.002      |

- B. Subgrade: Soil material and levels resulting from the approved rough grading work.
- C. Existing Topsoil: In place soil on the site that will be stripped, screened and amended and re-used as a component of soil blends. The upper 6-12 inches of topsoil stripped from the project site and stockpiled for soil blending. Contractor is responsible for ensuring neither B-horizon subsoils nor subgrade is stripped with the topsoil.
- D. Imported Base Loam: Base Loam obtained by an approved soil supplier for off-site manufacture of soil blends to be imported to the project site.



- E. Lawn and Planting Soils: Lawn and Planting Soils are composed of a blend of stripped topsoil, organic material and sand. The quality of the blend depends on the quality of the original components. Locate and obtain approval of sources for base loam, organic material and sand that meet the Specification requirements. Contractor is then responsible for mixing the components. Approximate mixing ratios depend on the initial materials, and with the approval of the Architect or their representative, in order to meet Specification requirements for Lawn and Planting Soils.
- F. Contractor is solely responsible for quality control of the Work.
- G. The installer shall be a firm having at least 5 years of successful experience of a scope similar to that required for the Work, including the preparation, mixing and installation of custom Planting Soil and planting mixes.
- H. Soil work shall be performed by a firm that has sufficient earthwork machinery at the job site simultaneously to amply provide for the vigorous execution of the site work without interruption or delay, except for unforeseen circumstances, such as weather. Machinery operators shall be well experienced in this type of work.
- I. Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.
- J. Comply with all requirements for control of silt and sediment during soil installation work as indicated in the contract documents. Provide additional silt and sediment control to maintain silt and sediments within the working area as required by the progress of the work or as directed by the Landscape Architect.
- K. Pre-installation Conference: Conduct conference at project site prior to the start of any work related to Planting Soil preparation and shall meet the requirements of this Section.

#### 1.09 DELIVERY

- A. Material shall not be handled or hauled, placed or compacted when it is wet as after a heavy rainfall, early spring or if frozen. Soil shall be handled only when the moisture content is compliant with this Specification. Protection of stockpiles during the winter and spring months is essential. The Landscape Architect, Soil Scientist and the Owner shall be consulted to determine if the soil is too wet to handle.
- B. Sequence deliveries to avoid delay. On-site storage space is permissible only with written notice from the Owner. Deliver materials only after preparations for placement of soil have been completed.
- C. Prohibit vehicular and pedestrian traffic on or around stockpiled soil.
- D. Soil that is to be stockpiled longer than two weeks, whether on or off site, shall not be placed in mounds greater than ten feet high. Windrows are the preferred manner of stockpiling.

- E. Vehicular access to the site is restricted. Before construction, the Contractor shall submit for approval a plan showing proposed routing for deliveries and site access.

PART 2 - PRODUCTS

2.01 LOAM

- A. Loam: The Contractor shall provide additional loam as necessary to complete the work of this Section from off-site sources if there is not sufficient material on site suitable to complete the Work. The Contractor shall submit samples and an analysis from each proposed source of material. Provide loam that is fertile, friable, natural loam reasonably free from subsoil, clay lumps, brush, litter, roots, stones and other foreign materials.
- B. Loam shall be one of the following sandy loams; “coarse sandy loam”, “sandy loam”, “fine sandy loam”, determined by mechanical analysis ASTM D-422 and based on the USDA Classification System, and as defined in this Section. It shall be uniform in composition, without admixture of subsoil. It shall be free of stones greater than one and one-quarter inches, lumps, plants and their roots, debris and other extraneous matter, such as glass, brick, metals, plastics, etc. as determined by the Landscape Architect.
1. Planting loam for trees, shrubs, groundcover and vines, and perennials shall have the following grain size distribution for material passing the #10 (2.0 mm) sieve:

| <u>US Sieve No.</u> | <u>Percent Passing by Weight</u> |                |
|---------------------|----------------------------------|----------------|
|                     | <u>Maximum</u>                   | <u>Minimum</u> |
| 10                  | -----                            | 100            |
| 18                  | 93                               | 75             |
| 35                  | 80                               | 50             |
| 60                  | 56                               | 29             |
| 140                 | 32                               | 19             |
| 270                 | 23                               | 18             |

- 1) Percent Gravel in the loam mix shall be <15%.
  - 2) D80/D30 = <8.0 .
  - 3) Organic Matter = 5.0 – 10.0%
  - 4) pH shall be between 5.5 – 6.5.
2. Planting loam for general lawns shall have the following grain size distribution for material passing the #10 (2.0 mm) sieve:

| US Sieve No. | Percent Passing by Weight |     |
|--------------|---------------------------|-----|
|              | MAX                       | MIN |
| 10           | ---                       | 100 |
| 18           | 93                        | 75  |

|     |    |    |
|-----|----|----|
| 35  | 80 | 50 |
| 60  | 56 | 29 |
| 140 | 32 | 19 |
| 270 | 23 | 18 |

- 1) Percent Gravel in the loam mix shall be <15%.
  - 2) Organic Matter = 3.5 – 8.0%.
  - 3) pH shall be between 6.3 – 6.8.
  - 4) Saturated hydraulic conductivity of the mix shall not be less than 2.5 inches per hour according to ASTM D5856-95 (2000) when compacted to a minimum of 88% Standard Proctor, ASTM 698.
- C. One hundred percent by weight shall pass a one-inch (1”) sieve opening, and the maximum retained on the 1/4” sieve shall be 20 percent by weight of the total sample.
- D. Organic content and pH: loam shall contain not less than 6% or more than 10% organic (unless specified differently herein) matter of the sample that passes a 1/4” sieve when determined by the wet combustion method on a sample dried at 105 degrees.
- E. The pH value shall be as noted in the soil blends above.
1. Loam borrow shall be pH adjusted for particular planting applications and shall be adjusted prior to delivery to the Project sites as recommended by UMASS Soil & Plant Tissue Laboratory test results.
    - 1) When pH of loam borrow is equal to or greater than 7 use aluminum sulfate to adjust pH downward to required levels.
    - 2) When pH of loam borrow is less than 7 use either sulfur or ferrous sulfate to adjust pH downward to required levels.
    - 3) When pH of loam borrow must be raised to the required levels use limestone.
    - 4) Regardless of amendment Contractor chooses to use, Contractor, not the Owner, shall be responsible for obtaining specified pH by seeding and/or planting time.
- F. Loam shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. Topsoil shall not have levels of extractable aluminum greater than 200 parts per million except for acid-loving plants. Cation Exchange Capacity (CEC) shall be between 10 and 15.
- G. All planting loam provided from off-site sources shall be brought to the site meeting all specification requirements. There must be no mixing or amending of soil on site. The loam borrow must not be handled or moved when in a wet or frozen condition.

H. To assure planting loam purchased and screened loam stockpiled fulfills specified requirements regarding textural analysis, organic matter content, and pH, soil testing results will be obtained by the Contractor and submitted to the Architect for approval before any soil is delivered to the site.

2.02 SOIL ADDITIVES.

- A. Soil additives shall be used to counteract soil deficiencies as recommended by the soils analysis.
- B. Lime: Provide approved agricultural limestone containing not less than 85% of total carbonates with a minimum of 30% magnesium carbonates. Lime shall meet Massachusetts Department of Food and Agriculture standards for Fine-Sized Classification so that 50% passes a 100 mesh, 60% passes through a 60-mesh sieve, and 95% will pass a 20 mesh sieve.
- C. Aluminum Sulfate shall be unadulterated, 57% (Ortho Division, Chevron Chemical Company), or approved equal.
- D. Sand additive shall be comprised of clean, coarse, granular sand, subangular to sub-round, free from organic matter and deleterious substances. Sand shall be washed sand in accordance with the table below.

| <u>SIEVE SIZE</u> | <u>% passing</u> |
|-------------------|------------------|
| No. 4             | 100              |
| No.8              | 90-100           |
| No. 16            | 80-100           |
| No. 30            | 25-60            |
| No. 50            | 0-25             |
| No. 100           | 0-5              |
| No 200            | 0-3              |

- 1. The sand should have a coefficient of uniformity (D60/D10) of less than 4.0
  - 2. Amend existing loam to achieve requirements as described above.
- E. Compost: Provide compost as needed to raise the Organic Content of the topsoil to within specified range. Compost shall be:
- 1. Organic Matter for amending planting soils shall be a stable, humus-like material produced from the aerobic decomposition and curing of Leaf Yard Waste Compost, composted for a minimum of one year (12 months). The leaf yard waste compost shall be free of debris such as plastics, metal, concrete or other debris. The leaf yard waste compost shall be free of stones larger than 1/2", larger branches and roots. Wood chips over 1" in length or diameter shall be removed by screening. The compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor, and

meeting the following criteria as reported by laboratory tests.  
The ratio of carbon to nitrogen shall be in the range of 12:1 to 25:1.

2. Stability shall be assessed by the Solvita procedure. Protocols are specified by the Solvita manual (version 4.0). The compost must achieve a maturity index of 6 or more as measured by the Solvita scale. Stability tests shall be conducted by Woods End Research Laboratory, Mt. Vernon, Maine.
  3. Organic Content shall be at least 20 percent (dry weight). One hundred percent of the material shall pass a 1/2-inch (or smaller) screen. Debris such as metal, glass, plastic, wood (other than residual chips), asphalt or masonry shall not be visible and shall not exceed one percent dry weight. Organic content shall be determined by weight loss on ignition.
  4. pH: The pH shall be between 6.5 to 7.4 as determined from a 1:1 soil-distilled water suspension using a glass electrode pH meter American Society of Agronomy Methods of Soil Analysis.
  5. Salinity: Electrical conductivity of a one to five soil to water ratio extract shall not exceed 2.5 mmhos/cm (dS/m).
  6. The compost shall be screened to 1/2-inch maximum particle size and shall contain not more than 3 percent material finer than 0.002mm as determined by hydrometer test on ashed material.
  7. Nutrient content shall be determined by the Soil Testing Laboratory and utilized to evaluate soil-required amendments for the mixed soils. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Magnesium, Iron, Manganese, Lead, Soluble Salts, Cation Exchange Capacity, soil reaction (pH), and buffer pH.
  8. Acceptance of composted products shall be based on the following submittals by the Contractor:
    - 1) Approval of a Material Source.
    - 2) A copy of the Composting Permit for the Material Source selected.
    - 3) Certification by the supplier that the compost product meets state EPA guidelines and that it originates from 100 percent recycled vegetation material, no Bio-Solids will be accepted, that has been aerobically composted.
- F. Bone meal shall be fine ground, steam cooked, packing house bone with a minimum analysis of 23% phosphoric acid and 4% nitrogen.
- G. Fertilizers: Commercial fertilizer shall be a complete fertilizer complying with all State and Federal Fertilizer laws. Fifty-percent of available nitrogen shall be in a slow-release form as is found in certain urea-form products, or natural organic forms, or a combination of both. The salt index of the fertilizer shall not exceed 35. It shall contain the following percentages by weight.

Lawns

|            |     |     |
|------------|-----|-----|
| Nitrogen   | (N) | 10% |
| Phosphorus | (P) | 10% |
| Potash     | (K) | 10% |

- H. Fertilizer shall be delivered and mixed as specified, in standard size unopened containers, showing weight, analysis in compliance with Massachusetts Department of Food and Agriculture regulations, and name of manufacturer. It shall be stored in a weatherproof storage place, in such a manner that it will be kept dry, and its effectiveness not impaired.
- I. Fertilizer for planting shall be formulated for top-dressing, soil surface application to plants. Fertilizer shall be designed and certified by the manufacturer to provide controlled release of fertilizer continuously for not less than 9 months. One hundred percent of the nitrogen content shall be derived from organic materials. Nitrogen source shall be coated to ensure slow release. Fertilizer percentages of weight of ingredients shall be as recommended by the soil testing and analysis specified, performed, and paid for under this Section, Loam and Planting Preparation.
- J. Gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) shall be agricultural grade, granular form. Gradation shall conform to the following:

| <u>Sieve Designation</u> | <u>Percent Passing by Weight</u> |
|--------------------------|----------------------------------|
| No. 8 (2.36 mm)          | 100                              |
| No. 16 (1.18 mm)         | 97                               |
| No. 30 (0.60 mm)         | 82                               |
| No. 50 (0.30 mm)         | 46                               |
| No. 100 (0.15 mm)        | 21                               |

2.03 EROSION CONTROL MATTING.

- A. The erosion control blanket shall be a machine-produced mat of 100% agricultural straw matrix. The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with lightweight photodegradable polypropylene netting having an approximate 0.50 x 0.50 inch (1.27 x 1.27 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers (50 stitches per roll width) with degradable thread. The blanket shall be manufactured with a colored line or thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) to ensure proper material overlapping. The straw erosion control blanket shall be S150 as manufactured by North American Green, or Architect approved equal. The erosion control blanket shall have the following properties:

1. Material Content:

- 1) Matrix - 100% Straw or Coconut Fiber

- 2) Netting - (0.50 lb/yd<sup>2</sup>) (0.27 kg/m<sup>2</sup>)  
Both sides lightweight photodegradable  
(1.64 lbs/1,000 ft<sup>2</sup> [0.80 kg/100m<sup>2</sup>] approximate weight)
- 3) Thread - Degradable

2. Physical Specifications (per roll):

|                 | <u>IMPERIAL</u> | <u>METRIC</u>       |
|-----------------|-----------------|---------------------|
| Width:          | 6.67 ft         | 2.03m               |
| Length:         | 108.0 ft        | 32.92m              |
| Area:           | 80.00 sq.yds    | 66.89m <sup>2</sup> |
| Weight:         | 40.00 lbs       | 18.14kg             |
| Stitch Spacing: | 1.50 inch       | 3.81cm              |

- B. Erosion control blankets shall be applied parallel to direction of water flow. For slopes 2:1 or greater, Model SC150 shall be used. For slopes between 2:1 and 3:1, Model S150 shall be used. Slopes less than 3:1 do not, unless field conditions warrant, require erosion control blankets.
- C. Six inch wire staples shall be placed according to manufacturer's recommendations to anchor the mesh material.

PART 3 - EXECUTION

3.01 KICKOFF MEETING:

- A. At least 10 working days prior to the start of work, the Contractor shall request a landscape construction kickoff meeting with the owners representative, landscape architect and any other parties involved with landscape construction. Contractor shall articulate the means and methods of subgrade preparation, soil placement and other steps outlined in the Specification.
- B. Coordinate activities with other project contractors so that there is no soil disturbance from traffic or other construction activities subsequent to placement.
- C. Pre-Installation Examination Required: The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and shall notify Landscape Architect and Soil Scientist in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Contractor accepts substrates, previous work, and conditions.
- D. Examination of Subgrade: The subgrade shall be examined by the Contractor prior to the start of soil installation. Any deficiencies shall be noted and related to the Landscape Architect. Deficiencies include, but shall not be limited to the following:
  - 1. Construction debris present within the planting areas.
  - 2. The subgrade is at incorrect depths for installing the designed soil profile.

3. Incomplete irrigation.
  4. Incomplete lighting and exterior electrical installation.
  5. Conflict with underground utilities.
  6. Subgrade contaminated with oils, compressible material, silt or clay.
- E. Confirm that the subgrade is at the proper elevation and prepared as required. Subgrade elevations shall slope parallel to the finished grade as shown on the drawings
1. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Provide protection measures as required for public safety.
  2. All subgrade areas to be filled with Soil shall be free of construction debris, refuse, vegetation, compressible or decay able materials, all stones greater than three inches, concrete washout or soil crusting films of silt or clay that reduces or stops drainage from the soil into the subsoil; and/or standing water. Such material shall be removed from the site.
  3. The subgrade must slope toward the bottom of slopes and subdrains. Subgrade levels shall be adjusted as required to ensure that all planted areas have adequate drainage.
- F. Do not proceed with the installation of soil, until all utility work in the area has been installed
1. The Contractor shall identify the locations of underground utilities prior to proceeding with soil work and shall protect all utilities from damage.

### 3.02 WORKING AROUND UTILITIES

- A. Carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.
- B. Known underground and surface utility lines are indicated on the utility drawings – See Civil and Architect’s plans. Contact the local Dig Safe organization and give them their required time to respond and mark the property. Determine location of underground utilities and perform work in a manner that will avoid possible damage. Hand-excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.
- C. Perform work in a manner that will protect utilities from damage. Hand-excavate as required and provide adequate means of support and protection of utilities during soil installation operations. Maintain grade stakes set by others until parties concerned mutually agree upon removal. The Contractor shall repair all utilities damaged by soil operations at the Contractor’s expense.

### 3.03 FILLING AND COMPACTION.

- A. Verify that the subgrade preparations have been reviewed and accepted, including removal of all existing vegetation prior to placement of planting soils.



1. Notify the Landscape Architect of soil placement operations at least seven calendar days prior to the beginning of work.
- B. Perform percolation tests on existing subsoils or placed fill prior to placing and spreading loam for seeding, sodding, and planting:
1. Perform percolation testing of Subsoil or Placed Fills to determine whether or not the subgrade will drain properly. Perform percolation tests as specified in this Section. Perform percolation tests as a rate of one (1) per 10,000sf or as directed by the Landscape Architect. A minimum of three (3) infiltration tests per plating area shall be conducted on the site.
    - 1) Dig a hole in the installed subgrade soil that is a minimum of 8 inches in diameter and 8 inches deep.
    - 2) Place a 6 inch deep by 6 inch diameter plastic bucket with a minimum of 50 holes in the sides and bottom to allow free flowing of water, in the excavated hole. Fill the 1-inch space between the bucket and hole sidewall and bottom with concrete sand. Fill the bucket with water and let it drain completely. Immediately refill the bucket with water and measure the rate of fall in the water level.
    - 3) In the event that the water drains at a rate less than one and a quarter inch per hour (1.25" / 60 minutes), till the sub-soil to a depth required to break the over compaction (min of 6").
  2. Perform percolation testing of installed Loam to determine whether or not it will drain properly. Perform percolation tests as a rate of one (1) per 10,000sf or as directed by the Landscape Architect. A minimum of three (3) infiltration tests per planting area shall be conducted on the site. Locations of Loam infiltration tests shall not be within 5' from any previous infiltration test conducted on the subgrade.
    - 1) Dig a hole in the installed subgrade soil that is a minimum of 8 inches in diameter and 8 inches deep.
    - 2) Place a 6 inch deep by 6 inch diameter plastic bucket with a minimum of 50 holes in the sides and bottom to allow free flowing of water, in the excavated hole. Fill the 1-inch space between the bucket and hole sidewall and bottom with concrete sand. Fill the bucket with water and let it drain completely. Immediately refill the bucket with water and measure the rate of fall in the water level.
    - 3) In the event that the water drains at a rate less than the following, till the soil to a depth required to break the over compaction:
      - i. General Lawn Areas: 2.0" / 60 minutes.
      - ii. Planting Beds: 2.0" / 60 minutes.

3. In the event that percolation testing indicates that the Subsoil, Placed Fills or ordinary borrow has been over compacted and will not drain, the contractor shall loosen up the top eighteen inches (18”) of the subgrade to be planted, seeded, or sodded by ripping or other mechanical means. Recompact the borrow by driving a small, tracked bulldozer over the area at low speeds so that the tracks of the bulldozer pass over the affected area and the soil is compacted to a density that will percolate as specified under the work of this Section.
    - 1) Under no circumstances shall wheeled vehicles be driven over subsoil, placed fills or ordinary borrow that have been shown to percolate or subsoil, placed fills or ordinary borrow that has been loosened and shown to percolate.
  4. Perform sufficient percolation tests in areas of poorly draining or compacted subsoil or compacted placed fills as directed by the Architect to ensure that these underlying soils drain. Likewise, perform sufficient percolation tests after ripping and loosening to ensure that the soils are no longer too compact to drain.
- C. Subsoil or ordinary borrow shall have been excavated and filled as required by the Contract Documents. Do not damage the work previously installed. Maintain all required angles of repose of materials adjacent to the loam as shown on the Contract Documents. Do not over excavate compacted subgrades of adjacent pavement or structures during loaming operations.
- D. Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Subgrade elevations shall slope parallel to the finished grade and or toward any subsurface drain lines as shown on the Contract Documents. Provide a written report to the Architect that the subgrade has been placed to the required elevations and that the subgrade drains water at the rates specified under the required percolation tests specified, performed and paid for under this Section, Loam and Planting Preparation. Perform no work of placing and spreading loam until elevations have been confirmed and written report has been accepted by the Architect.
- E. Clear the subgrade of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Such construction debris, trash, rubble and foreign material shall be removed from the site and disposed of in a legal manner. Fill any over excavation with approved fill and compact to the required subgrade compaction levels.
- F. Do not proceed with the installation of loam until all utility work in the area has been installed.

- G. Protect adjacent walls, walks and utilities from damage or staining by the loam. Use 0.5-inch plywood and or plastic sheeting to cover existing concrete, metal and masonry work and other items as directed during the progress of the work. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.

### 3.04 FINE GRADING

- A. Immediately prior to dumping and spreading loam, the subgrade shall be in a friable condition, cleaned of all stones greater than 2 inches and all debris or rubbish. Such material shall be removed from the site, not raked to the edges and buried. Notify the Architect that the subsoil has been cleaned and request his/her attendance on site to review and approve subgrade conditions prior to spreading loam borrow.
- B. Loam borrow delivered to the site shall be protected from erosion at all times. Materials shall be spread immediately. Otherwise, materials that set on site for more than 24 hours shall be covered with tarpaulin or other soil erosion system acceptable to the Architect and surrounded by silt fence.
- C. No loam borrow shall be handled, planted, or seeded in any way if it is in a wet or frozen condition. A moist loam borrow is desirable.
- D. Soil additives shall be spread and thoroughly incorporated into the layer of loam by harrowing or other methods reviewed by the Architect. The following soil additives shall be incorporated:
  - 1. Ground limestone or acidulant as required by soil analysis to achieve the required pH as described in this Section. Spread limestone at the rate required by soil analysis up to a maximum limit of 200 pounds per 1,000 square feet. Should recommendations of soil analysis require greater rates of application than 200 pounds per 1,000 square feet, a surface application of limestone not in excess of 50 pounds per 1,000 square feet shall be made to the established lawn during the season after Final Acceptance. This second application of limestone shall be performed and paid for under the work of Section 32 92 00, Turf and Grasses, at rates determined under the testing requirements of this Section, Loam and Planting Preparation.
  - 2. Fertilizer at the rate and of analysis recommended by the soil analysis. For lawn areas this fertilizer application shall be the first in a series of fertilizer applications made under this Contract and shall be applied and incorporated under this Section, Loam and Planting Preparation. A second and third application of fertilizer for turf areas shall be specified, spread and paid for under Section 32 92 00 Turf and Grasses, of this Specification. For planting areas this fertilizer application shall be primary application and the process of application described under Section 32 90 00, Planting of this Specification and specified, provided, performed and paid for under this Section, Loam and Planting Preparation.
  - 3. Compost, sand or other soil amendments as required by soil analysis.

- E. Loam shall be sampled and tested as specified, performed and paid for under the work of this Section, to verify application and incorporation of limestone, fertilizer and other soil amendments.
- F. After loam and required additives have been spread, carefully prepare the loam by scarifying, harrowing, or tilling the loam to integrate soil additives into the top 8 inches of the loam. Remove all large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Remove from unscreened soils all stones over 3/4 inch in diameter from the top 6 inches of the loam bed. Loam shall also be free of smaller stones in excessive quantities as determined by the Architect and as specified herein.
- G. Sufficient grade stakes shall be set for checking the finished grades. Stakes must be set in the bottom of swales and at the top of slopes. Deviation from indicated elevations that are greater than one-tenth of a foot shall not be permitted. Connect contours and spot elevations with an even slope. Finish grades shall be smooth and continuous with no abrupt changes at the top or bottom of slopes.
- H. During the compaction process, 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 corresponding to the required grades.
- I. The Contractor shall install loam in successive horizontal lifts no thicker than 6 inches (6") in turf areas and 12 inches (12") in plant bed areas to the desired compaction as described herein. The Contractor shall install the soil at a higher level to anticipate any reduction of loam borrow volume due to compaction, settling, erosion, decomposition, and other similar processes during the warranty period. The Architect will ensure that the full depths of loam for lawn and plant beds are obtained by digging holes in the loam at the same frequency as for compaction testing.
  - 1. Compact loam to the required density as specified.
  - 2. Maximum dry density for loam shall be determined in accordance with ASTM D698. The following percentages of minimum to maximum dry densities shall be achieved for fill materials or prepared subgrades.

In lawn, plant beds and tree pits:

|  | <u>MIN</u> | <u>MAX</u> |
|--|------------|------------|
| Soils within planting areas in top eighteen inches of finished grade | 80%        | 85%        |
| Soils within Lawn Areas in top eighteen inches of finished grade     | 84%        | 86%        |

- 3. The surface area of each lift shall be scarified by raking prior to placing the next lift.

- J. In addition to the range cited above, compact each lift sufficiently to reduce settling but not enough to prevent the movement of water and feeder roots through the soil. The loam borrow in each lift should feel firm to the foot in all areas and make only slight heel prints. At completion of the loam borrow installation, the soil should offer a firm, even resistance when a soil sampling tube is inserted from lift to lift. After the placement of each lift, perform percolation tests to determine if the soil has been over compacted. Perform the following percolation test procedure:
1. Dig a hole in the installed soil that is a minimum of 4 inches in diameter. Holes in 6-inch lift in turf areas shall be 4 inches deep. Holes in 12-inch lifts in plant beds shall be 8 inches deep. Do not penetrate through the lift being tested.
  2. Fill the hole with water and let it drain completely. Immediately refill the hole with water and measure the rate of fall in the water level.
  3. In the event that the water drains at a rate less than one inch per hour, till the soil to a depth required to break the over compaction.
  4. Perform a minimum of one soil percolation test per 10,000 square feet area of turf area and 2,500 square feet of tree and shrub planting area as directed by the Architect.
- K. Select equipment and otherwise phase the installation of the loam to ensure that wheeled equipment does not travel over subsoil, placed fills or ordinary borrow or already installed soil. Movement of tracked equipment over said soils will be reviewed and considered for approval by the Architect. If it is determined by the Architect that wheeled equipment must travel over already installed soil, provide a written description of sequencing of work that ensures that compacted soil is loosened and uncompacted as the work progresses or place one-inch thick steel plate ballast (or equivalent ballast approved by the Architect) over the length and width of any travel way to cover loam borrow to protect it from compaction.
- L. Disturbed areas outside the limit of lawn work shall be graded smooth and spread with a minimum of 6 inches of loam to the finished grade.
1. Periphery Lawn and undisturbed soil areas and other areas depicted on the plans, shall remain protected for the duration of the Work. Any areas that become disturbed shall be returned to pre-construction conditions at no additional cost to the Owner.
  2. When working within or adjacent to the wood line, Contractor shall use manual tools, air spade or other minimally invasive excavation equipment to perform all work within Existing Soil Areas to preserve the integrity of existing root systems.

- M. Contractor shall be responsible for maintaining all stockpiles of existing, on-site loam on the site until final placement of all loam has been approved by the Architect in writing. No loam shall be removed from the site unless approved by the Architect in writing. Upon written approval by the Architect, Contractor shall remove all excess, unused existing on-site loam from the site and dispose of it in a legal manner.
- N. The contractor shall install erosion control matting where required on the drawings and specified under this Section.

### 3.05 PROTECTION

- A. The Contractor shall protect landscape work and materials from damage due to landscape operations, operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Treat, repair or replace damaged Planting Soil installation work immediately.
- B. Provide all means necessary, including fences, to protect all soil areas from compaction and contamination by trash, dust, debris, and any toxic material harmful to plants or humans after placement. Any area that becomes compacted, shall be de-compacted and tilled to the extent determined by the soil scientist and recompressed to the density ranges specified. Any uneven or settled areas shall be filled, re-graded and re-compacted to meet the requirements of this Specification. Soil that becomes contaminated shall be removed and replaced with specified soil material.
- C. Phase the installation of the planting soil such that equipment does not have to travel over already installed planting soil. Use of haul roads is acceptable provided that the haul road is completely re-worked to meet the requirements of this Specification. Under no circumstances shall heavy equipment or trucks be allowed to traverse placed topsoil or prepared subgrade unless said equipment is tracked or has low ground pressure tires. Apply filter fabric covering and planking or other engineering controls over soil to minimize compaction and collect dust and debris in any area where the Contractor must work after the installation of Planting Soil.
- D. Till compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Landscape Architect. Planting Soil shall be tilled or replaced by the Contractor at no expense to the Owner.

### 3.06 COORDINATION AND EXCESS MATERIALS

- A. Coordinate activities with other project contractors so that there is no soil disturbance from traffic or other construction activities after placement.
- B. Excess Soil and Materials: Remove the excess soil and materials from the site at no additional cost to the Owner unless otherwise requested.

### 3.07 CLEAN-UP

- A. During installation, keep pavements clean and work area in an orderly condition.
- B. Keep the site free of trash and debris at all times. Immediately dispose of wrappings or waste materials associated with products necessary for the completion of the work.

- C. All trash and debris shall be removed from the site.
- D. Once installation is complete, remove any excess soil from pavements or embedded in fixtures.

### 3.08 ACCEPTANCE

- A. Confirm that the final grade of the loam borrow is at the proper finish grade elevations. Adjust grade as required to meet the contours and spot elevations noted on the Plans. Request the presence of the Architect to inspect final grade. Do not proceed with the remaining work of this Contract until the Architect has given his/her written approval of the final grade.
- B. Placed Lawn, Planting and Athletic Soils must be capable of infiltrating water at the minimum rate provided in this Specification for each type of planting soil.

END OF SECTION

SECTION 32 92 00  
TURF AND GRASSES

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 apply to the work of this Section.

1.02 DESCRIPTION OF WORK

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all planting work and related items as indicated on the Contract Documents and as specified in this Section and includes, but is not limited to, the following:

1. Seeding
  - 1) General Lawns.
  - 2) Detention Basins.
  - 3) Conservation Seed Mix.
  - 4) Wetland Replication Seed Mix.
  - 5) Temporary Seeding for Erosion Control.
2. Installation of erosion control blanket
3. Maintenance
4. Inspection and acceptance
5. Cleaning and protection

1.03 RELATED WORK

- A. Carefully examine the site and all of the Contract Documents for requirements that affect the work of this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions. Other specifications sections that directly relate to the work of this Section include, but are not limited to, the following:

1. Section 02 41 00 – Demolition
2. Section 03 30 00 – Cast-In-Place Concrete
3. Section 31 00 00 – Earthwork
4. Section 31 25 00 – Erosion and Sedimentation Controls
5. Section 32 12 16 – Asphalt Paving
6. Section 32 13 13 – Exterior Concrete
7. Section 32 16 00 – Curbing
8. Section 32 18 16.13 – Playground Protective Surfacing
9. Section 32 31 00 – Fencing
10. Section 33 10 00 – Water Utilities
11. Section 33 30 00 – Sanitary Sewerage Utilities



12. Section 33 40 00 – Storm Drainage Utilities
13. Section 02 41 13 Site Preparation
14. Section 31 20 00 Earth Moving
15. Section 32 30 00 Site Improvements
16. Section 32 90 00 Planting
17. Section 32 91 00 Loam and Planting Preparation

B. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of all work of the Contract.

1. The planting subcontractor shall become fully acquainted with the nature and requirements of the project including the location of all underground utilities prior to starting the work of this Section.

#### 1.04 SUBMITTALS

A. Material Samples and testing:

1. Provide full analysis of existing on-site loam, and off-site loam source from a laboratory that has been approved in writing by the Architect. Sampling and testing shall be as specified, and performed under the work of Section 32 91 00 Loam and Planting Preparation.
2. Provide manufacturers' certified analysis for soil amendments and fertilizers to meet the requirements of this Section, Turf and Grasses.
3. Provide certified analysis for seed mixtures required including percentages of purity, germination and weed seed.
4. Provide organic pre-emergent weed treatment product and safety data, application rates.
5. Product Data.

#### 1.05 REGULATORY REQUIREMENTS

- A. Strictly comply with all applicable codes, regulations and requirements having jurisdiction.
- B. All fertilizer and pesticide applications shall be performed by a licensed applicator in strict conformance with all local, state and federal regulations. Notify the Architect at least two (2) weeks prior to scheduled date of application.

#### 1.06 QUALITY ASSURANCE

- A. All work shall be performed by experienced landscape professionals familiar with planting procedures and under the full-time supervision of a foreman who is a Massachusetts Certified Landscape Professional (MCLP).

B. Analysis of Materials: For each type of packaged material required for the work of this Section, provide manufacturers' certified analysis.

1.07 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in manufacturer's original unopened containers showing weight, analysis and name of manufacturer. Comply with manufacturer's instructions and recommendations for storage and handling. Protect all materials from damage, deterioration, injury and theft while stored at the site.

1.08 EXAMINATION OF CONDITIONS

A. All areas to be seeded shall be inspected by the Contractor prior to starting work and any incorrect grading or inadequate drainage shall be reported to the Architect prior to beginning work.

**PART 2 - PRODUCTS**

2.01 LOAM

A. Loam for lawns shall be approved, specified, provided, and installed under the work of Section 32 91 00, Loam and Planting Preparation, and loam amendments required by the test results and the work of this Section including but not limited to humus, fertilizers and limestone shall be applied separately at the required rates to the rough graded loam and shall be thoroughly and evenly incorporated to the full depth of the in-place loam. Apply approved limestone in sufficient quantity to bring the acidity of the loam to pH 6.5.

2.02 SOIL ADDITIVES

A. Soil additives shall be specified, provided, and installed under the work of Section 32 91 00 Loam and Planting Preparation.

2.03 SEED

A. Seed Material: Provide fresh, clean, new-crop seed complying with tolerance for purity and germination establish by Official Seed Analysis of North America. Seed shall be composed of the following varieties that shall be mixed in the proportions stated and shall test to minimum percentages of purity and germination. Deliver seed in fully labeled, standard, sealed containers. Seed that has become wet, moldy, or otherwise damaged, will not be accepted.

B. **General Lawn Seed Mix**, shall have the following seed mixture composition:

| <u>Common Name</u>          | <u>By Weight</u> | <u>Purity</u> | <u>Germination</u> |
|-----------------------------|------------------|---------------|--------------------|
| Cochise IV Fescue           | 80%              | 95%           | 90%                |
| Fiesta 4 Perennial Ryegrass | 10%              | 95%           | 90%                |

Impact Kentucky Bluegrass 10% 85% 90%

1. All varieties shall be within the top 50 percent and 25 percent respectively, of varieties tested in National Turfgrass Evaluation Program, or currently recommended as low maintenance varieties by University of Massachusetts or the University of Rhode Island.
2. Seeding rate for the seed mix shall be 6 pounds per 1,000 square feet.
3. Seed used for overseeding as specified herein shall be Perennial Ryegrass having 95% purity and 90% germination.

**C. Detention Basins Seed Mix**, shall have the following seed mixture composition:

| Botanical Name                 | Common Name              |
|--------------------------------|--------------------------|
| <i>Elymus riparius</i>         | Riverbank Wild Rye       |
| <i>Festuca rubra</i>           | Red Fescue               |
| <i>Schizachyrium scoparium</i> | Little Bluestem          |
| <i>Andropogon gerardii</i>     | Big Bluestem             |
| <i>Panicum virgatum</i>        | Switch Grass             |
| <i>Agrostis perennans</i>      | Upland Bentgrass         |
| <i>Bidens cernua</i>           | Nodding Bur Marigold     |
| <i>Eupatorium fistulosum</i>   | Hollow-Stem Joe Pye Weed |
| <i>Aster novae-angliae</i>     | New England Aster        |
| <i>Eupatorium perfoliatum</i>  | Boneset                  |
| <i>Verbena hastata</i>         | Blue Vervain             |
| <i>Juncus effusus</i>          | Soft Rush                |
| <i>Scirpus cyperinus</i>       | Wool Grass               |

1. Seed mix shall be “New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites” or equivalent by New England Wetland Plants, Inc, 820 West Street, Amherst, MA 01002, phone: 413-548-8000, [www.newp.com](http://www.newp.com) or approved equal having a similar composition of native grasses suited for generally moist, recently disturbed sites.
2. Seed mix rate application shall be 35 lbs. per acre if sown in the Spring, or 35 lbs. per acre if sown in the Spring/Summer season.
3. Additional cover crop during establishment phase: for spring planting, use a cover crop of spring oats applied at a rate of 30 lbs/acre. For fall planting, use a cover crop of grain rye, applied at a rate of 30 lbs/acre.

**D. Conservation Seed Mix**

1. Seed mix shall be “New England Roadside Matrix Upland Seed Mix” as supplied by New England Wetland Plants, Inc., 820 West St., Amherst, MA 01002, Phone: (413) 548-8000 or approved equal that has a balanced mix of native New England grasses, shrubs and wildflowers suited for drier restoration sites.
2. Seed Mix Rate of application shall be 30 lbs. per acre (1,452 sq. ft. per lb.) if sown in the Fall, or 25 lbs. per acre (1,742 sq. ft. per lb.) if sown in the Spring/Summer season. Seed mixture compositions shall be:

| Common Name              | Botanical Name             |
|--------------------------|----------------------------|
| Elymus virginicus        | Virginia Wild Rye          |
| Desmodium paniculatum    | Panicledleaf Trick Trefoil |
| Schizachryium scoparium  | Little Bluestem            |
| Andropogon gerardii      | Big Bluestem               |
| Festuca rubra            | Red Fescue                 |
| Sorghastrum nutans       | Indian Grass               |
| Panicum virgatum         | Switch Grass               |
| Rhus typhina             | Staghorn Sumac             |
| Cornus racemosa          | Grey Dogwood               |
| Cornus anomum            | Silky Dogwood              |
| Oenothera biennis        | Evening Primrose           |
| Asclepias tuberosa       | Butterfly Milkweed         |
| Rudbeckia hirta          | Black Eyed Susan           |
| Chamaecrista fasciculata | Partridge Pea              |
| Eupatorium fistulosum    | Hollow-Stem Joe Pye Weed   |

E. Wetland Replication Seed Mix

1. Wetland seed mix as defined under Section 32 71 00 – WETLANDS PROTECTION AND REPLICATION

F. Temporary Cover Seeding for erosion control.

1. Temporary cover seeding for erosion control and/or slope stablization shall be applied to areas of exposed soil. Seed mix shall be an annual type of growth species that will not reproduce in perpertuity. Temporary seed mix shall be as follows:

| Species                                       | Rate: lbs/ac | Percent Purity |
|---|--------------|----------------|
| Grain Oats ( <i>Avena sativa</i> )            | 10           | 98%            |
| Cereal Rye ( <i>Secale cereale</i> )          | 10           | 97%            |
| Winter Wheat ( <i>Triticum aestivum</i> )     | 10           | 95%            |
| Annual Ryegrass ( <i>Lolium multiflorum</i> ) | 6            | 97%            |
| TOTAL   | 36           |                |

## 2.04 FERTILIZERS

- A. Fertilizer shall be a commercial product complying with the State and United States fertilizer laws. Deliver to the site in the original unopened containers that shall bear the manufacturer's certificate of compliance covering analysis. Fertilizer shall contain not less than the percentages of weight of ingredients as recommended by the soil analysis.
- B. Nitrogen fertilizer shall be slowly soluble ureaformaldehyde, methylene urea, or isobutylidene diurea; or slow release sulfur-coated urea.
- C. Phosphorus shall be superphosphate or triple superphosphate.
- D. Potassium shall be sulfate of potash, K<sub>2</sub>SO<sub>4</sub>.
- E. Salt indexes per unit of nutrient for nitrogen, phosphorous, and potassium shall be less than 1.0 when compared to sodium nitrate (6.3).

## 2.05 LIMESTONE

- A. Ground limestone for adjustment of loam borrow pH shall contain not less than 85 percent of total carbonates and shall be ground to such fineness that 40 percent will pass through 100 mesh sieve and 95 percent will pass through a 20 mesh sieve. Contractor shall be aware of loam borrow pH and the amount of lime needed to adjust pH to specification in accordance with testing lab recommendations.

## 2.06 WATER

- A. Water: Shall be furnished by the Contractor from a legal off-site source via water truck and be suitable for irrigation, free of toxic ingredients. Sources of water at or near the site that are made available to the Contractor are a convenience to the Contractor. Limitations of site water sources shall be supplemented by off-site sources at the Contractor's expense to meet the maintenance requirements of this Section. Any municipal fees associated with providing water for this work shall be borne by the Contractor.

1. Watering Equipment: The Contractor shall furnish sufficient watering equipment to distribute water evenly with complete coverage daily to all seeded areas.

## 2.07 STRAW

- A. Straw for mulch at seeded areas shall be mowings of acceptable herbaceous growth reasonably free from noxious weeds or woody stems and shall be reasonably dry. Straw Mulch shall consist of stalks or stems of grain after threshing. No salt hay shall be used.

## 2.08 HYDROSEED MULCH, TACKIFIERS AND WATER RETENTION AGENTS

- A. Wood fiber mulch for Hydroseed application shall be a manufactured product of natural wood cellulose fibers with a non-toxic green marking dye incorporated to ensure uniform distribution. Mulch shall be packed in sealed original containers, clearly labeled with brand name and manufacturer. It shall have delivered moisture content less than 12 percent.
- B. Hydroseed tackifier shall be a powdered starch-based product approved by the Engineer. Hydroseed tackifier shall be applied in conjunction with the hydroseed slurry in accordance with the manufacturer's recommendations.
- C. Moisture retention agent shall be a powdered starch-based product, approved by the Engineer, and shall be capable of retaining up to 400 times their weight in water. Moisture retaining agents shall be added to the hydroseed slurry in accordance with the manufacturer's recommendations. Moisture retention agent shall be 'Hydro-Gel', as manufactured by Finn Corporation, Fairfield, OH.
- D. The rate of application for wood fiber mulch shall be in accordance with manufacturer's guidelines.

## 2.09 EROSION CONTROL MAT

- A. Refer to Section 32 91 00 – LOAM AND PLANTING PREPARATION for material.

## 2.10 HERBICIDES, CHEMICALS AND INSECTICIDES

- A. No insecticides, herbicides or fungicides shall be used on-site without the Contractor notifying and obtaining the prior approval of the Engineer.
- B. Provide chemicals and insecticides as needed for fungus or pest control. All chemicals and insecticides shall be approved by the Massachusetts Department of Food and Agriculture for the intended uses and application rates.
- C. Insecticides.

1. Shall be EPA registered and approved for use in public open spaces. All insecticides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
2. Insecticide use shall be limited and selective, only to control specific insect infestations, as identified by the Contractor or the Owner's Representative that may result in the disfigurement, decline, or death of plant materials.

#### D. Herbicides.

1. Herbicides shall be EPA registered and approved for use in public open spaces. All herbicide shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
2. Herbicide for post-emergent application shall be of a formulation that will not kill, damage, limit or prevent germination or establishment of the lawn seed mix.
3. Herbicide use shall be limited and selective, only to control specific weed infestations that have been identified by the Contractor or the Owner's Representative.
4. Provide post emergent crab grass control throughout the maintenance period to ensure a germinated and mown lawn free of crab grass.

#### E. Fungicides.

1. Fungicides shall be EPA registered and approved for use in public open spaces. All fungicides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
2. Fungicide use shall be limited and selective, only to control specific fungal pathogenic disease infestations, as identified by the Contractor or the Owner's Representative, that may result in the disfigurement, decline, or death of plant materials.

### PART 3 - EXECUTION

#### 3.00 GENERAL

- A. All areas within the Limit of Work lines not required to be otherwise developed shall be seeded as shown in the Contract Documents. The Contractor shall restore all lawn areas disturbed because of this Contract with specified loam and seed, as directed by Owner, whether within or outside the Limit of Work line.

#### 3.01 PREPARATION OF SUBGRADE AND SPREADING OF LOAM

- A. Preparation of subgrade and spreading of loam shall be specified, and performed under the work of Section 32 91 00 Loam and Planting Preparation.

### 3.02 FINE GRADING

- A. Fine grading shall be specified, and performed under the work of Section 32 91 00 Loam and Planting Preparation.

### 3.04 SEEDING

- A. Contractor shall obtain Landscape Architect's written approval of fine grading and be preparation before doing any seeding work.
- B. Seeding shall be done immediately after fine grading provided the seedbed has remained in a friable condition and has not become muddy or hard. If it has become hard, it shall be tilled to a friable condition and fine graded again.
- C. Protection of all newly loamed and graded areas is required and shall be accomplished by whatever means necessary such as mulch applied with a tackifier, or by other means approved by the Engineer. The Contractor shall be responsible for the prevention of siltation in areas beyond the limit of work and for all means of protection throughout the maintenance period at no additional cost to the Owner.
- D. Slope erosion control blankets shall be placed as indicated on the plans or as required by the Engineer. Refer to Section Section 32 91 00 – LOAM AND PLANTING PREPARATION for requirements. Seeding operations shall be conducted before the installation of the slope erosion control blanket, or as directed by the Landscape Architect or Engineer.
- E. Seeding shall be done when soil and weather conditions permit in early spring to June 15; and from August 15 to October 15. The actual planting of seed shall be done, however, only during periods within this season which are normal for such work as determined by weather conditions and by accepted practice in this locality. To prevent loss of soil via water and wind erosion and to prevent the flow of sediment, fertilizer, and pesticides onto roadways, sidewalks, and into catch basins, seed loam areas within 5-Days of spreading the loam.
  - 1. If there is insufficient time in the planting season to complete soil preparations, fertilizing, and seeding; permanent seeding may be left until the following planting season, at the option of the Contractor, or as required by the Engineer. In that event, a temporary cover crop shall be sown. This cover crop shall be cut and watered as necessary until the beginning of the following planting season, at which time the permanent seed crop shall be sown as specified.



- F. Sow seed using a spreader or hydroseeder. Do not seed when wind velocity exceeds 5 miles per hour. Distribute seed evenly over entire area by sowing equal quantity of seed specified or scheduled. Apply seed at one half the rate in two directions at right angles to each other. Roll the seeded areas lightly and water with a fine spray.
1. After the grass has germinated, all areas and parts of areas that fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas shall be reseeded repeatedly until all areas are covered with a uniform germination.
  2. Install straw mulch at areas seeded by spreader and cellulose fiber mulch at areas seeded by hydroseeder. Install mulch immediately after fine grading topsoil and seeding.
  3. Sow seed using a spreader in lawn areas directly adjacent to building structures as an alternative to Hydroseeding in these areas.
- E. Seeding of lawn shall be by Hydroseeding Method specified as follows:
1. Prior to the start of work, furnish a certified statement as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of hydroseeding that can be covered with the quantity of solution in the hydroseeder.
  2. Hydroseed with wood cellulose fiber mulch at a rate of 46 pounds per 1,000 square feet or 2,000 pounds per acre.
  3. Seed shall be incorporated with the mulching material to obtain a minimum hydroseeded sown coverage of 200 pounds of the specified seed mix per acre, as recommended by the seed suppliers, or as required by the Engineer.
  4. For the hydroseeding process, a mobile tank with a capacity of at least 500 gallons shall be filled with water and the mixture noted above in the specified proportions. The resulting slurry shall be thoroughly mixed by means of positive agitation in the tank and kept in an agitated state in order that the materials may be uniformly suspended in the water. Apply the slurry by a centrifugal pump using the hose application techniques from the mobile tank. Only hose application shall be permitted. At no time shall the mobile tank or tank truck be allowed onto the prepared hydroseed beds. The hose shall be equipped with a nozzle of a proper design to ensure even distribution of the hydroseeding slurry over the area to be hydroseeded and shall be operated by a person thoroughly familiar with this type of seeding operation.
  5. The Contractor shall immediately cleanup hydroseed oversprays from plant materials, pavements, furnishings, etc., to the satisfaction of the Engineer.

### 3.05 LAWN MAINTENANCE

- A. The Contractor shall maintain and protect the entire seeded area, as necessary to ensure dense healthy growth. Maintenance shall begin immediately after any area is seeded and shall continue for a minimum of 60 days during the active growing period for seeded areas or until Final Acceptance, whichever is longer.
- B. In the event that seeding operations are completed too late in the Fall for adequate germination and growth of grass, maintenance shall continue through the following spring for at least 60 days. Maintenance shall include watering as specified, liming, fertilizing, removal of stones, control of weeds, insect pests and fungal pathogens, and regular mowing. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit. Following the completion of all lawn construction work, and until final acceptance of the project.
- C. Maintenance shall include watering as specified, liming, fertilizing, removal of stones, control of weeds, insect pests and fungal pathogens, repair of ruts and erosion, repair of protective devices and reseeded and regular mowing.
  - 1. Weed treatment: At lawns that were seeded the previous fall, a pre-emergent herbicide application is required in early spring. A post-emergent shall also be applied in late spring.
- D. Watering: The Contractor shall include in his base bid costs for daily and, if necessary, continuous watering of all grass areas during a normal eight hour working day to maintain the seed bed in a continuous moist condition satisfactory for good germination and turfgrass development. Water equivalent of one-inch of water per week (1"/week), applied over a minimum of 3 non-consecutive days. Control weeds as necessary to maintain grass at 98% weed free.
- E. Maintenance shall include all temporary protection fences, barriers and signs and all other work, tools and equipment incidental to proper maintenance.
- F. The Contractor shall be responsible for all maintenance of lawns necessary to establish a uniform germination of the specified grasses.
- G. Mowing and Edging:
  - 1. The Contractor shall keep all General Lawn and Sod areas mowed until Acceptance of the contract by cutting to a height of 2 inches when growth reaches 3 inches or as directed by the Landscape Architect. The lawn shall be cut no shorter than 2-inches in height and shall be regularly mowed as necessary to maintain the above-prescribed conditions

2. At each mowing, all edges of walks, drives, plant beds and other border conditions shall be edge trimmed by hand or machine to produce straight and uniform edge conditions.
  3. Remove and discard from paved areas only clippings and debris generated by each mowing and edging operation legally off-site. Landscape Architect, if practical and aesthetic, may allow sweeping (not blowing) clippings back into grass. Mowers shall be equipped with mulching blades. Do not remove from grass areas any clippings that have been generated by mowing operations. Do not mow grass when wet.
- H. Fertilizing at General Lawn seeded areas: The first application of fertilizer is specified, provided, performed and paid for under the Section 32 91 00, LOAM AND PLANTING PREPARATION. A second application of fertilizer shall be applied to seeded areas at the time of the first mowing and shall be performed and paid for under this section, TURF AND GRASSES. This second application shall be applied at a rate that ensures that one-half pound of nitrogen is applied per 1,000 square feet. Phosphorus and potassium shall be applied proportionally in accordance with the recommendations of the soil tests and the quantities previously integrated into the soil during the first application. A third application of nitrogen fertilizer shall be applied to seeded areas approximately two months after the second application and shall be paid for under this section, TURFS AND GRASSES. This third application shall correspond to the following application rates dependent upon the month of application.
1. May 1-15: Apply 1.0 pound of nitrogen per 1,000 square feet.
  2. June 15-30: Apply 1.0 pound of nitrogen per 1,000 square feet.
  3. August 15 through September 15: Apply 1.0 pound of nitrogen per 1,000 square feet.
  4. November 1-15: Apply 1.5 pounds of nitrogen per 1,000 square feet.

Nitrogen fertilizer shall be composed of 50 percent slowly soluble or slow release nitrogen fertilizer.

### 3.06 LAWN REVIEW AND ACCEPTANCE

- A. At the end of the maintenance period, seeded and sodded areas shall have a close stand of grass as defined above with no weeds present and no bare spots greater than 3 inches in diameter over greater than 5 percent of the overall seeded area. At least 90 percent of the grass established shall be permanent grass species. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded areas shall be extended until deficiencies are corrected. Seeded areas to be corrected shall be prepared and reseeded in accordance with the requirements of this Section, TURF AND GRASSES.
- B. The Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of inspection for preliminary acceptance. The Engineer shall recommend preliminary acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals, or replacements.

- C. At the time of acceptance, the Contractor shall remove temporary barriers used to protect lawn areas.
- D. The conditions of lawns will be noted and determination made by the Architect whether maintenance shall continue in any part. When acceptance is made in writing to the Contractor, the Contractor's responsibility for maintenance of lawns or parts of lawns shall cease.
- E. Areas of lawn not meeting the criteria for establishment specified herein will be noted. Remedial work and maintenance shall continue until the lawn is accepted by the Owner.
- F. Seeded areas shall be guaranteed until final acceptance of the project, or, in the case of late summer or fall planting, the guarantee period shall extend through the following spring.

### 3.07 CLEANING AND PROTECTION

- A. During operations, keep pavements clean and work area in an orderly condition. Protect lawns from damage by other contractors and trades and trespassers. After completion of the work, the Contractor shall remove all debris, materials, rubbish, excess dirt, etc. from the site and dispose of them in a legal manner. The premises shall be left clean and presentable to the satisfaction of the Architect.

END OF SECTION

SECTION 32 93 00  
TREES SHRUBS GROUNDCOVER PLANTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 apply to the work of this Section.

1.02 DESCRIPTION OF WORK

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all planting work and related items as indicated on the Contract Documents and as specified in this Section and includes, but is not limited to, the following:

1. Planting trees, shrubs, groundcovers, bulbs, perennials and plugs
2. One-year plant guarantee period for all plants
3. Inspection and acceptance
4. Cleaning and protection

1.03 RELATED WORK

- A. Carefully examine the site and all of the Contract Documents for requirements that affect the work of this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions. Other specifications sections that directly relate to the work of this Section include, but are not limited to, the following:

1. Section 024113 - Site Preparation & Clearing
2. Section 322000 – Earthwork
3. Section 321612 – Asphalt Paving
4. Section 321313 – Concrete Paving
5. Section 329100 - Loam and Planting Soil Preparation
6. Section 329219 – Seeding

- B. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of all work of the Contract.

1. The planting subcontractor shall become fully acquainted with the nature and requirements of the project including the location of all underground utilities prior to starting the work of this Section.

#### 1.04 REFERENCES

- A. The following standards shall apply to the work on this Section.
1. American National Standards Institute (ANSI):  
Z60.1 American Standard for Nursery Stock, latest edition, published by American Association of Nurserymen, (AAN).

#### 1.05 SUBMITTALS

- A. Material Samples and testing:
1. Provide full analysis of existing on-site loam, and off-site loam source from a laboratory that has been approved in writing by the Architect. Sampling and testing shall be as specified and performed under the work of Section 32 91 00 Loam and Planting Soil Preparation.
  2. Planting mulch: submit one gallon-sized Ziploc bag.
  3. Provide manufacturers' certified analysis for soil amendments and fertilizers.
  4. Plant materials List. Including: Scientific names of plants, size and quantity of plants available, location of nursery, and the suppliers name, phone number, address, and contact person.
    - a. Submit photographs of each plant proposed. A scale element or person of a known height shall appear in each photograph.
    - b. Submit Letter(s) of Certification from each nursery or the supplier listing the stock available for review attesting that the stock to be reviewed for selection is the specified plant stock meeting all the sizing and all other specified requirements and that these plants are free from disease, insect infestation or damage.
    - c. Based upon his review of the plant photograph submission(s) will determine if the plants are acceptable for field review at the nursery.
    - d. The Landscape Architect may, at his discretion, accept the plant material from the photograph without his inspection at the nursery if he deems it is in the best interest of the project to do so.
    - e. If the provisionally accepted plants do not meet the requirements of this specification when he reviews them on site prior to planting, remove them from the site at no additional cost to the Owner and replace with acceptable plant material.
  5. Other Submittals

- a. Schedule of Maintenance Operations and Monthly Status Report: including list of equipment, materials proposed for the job and watering schedule.
  - b. Licenses, permits and insurance required by Local, the State and Federal government pertaining to maintenance work.
  - c. Monthly Record: All materials, fertilizers, insecticides and disease control chemicals used for the project. State when used and for what purpose and the rate(s) of application and the time(s) of application.
  - d. Written application recommendation by a licensed agricultural pest control advisor for all weed, pest and disease controls restricted by the State of Massachusetts proposed for this work.
  - e. Monthly record of all watering for the project.
7. At project close out: Submit a landscape maintenance manual containing all schedules, records and permits listed above, as well as a documentation of accepted condition of Planting and Lawns at Final Acceptance.

#### 1.06 REGULATORY REQUIREMENTS

- A. Strictly comply with all applicable codes, regulations and requirements having jurisdiction.
- B. All fertilizer and pesticide applications shall be performed by a licensed applicator in strict conformance with all local, state and federal regulations. Notify the Owner's Project Representative at least two (2) weeks prior to scheduled date of application.

#### 1.07 QUALITY ASSURANCE

- A. Subcontract planting work to a single landscape construction company specializing in this work. All work shall be performed by experienced landscape professionals, minimum of two years (2yr), familiar with planting procedures and under the full-time supervision of a qualified foreman. The General Contractor shall notify the Architect in writing upon the selection of a landscape subcontractor and arrange for a pre-construction meeting between the Architect, General Contractor, and Subcontractor. Such meeting shall seek to establish the proposed schedule, source of plants, consideration of substitutions and general review of procedures.
- B. Inspection of Plant Materials: Plant materials are subject to inspection and approval upon delivery to the project site. Certificates of inspection of plant material shall be furnished as may be required by Federal, State and other authorities. No plants shall be planted until required inspections have been made and the plants approved.

- C. Label at least one tree and one shrub of each species within each plant grouping with a securely attached waterproof tag bearing legible designation of botanical and common name.

1.08 PLANTING SEASONS

- A. Complete landscaping work as quickly as possible as portions of the site become available for this work. Work only within seasonal limitations for proper planting as follows:

| Type of Plant Material   | Spring Season                            | Fall Season       |
|--------------------------|--|-------------------|
| Evergreen Trees & Shrubs | April 15 to June 1                       | Aug. 15 to Oct. 1 |
| Deciduous Trees & Shrubs | Shall be planted in a dormant condition. |                   |

- B. Planting performed outside of these seasonal limitations will not be accepted unless approval is obtained in writing from the Architect. Any approved work outside of these seasonal limitations pertains only to the work to be performed in the season of the year requested.

1.09 DELIVERY, STORAGE AND HANDLING

- A. **Packaged Materials:** Deliver packaged materials in manufacturer’s original unopened containers showing weight, analysis and name of manufacturer. Comply with manufacturer’s instructions and recommendations for storage and handling. Protect all materials from damage, deterioration, injury and theft while stored at the site.

1.10 EXAMINATION OF CONDITIONS

- A. All areas to be planted shall be inspected by the Contractor prior to starting work and any incorrect grading or inadequate drainage shall be reported to the Architect prior to beginning work.

PART 2 - PRODUCTS

2.01 LOAM

- A. Loam for planting shall be approved, specified, provided, and installed under the work of Section 32 91 00, Loam and Planting Preparation, and that has been pH adjusted according to particular planting applications and improved through the addition of organic material as directed under this Section.



- B. Planting loam mix for groundcover, perennial and bulb planting shall have a pH value of 5.5 to 6.5, which has been thoroughly premixed with organic material in the proportions of one part organic matter (humus or compost), with 5 parts of approved loam. Organic material shall be specified, provided, and installed under Section 32 91 00, Loam and Planting Preparation.

## 2.02 SOIL ADDITIVES

- A. Soil additives shall be specified, provided, and installed under the work of Section 32 91 00 Loam and Planting Preparation.
- B. For trees/shrubs planted late in the season after October 1<sup>st</sup> (or any transplant) Use Granular Mycorrhizal inoculant product for plant establishment per manufacturer recommendation. Mycor Tree Saver Transplant as manufactured by Plant Health Care Inc, Pittsburgh PA, or approved equal as determined by Landscape Architect.
- C. NutriPak slow-release tree and shrub fertilizer in two strengths – 1-2 years (fruit trees) and 3-5 years (hardwood). Apply as directed by the manufacturer.

## 2.03 STANDARD OF PLANTS

- A. The Contractor shall furnish all plants shown on the Contract Documents. No substitutions will be permitted, without written approval by the Landscape Architect. Furnish plants which have been nursery grown in accordance with the American Standard for Nursery Stock of the American Nursery and Landscape Association (ANLA) and ANSI Z60.1 - latest edition, and which have been grown under climate conditions similar to those in the locality of the project. All plants shall conform to the varieties, sizes and quantities specified on the plans and typical of their species. They shall be free from insects, insect eggs, scale and/or disease. The root system of each shall be well provided with fibrous roots. Plants shall have a sound, healthy, well-formed upper growth with straight trunks, well-branched and densely foliated when in leaf. Plants shall be legibly tagged with its proper name for purposes of identification of plant material during planting.
  - 1. Measurements: Height and spread dimensions specified refer to the main body of the plant and not from branch or root tip to tip. Measure the caliper of trees up to 4 inches at 6 inches above the ground level at trunk flare. Measure trees larger than 4 inches 1 foot above ground level.
  - 2. Plants larger than specified in the plant list may be used if approved by the Architect, but use of such plants shall not increase the contract price. If the use of larger plants is approved, the spread of roots or ball of earth shall be increased in proportion to the size of the plant.

3. No heeled-in plants or plants from cold storage shall be used.
- 
- B. All nursery plants shall be balled and burlapped or container-grown and shall have been acclimatized for at least one growing season. 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, after removal from the container. No plants shall be loose in the container. Container-grown plants shall have no girdling roots and shall not be in a root-bound condition. Plants shall remain in their container until planted.
  - C. Care shall be exercised in digging and preparing field-grown plants for shipment and planting. Balled and burlapped materials shall have solid unbroken balls of earth of sufficient size to encompass all fibrous feeding roots necessary to ensure successful recovery and development of the plants. Balls shall be firmly wrapped in untreated biodegradable burlap and tied securely with wire cages and/or jute twine. Roots or balls of plants shall be adequately protected at all times from sun and drying winds. No plant shall be accepted when the ball of earth surrounding its roots has been badly cracked or broken preparatory to or during planting, or after the burlap, staves, wire cage, rope, or platform in connection with its transplanting have been removed. Soil characteristics (i.e., composition, texture, pH, etc.) of all field-grown plants shall closely match those of the soil where plant materials are to be planted.
  - D. The branching height for deciduous trees installed adjacent to or within walks shall be 7 feet minimum, having been pruned to this height at least 1 year prior to transplanting. Except when a clump is designated, the trunk of each tree shall be a single trunk growing from a single, unmutilated 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 sunscald, frost cracks, or wounds resulting from abrasions, fire, or other causes. All pruning cuts shall comply with acceptable horticultural practices. No pruning wounds having a diameter of more than 1½-inches shall be present. Any such wounds must show vigorous bark growth on all edges. Evergreen trees shall be branched to within 1 foot of the ground. No tree that has had its leader cut or die shall be accepted.
  - E. Shrubs shall meet the requirements for spread and/or height stated in the Plant List on the Drawings. The measures for height are to be taken from the crown or root flare to the average height of the top of the shrub mass (not the longest branch). The fullness of each shrub shall correspond to the trade classification "No. 1". Single stemmed or thin plants will not be accepted. The side branches must be generous, well-twigged and the plant as a whole must be well-bushed to the ground. The plants must be in a moist, vigorous condition, free from dead wood, bruises or other root or branch injuries.

- F. Herbaceous plants, vines and groundcovers shall be of the size, age and/or condition designated in the Plant List on the Drawings.
- G. Plants shall be delivered only after preparations for planting have been completed. Plants shall be handled and packed in a horticulturally approved manner and all necessary precautions shall be taken to ensure that plants arrive on-site in a healthy vigorous condition. Trucks used for transporting plants shall be equipped with covers to protect plants from windburn, desiccation, and overheating during transport. Plants that have not been thoroughly watered shall not be accepted at the planting site. Any plants delivered to the site in a dry or wilted condition shall be rejected and replaced at no expense to the Owner. All plant materials shall be protected, watered and otherwise maintained prior to, during, and upon delivery to the site.
- H. Plants shall be subject to inspection and approval by the Engineer at the place of growth, or upon delivery, for conformity to specification requirements as to quality, size, variety, and condition. Inspection and selection of plants before digging shall be at the option of the Engineer. The Contractor, or its representative, shall be present, if requested by the Engineer, for inspection of plants at the Nursery. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of work, for size and condition of balls and roots, disease, insects and latent defects or injuries. Rejected plants shall be removed immediately from the site. Certificates of inspection of plant materials shall be furnished as may be required by Federal, State and other authorities to accompany shipments.

#### 2.04 BARK MULCH

- A. Bark Mulch: for planting beds shall be a pine bark product free from lumps, dirt, deleterious materials, weeds, weed seeds, or color additives. Bark shall be substantially free from wood fibers. No pieces of bark shall exceed three (3) inches in any dimension, or be thicker than 1/4 inch. Mulch shall have been aged for a minimum of six months, and not longer than two years. Bark shall be no more than two years old. All plant beds shall receive a two to four inch layer of mulch, not to exceed four inches.

#### 2.05 WATER

- A. Water: shall be furnished by the Contractor from a legal off-site source via water truck and be suitable for irrigation, free of toxic ingredients. Sources of water at or near the site that are made available to the Contractor are a convenience to the Contractor. Limitations of site water sources shall be supplemented by off-site sources at the Contractor's expense to meet the maintenance requirements of this Section. Any municipal fees associated with providing water for this work shall be borne by the Contractor.

1. Watering Equipment: The Contractor shall furnish sufficient watering equipment to distribute water evenly with complete coverage daily to all seeded areas.
2. All new and transplanted trees shall be furnished and installed with 20 gallon, slow release watering Tregator bags or approved equal. Manufactured by Spectrum Products, Inc., Youngsville, NC, phone 1-800-tregator.

## 2.06 ANTIDESICCANTS

- A. Antidesiccants shall be emulsions or other materials which will provide a protective film over plant surfaces permeable enough to permit transpiration and specifically manufactured for that purpose. Antidesiccant shall be "Wilt-Pruf" available from Nursery Specialty Products, Inc., New York, N.Y. or approved equal, and mixed and applied according to the manufacturer's instructions.

## 2.07 TREE ANCHORING MATERIALS

- A. Stakes: For supporting small trees under 3" caliper shall be of sound wood uniform in size, reasonably free of knots, and capable of standing in the ground at least two years. Stakes shall be 2"x 2," not less than eight and one half feet in length and stained with non-toxic dark brown stain. All trees 3" caliper or over shall be supported by guying cable as per planting detail.
- B. Arbor Ties: Utilize Arbortie by Deeprout, or approved equal, when staking and guying plant material.

## 2.08 TREE WRAPPING MATERIALS

- A. Wrapping Material: shall only be as directed by the Landscape Architect. Product to have a lifetime warranty, crinkled to 33-1/3% stretch. It shall consist of two layers of craft with asphalt based material between them, similar to and equal to the "Leonard Crinkled Paper Tree Wrap", as manufactured by the A.M. Leonard, Piqua, OH or approved equal.

## 2.09 PLUGS

- A. Plugs shall be in 2 3/8" square X 3 3/4" deep open-bottomed pots. Plugs shall be thoroughly rooted through the container. No species shall be substituted without approval of the architect.

## 2.10 INSECTICIDES, HERBICIDES, FUNGICIDES

- A. No insecticides, herbicides or fungicides shall be used on-site without the Contractor notifying and obtaining the prior approval of the Engineer.

B. Insecticides:

- a. Shall be EPA registered and approved for use in public open spaces. All insecticides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
- b. Insecticide use shall be limited and selective, only to control specific insect infestations, as identified by the Contractor or the Owner's Representative that may result in the disfigurement, decline, or death of plant materials.

C. Herbicides:

- a. Herbicides shall be EPA registered and approved for use in public open spaces. All herbicide shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
- b. Herbicide for post-emergent application shall be glyphosate contact, 'Roundup', as manufactured by Monsanto, Inc., or approved equal.
- c. Herbicide use shall be limited and selective, only to control specific weed infestations that have been identified by the Contractor or the Owner's Representative.

D. Fungicides:

- a. Fungicides shall be EPA registered and approved for use in public open spaces. All fungicides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
- b. Fungicide use shall be limited and selective, only to control specific fungal pathogenic disease infestations, as identified by the Contractor or the Owner's Representative, that may result in the disfigurement, decline, or death of plant materials.

## PART 3 - EXECUTION

### 3.01 PLANTING

- A. All plants shall be subject to inspection and approval by the Engineer upon delivery to the site. No materials shall be planted until approval is received.
- B. All plant roots and earth balls must be kept damp and thoroughly protected from sun and drying winds at all times from the beginning of the digging operation, during transportation, and on the ground until the final operation of planting.
- C. Prior to spreading loam, subgrades shall have been tested to determine if they are too compact to drain water as specified.

- D. Plant material Selection: at least one month prior to the expected planting date, the Contractor shall request that the Landscape Architect select and tag plants to be planted as specified. The Contractor shall pay for the transportation, subsistence and overnight accommodations, if necessary, for the Landscape Architect's representative during the period of time required to select and tag the plant material.
- a. The Contractor shall be responsible to certify the availability of quality plants in specified sizes from his/her sources of supply prior to requesting that the Landscape Architect make plant source inspections. In the event that plants at the inspection location are found to be unavailable or of insufficient size, the Contractor shall be liable to reimburse the Owner for all costs of the Landscape Architect's hourly services which are incurred during unproductive inspection trips.
  - b. Unless specifically designated otherwise, a representative of the Contractor shall accompany the Landscape Architect on all plant material selection field trips.
  - c. Representative samples only of shrubs, perennials and groundcover plants may be tagged or marked for approval as an "Approved Typical Sample" and shipped to the site. Any shrub or groundcover plant that arrives at the construction site that does not meet the Approved Typical Sample will be rejected by the Landscape Architect.
  - d. Inspection and approval of plants at the source shall not impair the right of subsequent inspection and rejection upon delivery to the site, or during the progress of the work if the Landscape Architect finds that plants do not meet the requirements of the PLANT LIST or this Contract, have declined noticeably due to handling abuse, lack of maintenance, or other causes. Cost of replacements, shall be borne by the Contractor.
- E. Contractor shall locate all existing underground utilities of the proposed planting and notify the Architect of any conflicts prior to digging.
- F. Locations for all plants shall be staked-out on the ground and approved by the Architect before any excavation is made. Adjustments in locations shall be made as directed by the Architect. Planting shall be in accordance with the planting details on the Drawings. In the event that rock, underground construction work or obstructions are encountered in any proposed planting pit or bed, the Engineer may select alternate locations. Where locations cannot be changed, the obstruction shall be removed, subject to the Engineer's approval, to a depth of not less than 3 feet below grade and not less than 6-inches below the bottom of the root ball when plant is properly set at the required grade. Removal of boulders or obstructions greater than 1 cubic yard in size shall be subject to approval and will be paid for by the Owner. No ledge will be removed to create planting pits or beds.

- G. All planting pits shall be excavated with sloped walls, wider at the top than at the bottom, and scarified to eliminate glazing. Tree pits shall be at least 2 feet greater in diameter than the root ball of earth or root system. Shrub pits shall be at least 1 foot greater than the diameter of the root ball. Planting pits shall not be deeper than the height of the root ball or as shown on the planting details, which ever is greater.
- H. When excavation occurs in areas of heavily compacted earth, stones, concrete chunks or other foreign matter, pits shall be dug at least 3 times the width of the rootball. Excavated material from plant pits shall be disposed of as required.
- I. The Contractor shall take special care to ensure that the plant material is not planted too deeply by removing burlap and soil mounded around the base of the plant, at the top of the rootball, to expose the trunk flare. A measurement shall be taken from the trunk flare to the bottom of the root ball. This measurement shall be the depth of the planting hole.
- J. Container plants shall be removed from their growing container before planting. If roots are densely matted, the outer root mass shall be scored, sliced vertically, with a sharp knife to separate roots. All herbaceous plants and groundcovers shall be evenly spaced to produce a uniform effect and staggered in rows at intervals designated on the contract drawings.
- K. Shrubs and trees shall be set in the center of planting pits, plumb and straight, and at such a level that after settlement the crown of the roots will be 1-inch above the surrounding finished grade. Root ball masses shall not be loosened, broken or damaged. When balled and burlapped plants are set, planting mixture shall be compacted around bases of balls to fill all voids. All tying materials, twine and rope shall be cut and removed. Biodegradable burlap shall be laid back or cut away from the top half of the ball. If a wire basket is present, the upper 2/3 of the basket shall be cut away and removed. Do not remove the entire basket. Roots or bare root plants shall be properly spread out and planting mixture carefully worked in among them. Broken or frayed roots shall be cleanly cut.
- L. Backfill plant pits with planting mixture in layers of not more than 9-inches and firmly tamp each layer and water to sufficiently settle the backfilled soil before the next layer is put in place. When the planting pit is 2/3 backfilled, the hole shall be flooded and watered thoroughly so that the water level reaches the top of the planting pit. Allow water to soak in, then complete the backfilling operation.

- M. The pruning of trees and shrubs shall only be permitted to remove dead or dying branch limbs and tips, sucker growth, water sprouts, crossing or rubbing branches, broken or damaged branches, diseased or insect infested limbs, and to preserve the natural character of the plant. Plant materials shall be pruned in accordance with American Nurserymen Association Standards and as required by the Engineer. Questionable weak limbs and branch removals that may disfigure the plant shall be left to the discretion of the Engineer. The tree leader shall never be permitted to be cut. Pruning shall be done with clean, sharp tools. All large pruning cuts that are ½-inch in diameter or larger shall be made along the bark branch ridge. Pruning cuts shall not breach or otherwise interfere with the branch collar. All pruning cuts less than ¼-inch diameter shall be made with hand pruners as close to the main stem as possible without damaging the cambium or bud. Tree paint shall not be used to cover pruning cuts.
- N. Staking of newly planted trees shall be performed directly after they are planted. Trees of 3-inch caliper or under, require staking only as needed to hold the tree plumb. All trees of 3-inch caliper and over shall be staked. Support ties shall allow tree to move and sway, but be able to return the trunk to a plumb and true position. Contractor shall adjust staking as frequently as needed during the maintenance period.
- O. A 2 – 4 inch settled layer of bark mulch shall be applied over the entire area of the plant beds. Plantings installed over three months prior to the date of substantial completion shall be weeded and replenished with fresh mulch to specified thickness prior to acceptance.
- P. Provide a soil saucer equal to the diameter of the hole around each tree. Particular attention shall be made to create saucers at sloped areas that contain water around the base of the plant. Soil saucers shall be repaired and maintained as needed to perform effectively during the maintenance period.
- Q. Plants shall be watered at a rate of 3–5 gallons per inch of caliper twice within the first twenty-four (24) hours of the time of planting.
- R. Plug installation:
- a. Use an auger or other appropriate tool to excavate planting holes in a staggered pattern at specified spacing.
  - b. Evenly distribute plugs in informal drifts of 3-7 of any one species with the edges blended into adjacent species to avoid a formal appearance.
  - c. Plant plugs level with existing soil grade. Be certain that soil is placed around the plugs and firmed into place. Do not fill around plugs with mulch.
  - d. Thoroughly soak plugged area with water until soil is moist to a depth of 4 inches.

### 3.02 MAINTENANCE



A. Trees, Shrubs, Perennials, and Groundcover Plantings:

1. The Contractor shall maintain plantings until the date of substantial completion or until the date of acceptance, whichever is later.
2. Maintenance shall begin immediately after each plant is planted and shall include watering, weeding, pruning, pest control, removal of dead materials and otherwise maintaining plants. Correct defective work as soon as possible after it becomes apparent and weather and season permit. Reset settled plants to proper grade and position, restore planting saucer, and remove dead material. Repair soil saucers around trees and replenish bark mulch to meet the specified thickness as needed throughout the maintenance period.
3. Watering: The Contractor shall include in his base bid costs for weekly watering of all plant areas for the entire first growing season. The required watering frequency will vary depending on temperature and natural rainfall. The Contractor shall respond to adverse weather conditions in a timely manner to maintain the moisture level in the soil necessary for proper plant establishment. Plants shall be watered at a rate of 3-5 gallons per inch of caliper. Slow release watering bags shall be filled weekly during this period. Plants subjected to drought stress during the required maintenance period may become unacceptable as determined by the Architect and require replacement at no additional cost to the Owner.
4. Anti-desiccant: Treat plants subject to desiccation at the time of planting and again prior to winter according to the manufacturer's recommendations.
5. During the maintenance period, any damage or decline in the condition of plantings shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional arborists and/or horticulturalists to inspect plant materials and to identify problems and recommend corrective procedures. The Landscape Architect shall be immediately advised of such actions. Inspection and recommendation reports shall be submitted to the Architect.

3.03 ACCEPTANCE

- A. Upon completion of planting work per Construction Phase, the Contractor shall request in writing that the Landscape Architect formally inspect the planting work. The General Contractor, Owner, and landscape Architect shall walk all areas of completion to determine date of turnover to the Owner.

- B. Following the correction of all Punch List deficiencies, the Contractor shall request in writing that the Landscape Architect formally inspect the planting work. If plant materials and workmanship are acceptable, the Landscape Architect will issue a written Certificate of Final Acceptance to the Contractor.
- C. At the end of the guarantee period, the Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of final inspection for final acceptance.
- D. The Engineer shall recommend final acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals or replacements.

### 3.04 PLANT GUARANTEE

- A. The date of the Certificate of Final Acceptance shall establish the commencement of the required one-year guarantee and establishment period for planting work.
- B. When the work is accepted in part, the guarantee period shall extend from each partial acceptance to the terminal date of the last guarantee period. All guarantee periods terminate at one time.
- C. At the end of the guarantee and establishment period, a final inspection will be held to determine whether any plant material replacements are required. Plants found to be unacceptable shall be removed promptly from the site and replaced.
- D. Plants shall be healthy, free of pests and disease. Plants shall exhibit vigorous growth, shall bear foliage of normal density, size and color and shall have no less than seventy-five percent (75%) of their branches alive at the end of the guarantee period. If the leader of any single-leader species is dead, the entire plant shall be considered dead.
- E. Any plant required under this Contract that is dead or unsatisfactory, as determined by the Engineer, shall be removed from the site. These shall be replaced as soon as weather permits during the specified planting season, at no additional cost to the Owner, until the plants live through one year.
- F. All replacements shall be plants of the same kind and size as specified on the Plant List. They shall be furnished and planted as specified above.
- G. The guarantee of all replacement plants shall extend for an additional one-year period from the date of their acceptance as replacement.

- H. Guarantee shall not apply to the replacement of unacceptable plants resulting from the removal, loss, or damage due to occupancy of the project in any part; vandalism or acts of neglect on the part of others; physical damage by animals, vehicles, etc.; and Acts of God, including but not limited to, catastrophic fire, hurricanes, riots, war, etc.
- I. In the instance of curtailment of water by local water authorities (when supply was to be furnished by the Owner), the Contractor shall furnish all necessary water by water tanker, the cost of which will be approved and paid for by the Owner.

### 3.05 CLEANING AND PROTECTION

- A. During operations, keep pavements clean and work area in an orderly condition. Protect all plantings from damage by other contractors and trades and trespassers. After completion of the work, the Contractor shall remove all debris, materials, rubbish, excess dirt, etc. from the site and dispose of them in a legal manner. The premises shall be left clean and presentable to the satisfaction of the Architect.

END OF SECTION

SECTION 33 05 26.13

TRACER TAPE

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing, handling and installation of tracer tape, as called for on the drawings.

1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Manufacturer's literature on the materials, colors and printing specified herein, shall be submitted to the Owner's Representative for review.
- B. Tape samples shall also be submitted to the Owner's Representative for review.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

Tracer tape shall be by Reef Industries, Houston, TX; Empire Level, Mukwonago, WI; Pro-Line Safety Products Co., W. Chicago, IL; or approved equal.

2.02 TRACER TAPE:

- A. Tracer tape shall be at least 3-inches wide.
- B. Tracer tape for non-ferrous pipe or conduit shall be constructed of a metallic core bonded to plastic layers. The metallic tracer tape shall be a minimum 5-mil thick and must be locatable at a depth of 18-inches with ordinary pipe locaters.
- C. Tracer tape for ferrous pipe or conduit shall consist of multiple bonded plastic layers. The non-metallic tracer tape shall elongate at least 500% before breaking.
- D. The tape shall bear the wording: "BURIED DRAIN LINE BELOW" (with "DRAIN" replaced by "WATER", "SEWER", "ELECTRICAL", "GAS", "TELEPHONE", or "CHEMICAL" as appropriate), continuously repeated every 30-inches to identify the pipe.
- E. Tape colors shall be as follows, as recommended by the American Public Works Association (APWA):

|           |        |
|-----------|--------|
| Electric  | Red    |
| Gas & Oil | Yellow |

|                |                |
|----------------|----------------|
| Communications | Orange         |
| Water          | Blue           |
| Sewer & Drain  | Green          |
| Chemical       | Red (not APWA) |

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Tracer tape shall be installed directly above the pipe or conduit it is to identify, approximately 12-inches below the proposed ground surface.
- B. The Contractor shall follow the manufacturer's recommendations for installation of the tape, as approved by the Owner's Representative.

END OF SECTION

SECTION 33 11 13.13

DUCTILE IRON PIPE AND FITTINGS FOR WATER MAINS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers the furnishing, handling, hauling, laying, jointing, testing and disinfecting of all ductile iron pipe, including fittings and appurtenant work as indicated on the drawings and as specified.

1.02 RELATED WORK:

- A. Section 03 05 00, FIELD CONCRETE
- B. Section 31 00 00, EARTHWORK
- C. Section 32 12 00, PAVING
- D. Section 32 91 19, SEEDING
- E. Section 33 11 13.16, SERVICE CONNECTIONS
- F. Section 33 12 22, HYDRANTS AND VALVES

1.03 QUALITY ASSURANCE:

- A. All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. The Contractor shall furnish in duplicate to the Owner's Representative sworn certificates of such tests.
- B. In addition, the Owner reserves the right to have any or all pipe, fittings and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.

1.04 REFERENCES:

- A. The following standards, latest version thereof, form a part of this specification as referenced:

American Water Works Association (AWWA)

AWWA C104 Cement-Mortar Lining for Ductile- Iron Pipe and Fittings

AWWA C105 Polyethylene Encasement for Ductile Iron Pipe Systems

|      |      |   |
|------|------|---|
| AWWA | C110 | Ductile-Iron and Gray-Iron Fittings Water   |
| AWWA | C111 | Rubber Gasket Joints for Ductile- Iron Pressure Pipe and Fittings   |
| AWWA | C116 | Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings |
| AWWA | C150 | Thickness Design of Ductile-Iron Pipe   |
| AWWA | C151 | Ductile-Iron Pipe, Centrifugally Cast for Water   |
| AWWA | C153 | Ductile-Iron Compact Fitting for Water Service.   |
| AWWA | C600 | Installation of Ductile-Iron Water Mains & Their Appurtenances  |
| AWWA | C651 | Disinfecting Water Mains  |

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs including descriptive literature and complete characteristics and specifications, and code requirements. Shop drawings shall be submitted for the ductile iron pipe, type of joint, fittings, couplings, filling rings, restrained joints, and lining and coating in accordance with specifications.

PART 2 - PRODUCTS

2.01 PIPE:

- A. The Contractor shall use push-on joint type ductile iron pipe unless otherwise indicated on the plans or specified herein.
- B. All ductile iron pipe shall be designed in accordance with AWWA C150 and shall be manufactured in accordance with AWWA C151.
- C. Unless otherwise indicated or specified, ductile iron pipe shall be Thickness Class 52.

2.02 JOINTS:

- A. Joints for ductile iron pipe shall conform to AWWA C111.
- B. Pipe and fittings shall be furnished with approved joint restraining appurtenances as specified herein, or within the limits as indicated on the drawings, to keep the piping from pulling apart under pressure.

2.03 FITTINGS:

- A. Fittings shall conform to the requirements of AWWA C110 or C153 as appropriate and shall be of a pressure classification at least equal to that of the pipe with which they are used.
- B. The Contractor shall use ductile iron fittings. Cast-iron, Class 250 fittings may be substituted, upon approval of the Owner's Representative, for ductile iron fittings.
- C. Unless otherwise indicated, fittings shall have all bell mechanical joint ends.

2.04 GASKETS, GLANDS, NUTS AND BOLTS:

- A. Gaskets, glands, nuts, bolts and accessories shall conform to AWWA C111 or C153 as appropriate.
- B. Gaskets shall be of plain tipped rubber, suitable for exposure to the liquid within the pipe.
- C. Glands shall be ductile or cast iron.
- D. Bolts and nuts shall be high strength alloy.

2.05 LINING AND COATING:

- A. The inside of pipe and fittings shall be given a cement lining and asphaltic seal coat in accordance with AWWA C104. The thickness of the lining shall be double that specified in AWWA C104.
- B. The outside of pipe and fittings shall be coated with the standard asphaltic coating specified under the appropriate AWWA Standard Specification for pipe and fittings.
- C. Machined surfaces shall be cleaned and coated with a suitable rust preventative coating at the shop immediately after being machined.

2.06 FLEXIBLE COUPLINGS:

- A. The Contractor shall use solid sleeve coupling fittings for joining pipe. With the approval of the Owner's Representative, sleeve-type flexible couplings may be substituted.
- B. All sleeve-type couplings and accessories shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.
- C. Couplings shall be cast or ductile iron and shall be provided with gaskets of a composition suitable for exposure to the liquid within the pipe.



- D. Sleeve-type couplings shall be made by Dresser Mfg. Div., Bradford, PA; Smith-Blair, Inc., San Francisco, CA; Romac Industries Inc., Seattle, WA; Ford Meter Box Co., Wabash, IN; or be an approved equal.
- E. Couplings for buried pipe shall be Dresser 153; Smith-Blair Type 441 or 443; Romac Style 501; Ford Style FC1 or FC2; or approved equal.

2.07 JOINT RESTRAINTS:

- A. Where indicated or necessary to prevent joints or sleeve couplings from pulling apart under pressure, anchoring and joint restraint methods shall be utilized. Methods shall be restrained joint systems. The number of joints to be restrained shall be determined in accordance with Table 1, as shown on the construction plans or provided by the Owner's Representative.
- B. Restrained joint systems for standard mechanical joint fittings or push on joint pipe shall be restraining glands (Megalug by EBAA Iron Sales Inc., Eastland, TX; StarGrip by Star Pipe Products, Houston, TX; RomaGrip by Romac Industries, Inc., Sultan, WA; Sigma One-Lok by Sigma Corporation, Cream Ridge, NJ; or approved equal) and restraining gaskets (Fast-grip joint by American Cast Iron Pipe Company, Birmingham, AL; Field Lok 350 Gasket by United States Pipe and Foundry Company, Birmingham, AL; Sure Stop 350 Restrained Joint Gaskets by McWane Ductile, Phillipsburg, NJ; or approved equal). Methods that rely on the use of friction clamps and/or retainer glands with set screws alone are not acceptable.
- C. Restrained joint systems for non-standard or modified joints shall be Flex-Ring or Lok-Ring by American Cast Iron Pipe Company, Birmingham, AL; TR-Flex Joint by United States Pipe and Foundry Company, Birmingham, AL; Super-Lock Joint by Clow Corporation, Bensenville, IL; Fastite Joint by Atlantic States Cast Iron Pipe Company, Phillipsburg, NJ; Snap-Lok or Bolt-Lok by Griffin Pipe Products Company, Oak Brook, IL; or approved equal.
- D. Concrete thrust blocks may only be used for 6-inch, 8-inch, 10-inch, or 12-inch pipe where use of a joint restraint system is not feasible. Use of concrete thrust blocks shall be installed with the minimum bearing area (in square feet) against undisturbed material in accordance with the following:

| Size of Main  | 90° Bends, Tees, Caps and Plugs | 45° Bends and Wyes | 22-1/2° Bends | 11-1/4° Bends |
|---------------|---------------------------------|--------------------|---------------|---------------|
| 6- & 8-inch   | 5                               | 4                  | 2             | 2             |
| 10- & 12-inch | 12                              | 9                  | 5             | 2             |

- E. Tie rods may only be used for 6-inch, 8-inch, 10-inch, or 12-inch pipe where use of a joint restraint system is not feasible. Bolts shall have adequate length to allow nuts on both sides of the gland. Tie bolts shall have the same diameter as the tie rods and be in accordance with the following:

| Pipe Size | Tie Rod |          |
|-----------|---------|----------|
|           | Number  | Diameter |
| 6         | 2       | 1/2"     |
| 8         | 2       | 3/4"     |
| 10        | 2       | 3/4"     |
| 12        | 4       | 3/4"     |

- F. Location of restrained joints shall be based on Table 1, as shown on the construction plans or provided by the Owner's Representative. All joints that occur within the restrained length listed in Table 1, for the specific application, shall be restrained. For example, for a 90° bend, 8-inch unwrapped pipe, the restrained length required is 33 feet. Therefore, all joints within 33 feet of the 90° bend must be restrained.

### PART 3 - EXECUTION

#### 3.01 INSPECTION BEFORE INSTALLATION:

Pipes and fittings shall be subjected to a careful inspection just before being laid or installed.

#### 3.02 HANDLING AND CUTTING:

- A. Any pipe or fitting which has a damaged lining, scratched or marred machine surface and/or abrasion of the pipe coating or lining shall be rejected and removed from the job-site.
- B. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used will be perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.
- D. Except as otherwise approved, all cutting shall be done with a machine suitable for cutting ductile iron pipe. Hydraulic squeeze cutters are not acceptable for cutting ductile iron pipe. Travel type cutters or rotary type abrasive saws may be used. All cut ends shall be examined for possible cracks caused by cutting.
- E. Lined and coated pipe and fittings shall be assembled and installed with approved packing or gaskets of the type recommended by the pipe manufacturer for the particular lining used.

#### 3.03 INSTALLATION:

A. DEPTH:

1. The pipe shall be installed with a minimum of 5'-0" of cover, unless specifically indicated otherwise on the plans or required by the Owner's Representative.
2. Where pipe is installed at less than the required cover, the Contractor shall furnish and install insulation in accordance with Section 33 11 13.43, INSULATION FOR PIPELINES, or as required by the Owner's Representative.

B. PIPE AND FITTINGS:

1. No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.
2. Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.
3. Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or as required. Care shall be taken to ensure good alignment both horizontally and vertically.
4. In buried pipelines, each pipe shall have firm bearing along its entire length.
5. Castings to be encased in masonry shall be accurately set, with the bolt holes, if any, carefully aligned.
6. Immediately prior to being set, castings shall be thoroughly cleaned of all rust, scale and other foreign material.
7. Fittings shall not be used to clear beneath or above an existing structure or pipeline unless approved by the Owner's Representative. The water main shall be brought to a depth sufficient to clear the structure or pipeline without the use of bends.

C. TEMPORARY PLUGS:

At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

D. PUSH ON JOINTS:

1. Joining of push-on joint pipe shall conform to AWWA C600.

2. If effective sealing of the joint is not attained, the joint shall be disassembled, thoroughly cleaned, a new gasket inserted and joint reassembled.
3. Deflection of alignment at a joint shall not exceed the appropriate permissible deflection as specified in AWWA C600. The tables in AWWA C600 indicate the maximum permissible deflection for 18 and 20-foot pipe lengths. Maximum permissible deflections for other lengths shall be in proportion to such lengths.

E. MECHANICAL JOINTS:

1. Assembling of fittings with mechanical joint ends shall conform to AWWA C600.
2. If effective sealing of the joint is not attained at the maximum torque indicated in the above standard, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be overstressed to tighten a leaking joint.
3. The deflection of alignment at a joint shall not exceed the appropriate permissible deflection as specified in the following table. These values indicate the maximum permissible deflection for 18-foot lengths. Maximum permissible deflections for other lengths shall be in proportion to such lengths.

| Pipe Deflection Allowances             |                         |
|--|-------------------------|
| Maximum permissible deflection, inches |                         |
| <u>Diameter of Pipe (inches)</u>       | <u>Mechanical-Joint</u> |
| 6                                      | 27                      |
| 8-12                                   | 20                      |
| 16                                     | 13.5                    |
| 20                                     | 11                      |
| 24                                     | 9                       |

F. RESTRAINED JOINTS:

1. Joining of restrained joint piping shall conform to the manufacturer's recommendations.
2. If effective sealing of the joint is not attained, the joint shall be disassembled, thoroughly cleaned, a new gasket inserted and joint reassembled.
3. Deflection of alignment at a joint shall not exceed the appropriate permissible deflection recommended by the manufacturer.
4. All restraining appurtenances (and tie rods) shall be coated with an approved

bituminous paint after assembly. The completed joint shall be inspected and the paint repaired/touched-up as necessary.

G. SLEEVE-TYPE COUPLINGS:

1. Pipe ends shall be cleaned thoroughly prior to installation. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferable by use of a torque wrench of the appropriate size and torque for the bolts. The correct torque as indicated by a torque wrench shall not exceed 90 foot-lb. for joints up to 24-inches.

3.04 TESTING:

- A. Prior to the hydrostatic pressure test, the piping shall be thoroughly flushed clean of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings. Flushing velocity shall be a minimum of 2.5 ft./sec.

- B. The installed pipe shall be pressure tested in accordance with AWWA Standard C600.

C. HYDROSTATIC PRESSURE TEST:

1. Unless otherwise approved, all pipelines shall be given a hydrostatic pressure test between line valves. The Contractor shall furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gates, and other necessary equipment; and all labor required. The Owner or Owner's Representative shall have the privilege of using its own gauges.
2. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when desired.
3. Pipelines intended for buried service shall be tested after backfill and compaction of the trench.
4. The section of pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. The Contractor shall follow established procedures for filling the pipe and expelling trapped air to avoid exposing the piping system to water-hammer. If blowoffs are not available at high points for releasing air, the Contractor shall excavate as required and install the necessary taps. If the Contractor changes the grade of pipe installation, he will be responsible for locating the taps at the correct location in the system for testing. Taps shall be installed at the beginning and end of each disinfection run. After completion of the test, if so required by the Owner's Representative, the Contractor shall remove corporations used for testing; plug the holes; and backfill as necessary.

5. The section under test shall be maintained full of water at working pressure for a period of 24 hours prior to the hydrostatic pressure test being applied to stabilize the pipeline with respect to movement under pressure, water absorption by the lining, etc. The pipeline may require several cycles of pressurizing and bleeding trapped air prior to beginning the test.
6. When hydrants are in the pipeline test section, the hydrostatic test shall be made against the main valve in the hydrant. The hydrostatic test shall not be conducted against the branch valve.
7. The hydrostatic test shall consist of raising the water pressure within the test section to a pressure not less than 1.25 times the working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times the working pressure of the lowest elevation of the test section. The specified test pressure shall be corrected to the elevation of the test gauge.
8. The hydrostatic test shall be of at least a 2 hour duration. The test pressure shall not vary by more than +/- 5 psi for the duration of the test. Test pressure shall be maintained within this tolerance by adding makeup water through the pressure test pump into the pipeline test section.
9. The amount of makeup water (testing allowance) added to the test section shall be accurately measured by suitable methods and shall not exceed the maximum allowable quantity of makeup water. No pipe installation will be accepted if the quantity of makeup water is greater than that determined by the following formula:

$$L = \frac{S D \sqrt{P}}{148,000}$$

Where:

- L = makeup water, in gallons per hour
- S = length of test section, in feet
- D = nominal diameter of pipe, in inches
- P = average test pressure, in psi (gauge)

10. If the section fails to pass the hydrostatic pressure test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified hydrostatic test.

3.05 DISINFECTION AND FLUSHING:

- A. The Contractor shall disinfect the lines carrying potable water.
- B. The Contractor shall furnish all equipment and materials necessary to do the work of disinfecting, and shall perform the work in accordance with the procedure outlined in AWWA C651 and all amendments thereto.
- C. In general, the procedure of disinfecting the main shall be to apply the chlorine through a tap in one end of the section and bleed it off through a tap at the other end.
- D. The applied dosage shall be such as to produce a chlorine concentration of not less than 10 mg/l after a contact time of not less than 24 hours.
- E. During the disinfection period, care shall be exercised to prevent contamination of water in existing mains.
- F. Any temporary connection to the mains or other facilities required to accomplish the disinfection of the mains shall be at the Contractor's expense.
- G. After treatment, the main shall be flushed with clean water until the residual chlorine concentration is less than 0.2 mg/l. The flushing rate shall be 3.0 ft/sec to achieve full scour of sand particles.
- H. Before disposing of the water used in disinfecting and flushing water mains the Contractor shall thoroughly neutralize it through the application of a reducing agent, as referenced in AWWA C651 and C655.
- I. Bacteriological sampling and testing shall be done in accordance with AWWA C651 (Option A – One sample taken after flushing is complete followed by another sample taken 16 hours after the first sample or Option B – Two samples taken 15 minutes apart after a 16 hour post flushing rest period) for each main and each branch. Sampling shall be accomplished with sterile bottles treated with sodium thiosulfate, as required by Standard Methods. No hose or fire hydrants shall be used in collection of samples. A corporation stop installed on the main, with a removable copper tube gooseneck assembly, is the recommended method.
- J. Bacteriological sampling and testing shall be conducted by a state certified laboratory certified for total and fecal coliform analyses of potable water.
- K. Testing shall be done by a laboratory approved by the Owner's Representative, in accordance with Standard Methods, and shall show the absence of coliform organisms.

END OF SECTION

SECTION 33 11 13.16

SERVICE CONNECTIONS (WATER SERVICES)

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing and installation of new water service connections and the repair, replacement, and/or transfer of existing water service connections as shown on the drawings, as specified herein, and as required by the Owner's Representative.

1.02 RELATED WORK:

- A. Section 32 12 16.13, HOT MIX ASPHALT PAVING
- B. Section 03 50 00, FIELD CONCRETE
- C. Section 32 91 19, SEEDING
- D. Section 33 11 13.13, DUCTILE IRON PIPE AND FITTINGS FOR WATER MAINS

1.03 REFERENCES:

- A. The following standards form a part of this specification:

American Society for Testing and Materials (ASTM)

- ASTM B88 Seamless Copper Water Tube
- ASTM B584 Copper Alloy Sand Castings for General Applications
- ASTM D2737 Polyethylene (PE) Plastic Tubing

American Water Works Association (AWWA)

- AWWA C800 Water-Service Line Fittings
- AWWA C651 Disinfecting Water Mains
- AWWA C901 Polyethylene Pressure Pipe & Tubing, 1/2-inch through 3-inch for Water Service

Federal Specifications (FS)

- FS WW-T-799C Tube, Copper, Seamless



1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

Manufacturer's literature of the materials of this section for review.

PART 2 - PRODUCTS

2.01 SERVICE PIPING:

- A. Piping for buried copper water services shall be continuous Type K annealed seamless copper water tubing conforming to ASTM B88 Standard Specification for Seamless Copper Water Tube or U.S. Federal Specification WW-T-799C for Tube, Copper, Seamless. Tubing shall be 1-inch diameter unless otherwise indicated.
- B. Couplings, if required, for existing to new service pipe connections shall have compression connections on the inlet and compression connections on the outlet. Couplings shall be made of brass as specified in AWWA C800. All brass components that come into contact with potable water shall be made from either CDA/UNS Brass Alloys C89520 or C89833 and shall not contain more than twenty five hundredths of one percent (0.25% or less) total lead content by weight. The lead leach limit of the coupling shall be 5 parts per billion (ppb). Couplings shall be NSF/ANSI 61 Annex F and Annex G and NSF/ANSI 372 certified by an ANSI accredited organization and shall be stamped or embossed with a mark or name indicating that the product is manufactured from a low-lead alloy, as specified above.

2.02 CORPORATION STOPS:

- A. Corporations stops shall be made of brass as specified in AWWA C800. All brass components that come into contact with potable water shall be made from either CDA/UNS Brass Alloys C89520 or C89833 and shall not contain more than twenty five hundredths of one percent (0.25% or less) total lead content by weight. The lead leach limit of the corporation stops shall be 5 ppb. Corporation stops shall be NSF/ANSI 61 Annex F and Annex G and NSF/ANSI 372 certified by an ANSI accredited organization and shall be stamped or embossed with a mark or name indicating that the product is manufactured from a low-lead alloy, as specified above.
- B. The inlet shall have AWWA taper thread (CC) connections and the outlet shall have compression connections.
- C. Service clamps shall be installed with all corporation stops 2-inches and larger in size and with all corporation stops installed in PVC pipe. Clamps shall be all bronze, ductile iron or stainless steel, double strap, AWWA taper thread (CC) with O-ring seal.
- D. Corporation stops shall be by Ford Meter Box Co., Inc., Wabash, IN; Red Hed Manufacturing Co., Lincoln, RI; Mueller Co., Decatur, IL; or approved equal.

## 2.03 CURB STOPS:

- A. Curb stops shall be of brass as specified in AWWA C800. All brass components that come into contact with potable water shall be made from either CDA/UNS Brass Alloys C89520 or C89833 and shall not contain more than twenty five hundredths of one percent (0.25% or less) total lead content by weight. The lead leach limit of the curb stops shall be 5 ppb. Curb stops shall be NSF/ANSI 61 Annex F and Annex G and NSF/ANSI 372 certified by an ANSI accredited organization and shall be stamped or embossed with a mark or name indicating that the product is manufactured from a low-lead alloy, as specified above.
- B. Curb stops shall be ball style and the inlet and the outlet shall have compression and/or flared connections.
- C. Curb stops shall be by Red Hed Manufacturing Co., Lincoln, RI; Ford Meter Box Co., Inc., Wabash, IN; Mueller Co., Decatur, IL; or approved equal.

## 2.04 CURB BOXES:

- A. The cast iron box shall be the sliding Buffalo type with Arch pattern base. Minimum inside diameter of the upper section shall be 1-1/2-inch for 3/4-inch and 1-inch curb stops and 2-inch for 1-1/2-inch and 2-inch curb stops. Curb box lid shall have brass pentagonal nut.
- B. Boxes shall be equipped with 30-inch stationary extension rods with pinned connections to the curb stop.

## PART 3 - EXECUTION

### 3.01 INSTALLATION:

- A. Where new water mains are being installed and existing water services are to be transferred to the new main, the Contractor shall discontinue the existing water services by shutting down the corporation stop at the old water main, unless specifically otherwise required by the Owner's Representative. The Contractor shall take special care to minimize the interruption of existing water service.
- B. The Contractor shall tap a new corporation stop, cut the existing service piping and connect the new service piping to the old service piping using an approved coupling at a point between the main and the existing curb stop and box.
- C. Where transfers are to be made and the existing curb stop and box cannot be utilized or a new curb stop and box is required, the Contractor shall connect the new service piping to the existing service piping using an approved coupling approximately 12-inches from the curb stop on the building side of the stop.

- D. Where transfers are being made and the existing service is of lead, galvanized steel, or iron, the service shall be replaced to the curb stop and box unless otherwise required. If required, the curb stop and box shall be replaced as specified above.
- E. Curb stops and boxes shall be set plumb, flush with the ground or paved surface, and centered with the box located directly over the stop. The box shall be set on a concrete block or flat stone. Earth fill shall be carefully tamped around the boxes to a distance of 4 feet on all sides of the box or to the undisturbed face of the trench, if less than 4 feet.
- F. Curb stops shall be operational and accessible at all times during construction and warranty period. The Contractor shall verify the proper operation of all curb stops in the presence of the Owner's Representative and/or Owner following completion of the project and prior to the acceptance of substantial completion.
- G. All services shall be installed at 5 feet 0 inches of cover unless otherwise required by the Owner's Representative.
- H. Service connections shall be tested and disinfected in accordance with AWWA standards.

END OF SECTION

SECTION 33 11 13.31

POLYVINYL CHLORIDE PRESSURE PIPE  
AND FITTINGS (SCHEDULE 80)

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers polyvinyl chloride (PVC) Schedule 80 pressure pipe and fittings as shown on the drawings and as specified herein.

1.02 RELATED WORK:

- A. Section 31 50 00, SUPPORT OF EXCAVATION
- B. Section 31 00 00, EARTHWORK
- C. Section 33 05 26.13, TRACER TAPE
- D. Section 33 39 13, PRECAST MANHOLES AND CATCHBASINS

1.03 QUALITY ASSURANCE:

- A. All pipe and fittings shall be inspected and tested at the factory as required by the standard specifications to which the material is manufactured. The Contractor shall furnish in duplicate to the Engineer sworn certificates of such tests.
- B. In addition, the Owner reserves the right to have any or all pipe, fittings, and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.

1.04 REFERENCES:

- A. The following standards form a part of this work as referenced:

American Society for Testing and Materials (ASTM)

|      |       |  |
|------|-------|--|
| ASTM | D1784 | Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds |
| ASTM | D1785 | Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120                             |
| ASTM | D2321 | Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe                         |

|      |       |   |
|------|-------|---|
| ASTM | D2464 | Specification for Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80                          |
| ASTM | D2467 | Specification for Socket-Type Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80                       |
| ASTM | D2564 | Specification for Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings                        |
| ASTM | D2855 | Recommended Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Plastic Pipe and Fittings |

American Water Works Association (AWWA)

|      |      |                          |
|------|------|--------------------------|
| AWWA | C651 | Disinfecting Water Mains |
|------|------|--------------------------|

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Shop drawings shall consist of manufacturer's scale drawings, cut, or catalogs including descriptive literature and complete characteristics and specifications, and code requirements. Shop drawings shall be submitted for the PVC pressure pipe, type of joints, fittings, and couplings in accordance with specifications.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS:

- A. Unless specifically designated otherwise, PVC pipe and fittings shall be Schedule 80 with solvent weld joints as specified herein.
- B. PVC Schedule 80 pipe shall conform to ASTM D1785.
- C. PVC Schedule 80 socket fittings shall conform to ASTM D2467 and PVC Schedule 80 threaded fittings to ASTM D2464.
- D. Rigid PVC used in the extrusion of the pipe and fittings shall be Type 1, Grade 1 compound as stated in ASTM D1784 with a cell classification of 12454B.
- E. Both pipe and fittings shall be the product of one manufacturer.
- F. Solvent cements shall conform to ASTM D2564.

## PART 3 - EXECUTION

### 3.01 HANDLING AND CUTTING PIPE:

- A. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring surfaces, and abrasion of the pipe coating.
- B. Any fittings showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work site.
- C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used will be perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.
- D. Except as otherwise approved, all cutting shall be done with a machine suitable for cutting PVC pipes.

### 3.02 INSTALLING PIPE AND FITTINGS:

- A. Unless specifically otherwise required by the Engineer, all piping shall have not less than 5-feet of cover.
- B. Pipes and fittings shall be subjected to a careful inspection just before being laid or installed.
- C. No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.
- D. Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.
- E. Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or as required. Care shall be taken to ensure good alignment both horizontally and vertically.
- F. In buried pipelines, each pipe shall have firm bearing along its entire length.
- G. The deflection of alignment at a joint shall not exceed the appropriate permissible deflection as recommended by the manufacturer.
- H. Pipe shall be installed underground in a manner that will ensure that external loads will not subsequently cause a decrease of more than 5 percent in the vertical cross-section dimension (deflection). When installing the pipes, they shall be rotated 180° in order

that the upper quadrant of the pipe which was exposed to direct sunlight will not be backfilled upon.

- I. Except as specifically designated otherwise, installation shall be in accordance with ASTM D2321.
- J. At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary water-tight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

### 3.03 JOINTING OF PIPE:

- A. Jointing of pipe shall conform to ASTM D2855.
- B. Except where threaded fittings are required to adapt to metallic pipe, all fittings and pipe shall be solvent welded.
- C. Cementing operations shall not be attempted where the temperature of the pipe, fittings or ambient exceed 100°F. Cementing operations should be done out of direct sunlight.
- D. The following procedures shall be followed:
  - 1. Inspect fitting sockets and pipe ends to make sure there is no chipping, gouging or scratching.
  - 2. Clean pipe ends and fitting sockets carefully, using clean cotton wiping rags.
  - 3. Try fitting sockets on pipe to make sure the pipe will penetrate at least one third of socket depth.
  - 4. Cut pipe to length required. Pipe must be cut at right angle to linear section, deburred on the I.D. and deburred and slightly beveled on the O.D.
  - 5. Apply a coat of primer to fitting socket using a scrubbing motion to ensure penetration. Repeated applications may be necessary.
  - 6. Apply a liberal coating of primer to the end of the pipe, using a scrubbing motion to ensure penetration. Extend this coating slightly beyond fitting socket depth. Be sure the entire surface is well softened.
  - 7. Apply a second coat of primer to fitting socket and without delay apply a coat of cement to pipe end using a scrubbing motion to achieve an even coating.
  - 8. Without delay, apply a uniform, light coating of cement to fitting socket making sure that cement does not penetrate fitting portion of socket.

9. Without delay, apply a second coating of cement to pipe end and immediately insert pipe in fitting. Turn the pipe or fitting 1/4 turn during assembly to distribute the cement evenly, but not after the pipe is bottomed in the socket. Remove all excess cement from around pipe and fitting with clean dry rag. Assembly should be completed within 20 seconds after the last application of cement. Do not hammer or pound fittings or pipe during the assembly process. Socket and pipe surfaces must be soft and wet at time of assembly.
10. Hold socket and pipe in fully bottomed position until cement "sets up." Hold tightly for 30 seconds on sizes up to 4-inches.
11. Assemblies should not be handled excessively until set- up. Allow the following times:
 

|            |                 |
|------------|-----------------|
| 30 minutes | at 60° to 100°F |
| 1 hour     | at 40° to 60°F  |
| 2 hours    | at 20° to 40°F  |
| 4 hours    | at 0° to 20°F   |

3.04 PRESSURE AND LEAKAGE TESTS:

- A. Prior to the pressure and leakage tests, the piping shall be thoroughly cleaned of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to the pipe.
- B. Except as otherwise required, all pipelines shall be given combined pressure and leakage tests in sections of approved length. The Contractor shall furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gates, and other necessary equipment; and all labor required. The Owner/Engineer reserves the right to provide separate gages.
- C. Subject to Engineer approval, the Contractor may schedule the time to make the tests when he desires.
- D. The section of pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. The Contractor shall follow established procedures for filling the pipe and expelling trapped air to avoid exposing the piping system to water hammer. If blowoffs are not available at high points for releasing air, the Contractor shall make the necessary excavations and install the necessary taps. If required by the Engineer, the Contractor shall plug said holes after completion of the test and do the necessary backfilling.
- E. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
- F. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test corrected to the gage location)



to the pressure rating of the pipe. If the Contractor cannot achieve the specified pressure and maintain it for a period of one hour, the section shall be considered as having failed to pass the pressure test.

- G. Following or during the pressure test, the Contractor shall make a leakage test by metering the flow of water into the pipe, while maintaining a pressure of 150 pounds per square inch in the section being tested. If the average leakage during a two hour period exceeds 1 gallon per hour per 1,000 feet of pipe or 50 joints, the section shall be considered as having failed the leakage test.
- H. If the section fails to pass the pressure and leakage test, the Contractor shall locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.
- I. If in the judgement of the Engineer, it is impracticable to follow the foregoing procedure exactly for any reason, modifications in the procedure shall be made as required and approved, but in any event the Contractor shall be responsible for the ultimate tightness of the line within the above leakage and pressure requirements.

### 3.05 DISINFECTION AND FLUSHING:

- A. The Contractor shall disinfect the lines carrying potable water.
- B. The Contractor shall furnish all equipment and materials necessary to do the work of disinfecting, and shall perform the work in accordance with the procedure outlined in AWWA C651 and all amendments thereto.
- C. In general, the procedure of disinfecting the main shall be to apply the chlorine through a tap in one end of the section and bleed it off through a tap at the other end.
- D. The applied dosage shall be such as to produce a chlorine concentration of not less than 10 mg/l after a contact time of not less than 24 hours.
- E. During the disinfection period, care shall be exercised to prevent contamination of water in existing mains.
- F. Any temporary connection to the mains or other facilities required to accomplish the disinfection of the mains shall be at the Contractor's expense.
- G. After treatment, the main shall be flushed with clean water until the residual chlorine concentration is less than 0.2 mg/l.
- H. The Contractor shall dispose of the water used in disinfecting and flushing in an approved manner.

- I. Bacteriological sampling and testing shall be done in accordance with AWWA C651 for each main and each branch. Sampling shall be accomplished with sterile bottles treated with sodium thiosulfate, as required by Standard Methods. No hose or fire hydrants shall be used in collection of samples. A corporation stop installed on the main, with a removable copper tube gooseneck assembly, is the recommended method.
- J. Testing shall be done by a laboratory approved by the Engineer, in accordance with Standard Methods, and shall confirm the absence of coliform organisms. A standard plate count may be required at the option of the Engineer.

END OF SECTION

## SECTION 33 11 13.34

### CONNECTIONS TO EXISTING WATER MAINS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This section covers connections to existing water mains, complete.
- B. The Contractor shall furnish all pipe, fittings, valves, tapping machines, if required, and appurtenances. The Contractor shall do all excavation and backfill as required.

##### 1.02 RELATED WORK:

- A. Section 01 51 36, TEMPORARY WATER SERVICE.
- B. Section 03 05 00, FIELD CONCRETE
- C. Section 33 11 13.13, DUCTILE IRON PIPE AND FITTINGS
- D. Section 33 12 22, HYDRANTS AND VALVES

#### PART 2 - PRODUCTS: NOT APPLICABLE

#### PART 3 - EXECUTION

##### 3.01 CONTRACTOR OPERATIONS:

- A. The Contractor shall make all connections to the existing mains as indicated on the drawings and as herein specified.
- B. The Contractor shall develop a program for the construction and putting into service of the new work subject to the approval of the Owner's Representative. All work involving cutting into and connecting to the existing work shall be planned so as to interfere with operation of the existing facilities for the shortest possible time and when the demands on the system best permit such interference even to the extent of working outside of normal working hours to meet these requirements.
- C. The Contractor shall have all possible preparatory work done prior to making the connection and shall provide all labor, tools, material, and equipment required to do the work in one continuous operation.
- D. The Contractor shall have no claim for additional compensation, by reason of delay or inconvenience, for adapting its operations to the needs of the Owner's water supply. No

damages shall be claimed by the Contractor for delays in dewatering pipelines nor shall any damages be claimed because of water leaking through closed valves after dewatering is completed.

- E. Under no circumstances shall any customers be without water for a period of more than 4 hours without prior approval of the Owner.
- F. Existing pipeline that is not to be abandoned but is damaged by the Contractor during the work shall be replaced by it at its own expense in a manner approved by the Owner's Representative.

### 3.02 TAPPING CONNECTION TO EXISTING MAINS:

- A. Tapping connections to the existing mains, where indicated on the drawings, shall be made with service pressure in the main, using tapping sleeves and valves and a suitable tapping machine.
- B. Other connections to existing mains shall be made with the main out of service, unless otherwise required by the Owner's Representative. Such connections will not require tapping sleeves and valves but connections as indicated on the drawings.

END OF SECTION

## SECTION 33 11 13.43

### INSULATION FOR PIPELINES

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This Section covers the furnishing of all material, accessories, labor, and equipment necessary to insulate the pipelines where shown on the drawings and where so required by the Engineer.

##### 1.02 RELATED WORK:

- A. Section 31 00 00, EARTHWORK
- B. Section 33 11 13.13, DUCTILE IRON PIPE AND FITTINGS FOR WATER MAINS

##### 1.03 REFERENCES:

- A. The following standards form a part of this specification as referenced:

American Society for Testing and Materials (ASTM)

ASTM C552 Specification for Cellular Glass Block and Pipe Thermal Insulation

##### 1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of manufacturer's literature of the materials of this section and installation instructions for the products being provided for the project shall be submitted to the Engineer for review.
- B. A sample of the insulation shall be submitted to the Engineer.

#### PART 2 - PRODUCTS

##### 2.01 INSULATION: DIRECT BURIED PIPE

- A. Insulation shall be cellular glass type. The insulation shall be a cellular glass product that is made specifically for thermal insulation of piping and is compatible with the piping material. Insulation shall be a minimum of 2-inches thick, unless otherwise shown on the drawings.

- B. Insulation shall be composed of all glass sealed cells having no binders or fillers. The completed product shall be rigid and impermeable, with an ultimate compressive strength of at least 90 psi. The thermal conductivity of the cellular glass shall be no higher than 0.29 BTU-in./hr • ft<sup>2</sup> • °F @ 75°F and 0.28 BTU-in./hr • ft<sup>2</sup> • °F @ 50°F.
- C. The cellular glass insulation shall comply with all requirements of ASTM C552. The cellular glass shall be fabricated in half sections whenever possible.
- D. Bands for securing the insulation to the pipe shall be 0.5 inches wide by 0.020 inches thick made of stainless steel.
- E. The jacketing for the insulation shall be one of the following methods:
  - 1. A 125 mil (3mm) thick, heat sealed high polymer asphaltic membrane with an integral glass scrim and integral 1 mil (.02mm) aluminum foil and a thin Mylar film on the surface, equal to Pittwrap Jacketing as manufactured by Pittsburgh Corning or equal.
  - 2. Mastic - asphalt cutback mastic, equal to Pittcote 300 Finish, as manufactured by Pittsburgh Corning or equal.
  - 3. Reinforcing fabric - an open mesh polyester fabric with a 6 x 5.5 mesh/inch configuration, equal to PC Fabric 79, as manufactured by Pittsburgh Corning or equal.
- F. The insulation shall be "Foamglass" with jacketing as manufactured by Pittsburgh Corning Corporation, Pittsburgh, PA, or an approved equal. A minimum of 6" layer of fine sand shall surround the insulated pipe before rock free backfill is used in the trench.
- G. The Foamglass and jacketing shall be installed per the manufacturer instructions included in the approved shop drawings.
- H. Tees, valves, and bends shall be covered with form fitting factory made sections.

END OF SECTION

SECTION 33 12 22  
HYDRANTS AND VALVES

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers the furnishing and installation of all outside hydrants, valves and appurtenances as indicated on the drawings and as specified herein.
- B. Pipe and couplings shall be specified under the appropriate pipe sections.

1.02 RELATED WORK:

- A. Section 03 05 00, FIELD CONCRETE
- B. Section 31 00 00, EARTHWORK
- C. Section 33 11 13.13, DUCTILE IRON PIPE AND FITTINGS FOR WATER MAINS
- D. Section 33 12 15, CONNECTIONS TO EXISTING WATER MAINS

1.03 REFERENCES:

- A. The following standards form a part of this specification:

American Society for Testing and Materials (ASTM)

|      |      |   |
|------|------|---|
| ASTM | A48  | Gray Iron Castings  |
| ASTM | A126 | Gray Iron Castings for Valves, Flanges, and Pipe Fittings   |
| ASTM | A536 | Ductile Iron Castings                                       |
| ASTM | B62  | Composition Bronze or Ounce Metal Castings                  |
| ASTM | D429 | Test Method for Rubber Property Adhesion to Rigid Substrate |

American Water Works Association (AWWA)

|      |      |   |
|------|------|---|
| AWWA | C500 | Metal Seated Gate Valves For Water Supply Service |
| AWWA | C502 | Dry-Barrel Fire Hydrants                          |

|      |          |   |
|------|----------|---|
| AWWA | C509     | Resilient-Seated Gate Valves for Water Supply Service               |
| AWWA | C515     | Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service |
| AWWA | C550     | Protective Interior Coatings for Valves and Hydrants                |
|      |          | Federal Specifications (FS)   |
| FS   | TT-V-51F | Varnish, Asphalt  |

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Shop drawings shall be submitted for the hydrants, valves and appurtenances indicating type of joint, and lining and coating, etc., in accordance with the specifications.
- B. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs including descriptive literature and complete characteristics and specifications, and code requirements.
- C. Refer to Paragraph 3.01.A for Affidavit of Compliance required to be submitted.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Valves shall open right (clockwise).
- B. Hydrants shall open left (counterclockwise).

2.02 HYDRANTS:

- A. Hydrants shall conform to the requirements of AWWA C502. They shall be equipped with a 5-1/4-inch main valve and 6-inch mechanical joint inlet.
- B. Hydrants shall have one 4-1/2-inch pumper and two 2-1/2-inch hose connections. Threads shall be NST.
- C. Hydrant operating and nozzle cap nuts shall be of pentagonal shape and measure one and one half inches from flat to point. The height of the nut shall not be less than one inch.
- D. All internal operating parts including main valve, main valve seat, drain valve mechanism, operating rod, etc., shall be removable without excavating.



- E. Main valve seats shall be made of brass or bronze and shall screw into a seat ring or sub-seat, which shall also be made of brass or bronze.
- F. Hydrants shall be traffic models with frangible bolts or breakaway couplings. Details of hydrant design shall meet the requirements of the Owner.
- G. For purposes of standardization, hydrants shall be Kennedy K-81D as manufactured by Kennedy Valve Company, Elmira, NY.

#### 2.03 HYDRANT PAINT:

- A. Hydrants shall be thoroughly cleaned and given two shop or field coats of paint in accordance with AWWA C502 and the instructions of the paint manufacturer. Paint color shall be the standard hydrant color of the Owner as follows:
  - 1. Barrel - OSHA yellow
  - 2. Bonnet – OSHA white
  - 3. Nozzle Caps and operating nut - OSHA white
- B. If the hydrants are delivered with the Owner's standard color, they shall be given one matching field coat of an alkyd gloss enamel. If the hydrants are not delivered with the Owner's standard color, they shall be given two coats of an alkyd gloss enamel, colors as indicated above.
- C. Hydrant paint shall be as manufactured by Sherwin-Williams, Cleveland, OH; Tnemec Company, Inc., Kansas City, MO; or Minnesota Mining and Manufacturing Co. (3M), St. Paul, MN; or approval equal.
- D. Alkyd gloss enamel shall be 801 DTM by Sherwin-Williams, 2H-Tneme by Tnemec; or approved equal. Reflective paint shall be Scotchlite #7211 by 3M.

#### 2.04 RESILIENT SEAT GATE VALVES:

- A. Resilient seat, wedge type gate valves shall be manufactured to meet all applicable requirements of AWWA C509 or AWWA C515. All valves shall be bubble-tight at 200 psi water working pressure, tested in both directions.
- B. Valve bodies shall be of cast or ductile iron and shall have non-rising threaded bronze stems acting through a bronze stem nut. Opening nuts shall be 2-inches square and shall open as specified above. All buried valves shall have mechanical joint ends.
- C. Valve wedges shall be of ductile iron with resilient seating surfaces permanently bonded to the wedges in strict accordance with ASTM D429 or attached to the face of the wedges with stainless steel screws. Each valve shall have a smooth, unobstructed water way free from sediment pockets.

- D. Valves shall have low friction, torque-reduction thrust bearings. All O-rings and gaskets shall be removable without taking the valves out of service.
- E. An NSF 61-approved epoxy coating, which is safe for potable water, shall be applied to exterior and interior valve surfaces.
- F. Valves for horizontal applications shall have Delrin wedge covers and be specifically designed for horizontal installation.
- G. Resilient seat gate valves shall be as manufactured by Clow Valve Co., Oskaloosa, IA; Mueller Co., Decatur, IL; American Valve and Hydrant; Birmingham, AL; Waterous Co., S. St. Paul, MN; MH Valve, Anniston, AL; Kennedy Valve, Elmira, NY; or approved equal.

#### 2.05 VALVE BOXES AND EXTENSIONS:

- A. Valve boxes shall be manufactured in North America. The minimum outside diameter of the boxes shall be 5½-inches and the lengths shall be as necessary to suit the ground elevation and the depth of each valve operator, regardless of the depth of cover.
- B. When there is more than 6 feet of cover, valve operators shall have non-rising extension stems which raise the operating nut to a depth of approximately 4 feet below grade. The extension stem shall have a centering support ring at the upper end. The lower socket shall be tapped with a set screw into the valve nut to prevent the extension stem from lifting off the valve nut.
- C. Each valve shall be provided with a box which has a close fitting 7-1/4-inch diameter cover and is substantially dirt-tight. The top of the cover shall be flush with the top of the box rim. The word "WATER" shall be cast in the top of the cover.
- D. Valve boxes shall be of cast iron and of the adjustable sliding, heavy pattern type. They shall be so designed and constructed as to prevent direct transmission of traffic loads to the pipe or valve. The upper or sliding section of the box shall be provided with a flange on the top of the section (not on the bottom) having sufficient bearing area to prevent undue settlement. The lower section of the box shall be designed to enclose the operating nut and stuffing box of the valve and to rest on the backfill. The boxes shall be adjustable through at least 6 inches vertically without reduction of lap between sections to less than 8-inches.

### PART 3 - EXECUTION

#### 3.01 AFFIDAVIT OF COMPLIANCE:

- A. The manufacturer shall furnish as part of the shop drawing submittal the Owner's Representative with an affidavit stating that valve(s), hydrants conform to the applicable requirements of the applicable AWWA Standard and the Owner's Representative's

specifications, and that all tests specified therein have been performed and all test requirements have been met and the test date.

- B. A copy of the Affidavit of Compliance shall be delivered to the construction site attached to each valve and/or hydrant furnished. The Affidavit shall be attached to the valve or hydrant inside a waterproof pouch.
- C. Any valve or hydrant received without the required affidavit shall be removed from the project and replaced at no expense to the Owner.
- D. All materials shall be certified "NEW". No reconditioned or repaired materials are permitted. Any reconditioned or repaired materials furnished or installed shall be removed and replaced with new materials at no expense to the Owner.

### 3.02 INSTALLATION:

- A. All valves shall be carefully installed and supported in their respective positions free from distortion and strain. Care shall be taken to prevent damage or injury to the valves and appurtenances during handling and installation.
- B. All material shall be carefully inspected for defects in workmanship and all debris and foreign material cleaned out of valve openings and seats. All mechanisms shall be operated to check for proper functioning, and all nuts and bolts checked for tightness.
- C. Valves and other equipment that do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense.
- D. Hydrants shall be set plumb. Earth fill shall be carefully tamped around the hydrants to a distance of 4 feet on all sides of the hydrant, or to the undisturbed trench face, if less than 4 feet. Hydrants and connecting pipe shall have at least the same depth of cover as the distributing main. Hydrants shall be set upon a layer of stone or a slab of concrete not less than 4-inches thick and 15-inches square. The side of the hydrant opposite the pipe connection shall be firmly wedged against the vertical face of the trench with a concrete thrust block, as indicated on the drawings.
- E. Broken stone shall be placed around the base of the hydrant at the location of the drain hole and backfill around the hydrant shall be thoroughly compacted to the grade line in a satisfactory manner. Hydrants shall have the interiors cleaned of all foreign matter before installation and shall be inspected in both the open and closed positions.
- F. The body of the hydrant shall be of sufficient length to allow the hydrant to be set at the proper elevation, as shown on the drawings. Extensions shall be furnished and installed at the Contractor's expense, when required for greater depths.
- F. Valve boxes shall be set plumb, flush with the ground or paved surface, and centered directly over the operating nut of the valves. Earth fill shall be carefully tamped around

the valve boxes to a distance of 4 feet on all sides of the boxes or to the undisturbed trench face, if less than 4 feet.

- G. Valves shall be operational and accessible at all times during construction and warranty period. The Contractor shall verify proper operation of all valves in the presence of the Owner's Representative and/or Owner following completion of the project and prior to the acceptance of Substantial Completion.

### 3.03 POLYETHYLENE ENCASEMENT:

- A. The pipe, hydrants and valves to be encased shall be thoroughly cleaned of all soil and debris prior to installation of the polyethylene encasement. No soil or debris shall be allowed to enter the encasement during or after its installation.
- B. Polyethylene encasement shall be installed using Method A as described in AWWA C105, with the encasement joints coincident with pipe joints. Adhesive tape shall be used to secure the encasement.
- C. Minimum overlap of polyethylene encasement shall be 24-inches, 12-inches on each side of pipe joints.
- D. If required, two layers of polyethylene encasement shall be installed. The first layer shall be completely installed on and secured to the length of pipe before the second layer is installed.
- E. Tears, cuts and other damage shall be repaired with a piece of polyethylene covering secured with adhesive tape, when approved by the Owner's Representative. Otherwise, the damaged length of polyethylene shall be replaced at the Contractor's expense.
- F. Care shall be taken when backfilling to avoid damage to the polyethylene encasement.

END OF SECTION

SECTION 33 31 13.16

POLYVINYL CHLORIDE GRAVITY PIPE AND FITTINGS  
(SDR-35)

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing and installation of Polyvinyl Chloride (PVC) pipe and fittings, as indicated on the drawings and as specified herein.

1.02 RELATED WORK:

- A. Section 31 00 00, EARTHWORK
- B. Section 31 50 00, SUPPORT OF EXCAVATION
- C. Section 33 05 26.13, TRACER TAPE
- D. Section 33 39 13, PRECAST MANHOLES

1.03 REFERENCES:

- A. The following standards form a part of these specifications as referenced:

American Society for Testing and Materials (ASTM)

|      |       |   |
|------|-------|---|
| ASTM | D2321 | Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe            |
| ASTM | D3034 | Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings                       |
| ASTM | D3212 | Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals       |
| ASTM | F679  | Specification for Polyvinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings |

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL

SPECIFICATIONS, SUBMIT THE FOLLOWING:

Manufacturer's literature of the materials of this section shall be submitted to the Owner's Representative for review.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. PVC nonpressure sewer pipe 4-inches through 15-inches diameter shall conform to ASTM D3034, 18-inches through 60-inches diameter to ASTM F679, all with SDR of 35 unless noted, and shall meet the specific requirements and exceptions to the aforementioned specifications that follow.
- B. PVC nonpressure sewer pipe shall be furnished in standard lengths.
- C. One pipe bell consisting of an integral wall section with a solid cross section rubber ring, factory assembled, shall be furnished with each standard, random and short length of pipe. Rubber rings shall be provided to the requirements of ASTM D3212.
- D. The rubber ring shall be retained within the bell of the pipe by a precision formed groove or recess designed to resist fishmouthing or creeping during assembly of joints.
- E. Spigot pipe ends shall be supplied with bevels from the manufacturer to ensure proper insertion. Each spigot end shall have an "assembly stripe" imprinted thereon to which the bell end of the mated pipe will extend upon proper jointing of the two pipes.
- F. PVC fittings shall be provided with bell and/or spigot configurations with rubber gasketed joints compatible with that of the pipe. Bend fittings with spigot ends shorter than the pipe recess bells will not be allowed. The shorter spigot end would not allow proper seating of the spigot in the mating bell and would permit undesired contact between the mating bell and the outside of the fitting bell.
- G. All pipe delivered to the job site shall be accompanied by independent testing laboratory reports certifying that the pipe and fittings conform to the above-mentioned specifications. In addition, the pipe shall be subject to thorough inspection and tests, the right being reserved for the Owner's Representative to apply such of the tests specified as he may from time to time deem necessary.
- H. All cutting of pipe shall be done with a machine suitable for cutting PVC pipe. Cut ends shall be beveled when recommended by the pipe manufacturer.

## PART 3 - EXECUTION

### 3.01 INSTALLATION:

- A. Except as modified herein, installation of the PVC pipe shall be in accordance with ASTM D2321.
- B. Each pipe length shall be inspected before being laid to verify that it is not cracked. Pipe shall be laid to conform to the lines and grades indicated on the drawings or given by the Owner's Representative. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required grade.
- C. The pipe shall be supported by compacted crushed stone. Crushed stone shall be as specified under Section 31 00 00, EARTHWORK.
- D. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, rammer, or other unyielding object. When each pipe has been properly bedded, enough of the backfill material shall be placed and compacted between the pipe and the sides of the trench to hold the pipe in correct alignment.
- E. Before a joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that inverts are matched and conform to the required line and grade.
- F. For pipe placed on crushed stone, immediately after the joint is made, the jointing area shall be filled with suitable materials so placed and compacted that the ends of either pipe will not settle under backfill load.
- G. No pipe or fitting shall be permanently supported on saddles, blocking, or stones.
- H. Branches and fittings shall be laid by the Contractor as indicated on the drawings, and/or as required by the Owner's Representative. Open ends of pipe and branches shall be closed with PVC caps secured in place with premolded gasket joints or as required by the Owner's Representative.
- I. All pipe joints shall be made as nearly watertight as practicable. There shall be no visible leakage at the joints and there shall be no sand, silt, clay, or soil of any description entering the pipeline at the joints. Where there is evidence of water or soil entering the pipeline, connecting pipes, or structures, the defects shall be repaired to the satisfaction of the Owner's Representative.
- J. The Contractor shall build a tight bulkhead in the pipeline where new work enters an existing sewer. This bulkhead shall remain in place until the Owner's Representative authorizes its removal.
- K. Care shall be taken to prevent earth, water, and other materials from entering the pipe,

and when pipe laying operations are suspended, the Contractor shall maintain a suitable stopper in the end of the pipe and also at openings for manholes.

- L. As soon as possible after the pipe and manholes are completed on any street, the Contractor shall flush out the new pipeline using a rubber ball ahead of the water, and none of the flushing water or debris shall be permitted to enter any existing sewer.

### 3.02 QUALITY ASSURANCE

#### A. LEAKAGE TESTING:

1. On completion of a section of sewer, including building connections installed to the property line, the Contractor shall install suitable bulkheads as required, dewater and test the sewer for leakage.
2. Unless otherwise approved, the section shall be tested using low pressure air test procedures. If circumstances permit, the Owner's Representative may allow testing by infiltration or exfiltration in lieu of air testing.
3. The air test procedures shall conform to the Uni-Bell Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe, UNI-B-6. The starting air pressure for the test shall be 4 psig (greater than the average groundwater back pressure of any groundwater above the pipe, but not greater than 9.0 psig). The minimum duration permitted for the prescribed low-pressure air exfiltration pressure drop between two consecutive manholes shall not be less than provided in Table I or Table II of UNI-B-6. The two tables are reproduced on the following pages.
4. Using the air pressure test, if there has been no leakage (zero psig drop) after one hour of testing, the section undergoing test shall have passed.
5. If either infiltration or exfiltration testing is permitted by the Owner's Representative, the test shall be conducted for at least 24 hours. The amount of infiltration or exfiltration shall not exceed 100 gallons per inch-diameter per mile of sewer per 24 hours.
6. The infiltration test measures leakage into a section of sewer and may be used only where the groundwater level is one foot or more above the crown of the section of sewer pipe at its upper end and at least one foot above the top of building connections and chimneys. For making the infiltration tests, underdrains, if used, shall be plugged and other groundwater drainage shall be stopped to permit the groundwater to return to its normal level insofar as practicable. Allowances shall be made for water that may enter the sewer through pipe connections and inlets during the infiltration test.
7. Where the groundwater level is less than 1 foot above the top of the pipe at its upper



end, the exfiltration test may be used. The sewers shall be subjected to an internal pressure by plugging the pipe at the lower end and then filling the pipelines and manholes with clean water to a height of 2 feet above the highest point in the system to be tested, including main pipeline, service connections and chimneys. When slopes between manholes are steep, the Contractor shall insure that this test can be accomplished without danger of forcing stoppers from wye or tee branches.

8. The rate of exfiltration from the sewers shall be determined by measuring the amount of water required to maintain the water level at the elevation established at the beginning of the test.
9. The Contractor shall construct such weirs or other means of measurements as may be required, shall furnish water and shall do all necessary pumping to enable the test to be properly made.
10. The Contractor shall be responsible for the satisfactory watertightness of the entire section of sewer. Should the sections under test fail to meet the requirements, the Contractor shall do all work of locating and repairing leaks and retesting as the Owner's Representative may require without additional compensation. A plan of the method of repairing any leaks that are found shall be submitted to the Owner's Representative for review.

**B. PIPE DEFLECTION MEASUREMENT:**

1. In accordance with ASTM D3034, no less than 30 days after completion of the PVC sewer pipe installation, the Contractor shall test the pipeline for deflection using a "go/no-go" deflection mandrel having a minimum of nine evenly spaced arms or prongs. The "go/no-go" gauge shall be hand pulled through all sections of the pipeline by the Contractor. The Contractor shall submit drawings of the "go/no-go" gauge to the Owner's Representative for approval prior to testing. Complete dimensions of the gauge for each diameter of pipe to be tested shall be in accordance with ASTM D3034.
2. Any section of pipe found to exceed 7.5 percent deflection shall be deemed a failed pipe and shall be excavated and replaced by the Contractor at his own expense.

TABLE I

MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP  
FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q=0.0015

| Pipe Diameter (in) | Minimum Time (min:sec) | Length for Min. Time (ft) | Time for Longer Length (sec) | Specification Time for Length (L) shown (min:sec) |        |        |        |        |        |        |        |
|--------------------|------------------------|---------------------------|------------------------------|---|--------|--------|--------|--------|--------|--------|--------|
|                    |                        |                           |                              | 100 ft  | 150 ft | 200 ft | 250 ft | 300 ft | 350 ft | 400 ft | 450 ft |
| 4                  | 3:46                   | 597                       | 0.380 L                      | 3:46  | 3:46   | 3:46   | 3:46   | 3:46   | 3:46   | 3:46   | 3:46   |
| 6                  | 5:40                   | 398                       | 0.854 L                      | 5:40  | 5:40   | 5:40   | 5:40   | 5:40   | 5:40   | 5:42   | 6:24   |
| 8                  | 7:34                   | 298                       | 1.52 L                       | 7:34  | 7:34   | 7:34   | 7:34   | 7:36   | 8:52   | 10:08  | 11:24  |
| 10                 | 9:26                   | 239                       | 2.374 L                      | 9:26  | 9:26   | 9:26   | 9:53   | 11:52  | 13:51  | 15:49  | 17:48  |
| 12                 | 11:20                  | 199                       | 3.418 L                      | 11:20   | 11:20  | 11:24  | 14:15  | 17:05  | 19:56  | 22:47  | 25:38  |
| 15                 | 14:10                  | 159                       | 5.342 L                      | 14:10   | 14:10  | 17:48  | 22:15  | 26:42  | 31:09  | 35:36  | 40:04  |
| 18                 | 17:00                  | 133                       | 7.692 L                      | 17:00   | 19:13  | 25:38  | 32:03  | 38:27  | 44:52  | 51:16  | 57:41  |
| 21                 | 19:50                  | 114                       | 10.470 L                     | 19:50   | 26:10  | 34:54  | 43:37  | 52:21  | 61:00  | 69:48  | 78:31  |
| 24                 | 22:40                  | 99                        | 13.674 L                     | 22:47   | 34:11  | 45:34  | 56:58  | 68:22  | 79:46  | 91:10  | 102:33 |
| 27                 | 25:30                  | 88                        | 17.306 L                     | 28:51   | 43:16  | 57:41  | 72:07  | 86:32  | 100:57 | 115:22 | 129:48 |
| 30                 | 28:20                  | 80                        | 21.366 L                     | 35:37   | 53:25  | 71:13  | 89:02  | 106:50 | 124:38 | 142:26 | 160:15 |
| 33                 | 31:10                  | 72                        | 25.852 L                     | 43:05   | 64:38  | 86:10  | 107:43 | 129:16 | 150:43 | 172:21 | 193:53 |
| 36                 | 34:00                  | 66                        | 30.768 L                     | 51:17   | 76:55  | 102:34 | 128:12 | 153:50 | 179:29 | 205:07 | 230:46 |
| 42                 | 39:48                  | 57                        | 41.883 L                     | 69:48   | 104:42 | 139:37 | 174:30 | 209:24 | 244:19 | 279:13 | 314:07 |
| 48                 | 45:34                  | 50                        | 54.705 L                     | 91:10   | 136:45 | 182:21 | 227:55 | 273:31 | 319:06 | 364:42 | 410:17 |
| 54                 | 51:02                  | 44                        | 69.236 L                     | 115:24  | 173:05 | 230:47 | 288:29 | 346:11 | 403:53 | 461:34 | 519:16 |
| 60                 | 56:40                  | 40                        | 85.476 L                     | 142:28  | 213:41 | 284:55 | 356:09 | 427:23 | 498:37 | 569:50 | 641:04 |

TABLE II

MINIMUM SPECIFIED TIME REQUIRED FOR A 0.5 PSIG PRESSURE DROP  
FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q=0.0015

| Pipe Diameter (in) | Minimum Time (min:sec) | Length for Min. Time (ft) | Time for Longer Length (sec) | Specification Time for Length (L) shown (min:sec) |        |        |        |        |        |        |        |
|--------------------|------------------------|---------------------------|------------------------------|---|--------|--------|--------|--------|--------|--------|--------|
|                    |                        |                           |                              | 100 ft  | 150 ft | 200 ft | 250 ft | 300 ft | 350 ft | 400 ft | 450 ft |
| 4                  | 1:53                   | 597                       | 0.190 L                      | 1:53  | 1:53   | 1:53   | 1:53   | 1:53   | 1:53   | 1:53   | 1:53   |
| 6                  | 2:50                   | 398                       | 0.427 L                      | 2:50  | 2:50   | 2:50   | 2:50   | 2:50   | 2:50   | 2:51   | 3:12   |
| 8                  | 3:47                   | 298                       | 0.760 L                      | 3:47  | 3:47   | 3:47   | 3:47   | 3:48   | 4:26   | 5:04   | 5:42   |
| 10                 | 4:43                   | 239                       | 1.187 L                      | 4:43  | 4:43   | 4:43   | 4:57   | 5:56   | 6:55   | 7:54   | 8:54   |
| 12                 | 5:40                   | 199                       | 1.709 L                      | 5:40  | 5:40   | 5:42   | 7:08   | 8:33   | 9:58   | 11:24  | 12:50  |
| 15                 | 7:05                   | 159                       | 2.671 L                      | 7:05  | 7:05   | 8:54   | 11:08  | 13:21  | 15:35  | 17:48  | 20:02  |
| 18                 | 8:30                   | 133                       | 3.846 L                      | 8:30  | 9:37   | 12:49  | 16:01  | 19:14  | 22:26  | 25:38  | 28:51  |
| 21                 | 9:55                   | 114                       | 5.235 L                      | 9:55  | 13:05  | 17:27  | 21:49  | 26:11  | 30:32  | 34:54  | 39:16  |
| 24                 | 11:20                  | 99                        | 6.837 L                      | 11:24   | 17:57  | 22:48  | 28:30  | 34:11  | 39:53  | 45:35  | 51:17  |
| 27                 | 12:45                  | 88                        | 8.653 L                      | 14:25   | 21:38  | 28:51  | 36:04  | 43:16  | 50:30  | 57:42  | 64:54  |
| 30                 | 14:10                  | 80                        | 10:683 L                     | 17:48   | 26:43  | 35:37  | 44:31  | 53:25  | 62:19  | 71:13  | 80:07  |
| 33                 | 15:35                  | 72                        | 12:926 L                     | 21:33   | 32:19  | 43:56  | 53:52  | 64:38  | 75:24  | 86:10  | 96:57  |
| 36                 | 17:00                  | 66                        | 15:384 L                     | 25:39   | 38:28  | 51:17  | 64:06  | 76:55  | 89:44  | 102:34 | 115:23 |
| 42                 | 19:54                  | 57                        | 20.942 L                     | 34:54   | 52:21  | 69:49  | 87:15  | 104:42 | 122:10 | 139:37 | 157:04 |
| 48                 | 22:47                  | 50                        | 27.352 L                     | 45:35   | 68:23  | 91:11  | 113:58 | 136:46 | 159:33 | 182:21 | 205:09 |
| 54                 | 25:31                  | 44                        | 34.618 L                     | 57:42   | 86:33  | 115:24 | 144:15 | 173:05 | 201:56 | 230:47 | 259:38 |
| 60                 | 28:20                  | 40                        | 42.738 L                     | 71:14   | 106:51 | 142:28 | 178:05 | 213:41 | 249:18 | 284:55 | 320:32 |

END OF SECTION

SECTION 33 39 13

PRECAST MANHOLES AND CATCH BASINS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers all precast manholes and catch basins complete, including, but not limited to, bases, walls, cones, mortar, inverts, frames and covers.

1.02 RELATED WORK:

- A. Section 31 00 00, EARTHWORK
- B. Section 32 12 00, BITUMINOUS CONCRETE RADWAY PAVING
- C. Section 03 05 00, FIELD CONCRETE

1.03 SYSTEM DESCRIPTION:

- A. Precast sections shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the drawings or as required by the Engineer.
- B. All manholes and catch basins shall have concrete bases. Concrete bases shall be precast unless otherwise specified. Invert channels shall be formed of brick and mortar upon the base.
- C. Catch basins shall have a 4-foot deep sump unless otherwise specified. Leaching basins shall have a bottom opening as shown on the drawings.
- D. Riser and cone sections shall be precast concrete.

1.04 REFERENCES:

- A. The following standards form a part of this specification as referenced:

American Society for Testing and Materials (ASTM)

|           |                                    |
|-----------|------------------------------------|
| ASTM A48  | Gray Iron Castings                 |
| ASTM C32  | Sewer and Manhole Brick            |
| ASTM C144 | Aggregate for Masonry Mortar       |
| ASTM C207 | Hydrated Lime for Masonry Purposes |

ASTM C478      Precast Reinforced Concrete Manhole Sections

ASTM C923      Specification for Resilient  
                    Connectors Between Reinforced  
                    Concrete Manhole Structures and Pipes

ASTM C1244      Standard Test Method for Concrete Sewer Manholes by the Negative Air  
                    Pressure (Vacuum) Test.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M198 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible  
                    Watertight Gaskets

Occupational Safety and Health Administration

OSHA 29 CFR 1910.27      Fall Prevention Protection

1.05      SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS,  
            SUBMIT THE FOLLOWING:

- A.      Six sets of manufacturer literature of the materials of this section shall be submitted to the Engineer for review.
- B.      Test reports as required shall be submitted to the Engineer.

PART 2 - PRODUCTS

2.01      PRECAST CONCRETE SECTIONS:

- A.      All precast concrete sections shall conform to ASTM C478 with the following exceptions and additional requirements:
  - 1.      The wall thickness of precast sections shall be as designated on the drawings, meeting the following minimum requirements:

| <u>Section Diameter (Inches)</u> | <u>Minimum Wall Thickness (Inches)</u> |
|----------------------------------|--|
| 48                               | 5                                      |
| 60                               | 6                                      |
| 72                               | 7                                      |
| 84                               | 8                                      |

- 2.      Type II cement shall be used except as otherwise approved.
- 3.      Sections shall be steam cured and shall not be shipped until at least five days after having been cast.

4. Minimum compressive strength of concrete shall be 4000 psi at 28 days.
  5. No more than two lift holes may be cast or drilled in each section.
  6. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.
  7. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.
  8. Circumferential steel reinforcement in walls and bases shall be a minimum of 0.12 sq. in./lin. ft. for 4-foot diameter sections and 0.15 sq. in./lin. ft. for 5- and 6-foot diameter sections. Reinforcing shall extend into tongue and groove.
- B. Conical reducing sections shall have a wall thickness not less than 5-inches at the bottom and wall thickness of 8-inches at the top. Conical sections shall taper from a minimum of 48-inches diameter to 24 or 30-inches diameter at the top, as shown on the drawings.
- C. Except where insufficient depth of cover dictates the use of a shorter base, bases shall be a minimum of 4 feet in height.
- D. Slab top sections and flat riser sections (Grade Rings) shall conform to the contract drawings, with particular attention focused upon the reinforcing steel and be designed to meet or exceed an HS-20 Loading requirement.
- E. The tops of the bases shall be suitably shaped by means of accurate ring forms to receive the riser sections.
- F. Precast sections shall be manufactured to contain wall openings of the minimum size to receive the ends of the pipes, such openings being accurately set to conform with line and grade of the sewer or drain. Subsequent cutting or tampering in the field, for the purpose of creating new openings or altering existing openings, will not be permitted except as required by the Engineer.
- G. "Drop-over" manholes shall be placed where indicated on the drawings. The Contractor shall accurately measure the diameter of the existing outlet pipe and inform the manufacturer of its size, so that the "Drop-over" type opening can be cut into the precast manhole base. The bottom shall be cast in place by the Contractor in accordance with Section 03 05 00, FIELD CONCRETE. The invert channel shall be formed of brick and mortar, as specified in this specifications section. The sub-base shall be a compacted, level foundation of crushed stone, at least 6-inches thick, as specified in Section 02300 EARTHWORK, but shall vary to the depth necessary to reach sound undisturbed earth.
- H. The exterior surfaces of all precast manhole bases, walls, and cones shall be given a minimum of one shop coat of bituminous dampproofing.

- I. The Engineer reserves the right to reject any unsatisfactory precast section and the rejected unit shall be tagged and removed from the job site immediately.
- J. The Engineer may also require the testing of concrete sections as outlined under Physical Requirements in ASTM C478 with the Contractor bearing all testing costs.

2.02 BRICK MATERIALS:

- A. Brick shall be sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer. Bricks shall comply with ASTM C32, for Grade SS, hard brick, except that the mean of five tests for absorption shall not exceed 8 percent by weight.
- B. Rejected brick shall be immediately removed from the work and brick satisfactory to the Engineer substituted.
- C. Mortar shall be composed of portland cement, hydrated lime, and sand in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as required by the Engineer and may vary from 1:1/4 for dense hard-burned brick to 1:3/4 for softer brick. In general, mortar for Grade SS Brick shall be mixed in the volume proportions of 1:1/2:4-1/2; portland cement to hydrated lime to sand.
- D. Cement shall be Type II portland cement as specified for concrete masonry.
- E. Hydrated lime shall be Type S conforming to ASTM C207.
- F. The sand shall comply with ASTM C144 specifications for "Fine Aggregate," except that all of the sand shall pass a No. 8 sieve.

2.03 FRAMES, GRATES, COVERS AND STEPS:

- A. Castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.
- B. All castings shall be thoroughly cleaned and may be subject to a careful hammer inspection at the Engineer's discretion.
- C. Castings shall be ASTM A48 Class 30B or better.
- D. The surface of the manhole covers shall have a diamond pattern with the cast words "WATER," "DRAIN" or "SEWER," whichever is appropriate.

- E. Manhole frames with 32-inch covers for 30-inch openings shall be 500 pounds minimum by EJ, No. V-1419; Quality Water Products, Style 47; Neenah Foundry Co., R1740B or approved equal.
- F. Watertight type manhole frames with 32-inch diameter covers (bolted and gasketed) shall be EJ, No. 2006APT 2008ZPT; Quality Water Products, Style C47WT; Neenah Foundry Co., R-1916-H or approved equal.
- G. Manhole frames with 26-inch covers for 24-inch openings shall be 475 pounds minimum by EJ No. 2110 (formerly LK110A); Neenah Foundry Co. R1720; Quality Water Products, Style 40; or approved equal.
- H. Watertight type manhole frames with 26-inch diameter covers (bolted and gasketed) shall be EJ No. 1268; Mechanics Iron Foundry Type A2073; Quality Water Products, Style 40WT; or approved equal.
- I. Frostproof manhole frames, with 30-inch diameter covers and inner lids, shall be R-1755 series by Neenah Foundry Co., Neenah, WI; 2006A1 2009Z by EJ, Brockton, MA; B-3045 (or similar) by Mechanics Iron Foundry, Boston, MA; or approved equal.
- J. 2-inch thick polystyrene insulation shall be firmly adhered to all frostproof inner lids.
- K. Catch basin frames and 23-7/8-inch square grates with 2-inch square openings shall be 8-inches in height minimum. They shall be Neenah Foundry Co. No. R3588-A; Quality Water Products No. 45-600; EJ 5548Z 5520M; or approved equal.
- L. Catch basin frames with bar grate openings and 23-7/8-inch square grates shall be 8-inches in height minimum. Bar grates shall not be used in areas where bicycle traffic could be present. They shall be Neenah Foundry Co. No. R-3589; Quality Water Products No. 45; EJ 5521Z 5520M3 BIKE GR LK121; or approved equal.
- M. Catch basin frames with cascade grate openings and 23-7/8-inch square grates shall be 8-inches in height minimum. They shall be Neenah No. R-3589; Quality Water Products LK121; EJ 5548Z 5520M; or approved equal.
- N. Catch basin frames set against curbing shall have three flanges only.

2.04 SEWER MANHOLE ACCESSORIES:

- A. Gasket materials shall be top grade (100% solids, vulcanized) butyl rubber and shall meet or exceed AASHTO M-198.
- B. Couplings at the manhole-pipe interface shall be made with a rubber seal system (with or without stainless steel straps) meeting the requirements of ASTM C923 and recommended for this type of connection.



- C. Stubs installed as specified and indicated on the drawings shall be short pieces of the same class pipe as that entering the manhole and shall have either stoppers or end caps as shown on the drawings. Stoppers or end caps shall be especially designed for that application.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

##### A. PRECAST SECTIONS:

1. Precast bases shall be supported on a compacted level foundation of crushed stone, as specified in Section 31 00 00 EARTHWORK, at least 6-inches thick, but shall vary to the depth necessary to reach sound undisturbed earth.
2. Precast reinforced concrete sections shall be set vertical and with sections in true alignment.
3. Butyl rubber joint sealant shall be installed between each concrete section. Catch basin sections do not require joint sealant if so indicated on the drawings.
4. All holes in sections used for handling the sections shall be thoroughly plugged with mortar. Mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

##### B. BRICK WORK:

1. Bricks shall be moistened by suitable means, as required by the Engineer, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
2. Each brick shall be laid as a header in a full bed and joint of mortar without requiring subsequent grouting, flushing or filling, and shall be thoroughly bonded as directed.
3. The brick inverts shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipe.

##### C. CASTINGS:

1. Cast iron frames, grates and covers shall be as specified. The frames and covers shall be set by the Contractor to conform accurately to the grade of the finished pavement, existing ground surface, or as indicated on the drawings. Frames shall be adjusted to meet the street surface.

2. Cast iron manhole frames and covers not located in paved areas shall be set 6-inches above finished grade, at a height as required by the Engineer, or as indicated on the drawings. The top of the cone shall be built up with a minimum of 1 course and a maximum of 5 courses of brick and mortar used as headers for adjustment to final grade.
3. Frames shall be set concentric with the top of the concrete section and in a full bed of mortar so that the space between the top of the concrete section or brick headers and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the concrete shall be placed all around the bottom flange. The mortar shall be smoothly finished to be flush with the top of the flange and have a slight slope to shed water away from the frame.
4. Covers and/or grates shall be left in place in the frames, for safety reasons, except while work is being performed.

D. ACCESSORIES:

1. Accessories shall be installed in accordance with manufacturer's instructions.
2. Stubs shall be set accurately to the dimensions indicated on the drawings. Stubs shall be sealed with suitable watertight plugs.

E. MANHOLE FALL PREVENTION SYSTEM:

Carrier rail shall extend from the manhole invert shelf to within 18-inches of finish grade. The rail and manhole rung clamp assembly shall be rigidly connected utilizing 3/8-inch stainless steel bolts. Assembly shall be clamped to manhole steps at 2-foot centers or as recommended by the manufacturer.

3.02 LEAKAGE TESTS:

A. Leakage tests shall be made by the Contractor and observed by the Engineer on each manhole. The test shall be by vacuum or by water exfiltration as described below:

B. VACUUM TEST:

1. The vacuum test shall be conducted in accordance with ASTM C1244. Test results will be judged by the length of time it takes for the applied vacuum to drop from 10 inches of mercury to 9 inches. If the time is less than that listed in Table 1 of ASTM C1244, the manhole will have failed the test. Test times from Table 1 are excerpted below.

TABLE 1

Minimum Test Times for Various Manhole Diameters

| Depth (Feet) | Diameter (Inches) |    |     |
|--------------|-------------------|----|-----|
|              | 48                | 60 | 72  |
|              | Times (Seconds)   |    |     |
| 0-12         | 30                | 39 | 49  |
| 12-16        | 40                | 52 | 67  |
| 16-20        | 50                | 65 | 81  |
| 20-24        | 59                | 78 | 97  |
| 26-30        | 74                | 98 | 121 |

2. If the manhole fails the initial test, the Contractor shall locate the leaks and make proper repairs. Leaks may be filled with a wet slurry of accepted quick setting material. If the manhole should again fail the vacuum test, additional repairs shall be made, and the manhole water tested as specified below.

C. WATER EXFILTRATION TEST:

1. After the manhole has been assembled in place, all lifting holes shall be filled and pointed with an approved non-shrinking mortar. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out. The test shall be made prior to placing the shelf and invert. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test.
2. The manhole shall be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test, as described above, is unsatisfactory as determined by the Engineer or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption by the manhole. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and a measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour loss rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed one gallon per vertical foot for a 24-hour period. If the manhole fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as required by the Engineer to bring the leakage within the allowable rate of one gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day, shall be cause for rejection of the manhole. It shall be the Contractor's responsibility to uncover the rejected manhole as necessary and to disassemble, reconstruct or replace it as required by the Engineer. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.

3. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc. It shall be assumed that all loss of water during the test is a result of leaks through joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Engineer that the water table is below the bottom of the manhole throughout the test.
4. If the groundwater table is above the highest joint in the manhole, and there is no leakage into the manhole, as determined by the Engineer, such a test can serve to evaluate water-tightness of the manhole. However, if the Engineer is not satisfied with the results, the Contractor shall lower the water table and carry out the test as described hereinbefore.

3.03 CLEANING:

All new manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION

## SECTION 33 41 00

### TRENCH DRAIN

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This section covers the trench drain system and associated accessories.

##### 1.02 RELATED WORK:

- A. Section 31 00 00, EARTHWORK
- B. Section 03 30 00, CAST-IN-PLACE CONCRETE

##### 1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Manufacturer's literature of the materials of this section.
- B. Tests reports as required by the Owner's Representative.
- C. Shop drawing and manufacturer's data on the trench drain system.

#### PART 2 - PRODUCTS

##### 2.01 TRENCH DRAIN SYSTEM:

- A. The trench drain shall be Model #K200 Klassikdain 'Drainlock' Load Class A, as manufactured by ACO Polymer Products, Inc. 9470 Pinecone Drive, Mentor, Ohio, (440-639-7230), or approved equal. Product representative: Steffon Portik ([steffon.portik@aco.com](mailto:steffon.portik@aco.com), 440-639-7231 x2363)
  - a. The trench drain shall be a steel edge modular system with an 8-inch internal width.
  - b. Unit pavers shall be cut to receive the dimensions of the trench drain.
  - c. Channels shall be manufactured from polyester resin polymer concrete. The edge rail shall be galvanized and cast-in to the channel.
  - d. Grates shall be secured with a boltless locking system.
  - e. The grate shall be Model #Type 676D Longitudinal Ductile Iron Grate as

manufactured by ACO Polymer Products, Inc. or approved equal. Grate shall be manufactured from ductile iron and ADA compliant. The grate removal tool provided by the manufacturer shall be provided to the City for maintenance purposes.

- f. Two end caps shall be provides, as Model #KS2 Universal Closing/Inlet/Outlet End Cap, as manufactured by ACO Polymer Products, Inc. or approved equal.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Pipe interiors, fitting interiors, and joint surfaces shall be thoroughly cleaned before installation. Pipes and fittings shall be maintained clean.
- B. Pipes shall be installed in the locations and to the required lines and grades shown on the drawings and provided in these Specifications, using an approved method of control.
- C. Excavations shall be maintained free of water during the progress of the Work. No pipes shall be laid in water, nor shall there be any joints made up in water.
- D. If any defective pipe is discovered after being placed, removal and replacement with sound pipe will be required at no additional cost to the Owner.
- E. Accessories shall be installed in accordance with manufacturer's instructions.
- F. Drainage grate shall be installed within at the pipe connection within the walk off mat collection pan, in the location indicated on the plans. Drainage grate shall be installed per the manufacturer's requirements.
- G. Down spout nozzle shall be installed on the outer face of upper plaza's retaining wall, in the location indicated on the plans. Down spout nozzle shall be installed per the manufacturer's requirements.

#### 3.02 LEAKAGE TESTS:

- A. Leakage tests shall be made and observed by the Owner's Representative. The test shall be by water exfiltration as described below:
- B. WATER EXFILTRATION TEST:
  - 1. After the trench drain has been assembled in place, all lifting holes shall be filled and pointed with an approved non-shrinking mortar. All pipes and other openings shall be suitably plugged and the plugs braced to prevent blow out.

2. The trench drain shall be filled with water to the top of the section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the side wall of the trench drain, the drain may be considered to be satisfactorily water-tight. If the test, as described above, is unsatisfactory as determined by the Owner's Representative or if the excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Owner's Representative so wishes, to allow for absorption by the drain. At the end of this period, the drain shall be refilled to the top, if necessary, and a measuring time of at least 8 hours begun. At the end of the test period, the drain shall be refilled to the top measuring the volume of water added. This amount shall be extrapolated to a 24-hour loss rate and the leakage determined on the basis of depth. The leakage for each drain shall not exceed one gallon per vertical foot for a 24-hour period. If the drain fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as required by the Owner's Representative to bring the leakage within the allowable rate of one gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day, shall be cause for rejection of the trench drain. It shall be the Contractor's responsibility to uncover the rejected trench drain as necessary and to disassemble, reconstruct or replace it as required by the Owner's Representative. The trench drain shall then be retested and, if satisfactory, interior joints shall be filled and pointed.
3. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc. It shall be assumed that all loss of water during the test is a result of leaks through joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Owner's Representative that the water table is below the bottom of the drain throughout the test.

### 3.03 CLEANING:

All new trench drains shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION

SECTION 33 41 13.22

CORRUGATED POLYETHYLENE [HDPE] DRAINAGE PIPE

PART 1 – GENERAL

1.01 WORK INCLUDED:

- A. This section includes furnishing all materials, labor and equipment and installing corrugated polyethylene [HDPE] drainage pipe and fittings as shown on the drawings and as specified herein.

1.02 RELATED WORK:

- A. Section 31 00 00 – EARTHWORK
- B. Section 31 50 00 – SUPPORT OF EXCAVATION

1.03 REFERENCES:

- A. The following standards form a part of this specification, as referenced:

American Society for Testing and Materials (ASTM)

|            |  |
|------------|--|
| ASTM D2321 | Standard for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications |
| ASTM F405  | Standard Specification for Corrugated Polyethylene Pipe and Fittings                                       |
| ASTM F667  | Standard Specification for Large Diameter Corrugated Polyethylene Pipe and fittings                        |

American Association Of State Highway and Transportation Officials

|             |  |
|-------------|--|
| AASHTO M294 | Standard Specification for Corrugated Polyethylene Pipe                      |
| AASHTO MP6  | Standard Specification for Corrugated Polyethylene Pipe 42” and 48” Diameter |

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of manufacturer’s literature on the materials of this Section shall be submitted to the Engineer for review.
- B. Manufacturer’s certification that the product was manufactured, tested, and supplied in accordance with this specification shall be furnished.



1.05 DELIVERY, STORAGE AND HANDLING:

- A. Pipe shall be packaged to withstand shipment without damage and handled carefully on the jobsite. Pipe shall be stored so that it is not exposed to sunlight.

PART 2 – PRODUCTS:

2.01 MATERIALS:

- A. This Section applies to corrugated polyethylene pipe with an integrally formed smooth interior.
- B. The nominal size for the pipe and fittings is based on the nominal inside diameter of the pipe.
- C. The pipe and fittings shall be free of foreign inclusions and visible defects. Fittings may be either molded or fabricated. Fittings supplied by manufacturers other than the supplier of the pipe shall not be permitted without the approval of the Engineer. The ends of the pipe shall be cut squarely and cleanly so as not to adversely affect joining.

2.02 MANUFACTURERS:

- A. Pipe and fittings shall be manufactured by Ipex, Inc.; Plexco, Division of Chevron Chemical Co.; J-M Pipe Co.; Advanced Drainage Systems, Inc. (ADS) or approved equal.

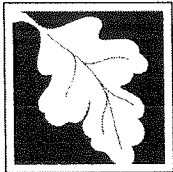
PART 3 – EXECUTION

3.01 INSTALLATION:

- A. Pipe interiors, fitting interiors, and joint surfaces shall be thoroughly cleaned before installation. Pipes and fittings shall be maintained clean.
- B. Pipes shall be installed in the locations and to the required lines and grades shown on the drawings and provided in these Specifications, using an approved method of control.
- C. Excavations shall be maintained free of water during the progress of the Work. No pipes shall be laid in water, nor shall there be any joints made up in water.
- D. If any defective pipe is discovered after being placed, removal and replacement with sound pipe will be required at no additional cost to the Owner.

END OF SECTION

## **APPENDIX A – Order of Conditions**



**Massachusetts Department of Environmental Protection**  
**Bureau of Resource Protection - Wetlands**  
**WPA Form 5 – Order of Conditions**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
 183-0706  
 MassDEP File #  
 eDEP Transaction #  
 HOLDEN  
 City/Town

**A. General Information**

**Please note:**  
 this form has been modified with added space to accommodate the Registry of Deeds Requirements

**Important:**  
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



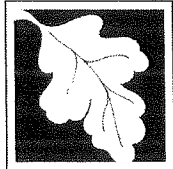
1. From: HOLDEN  
 Conservation Commission

2. This issuance is for (check one):  
 a.  Order of Conditions      b.  Amended Order of Conditions

3. To: Applicant:  
Peter      Lukes  
 a. First Name      b. Last Name  
Town of Holden  
 c. Organization  
1204 Main Street  
 d. Mailing Address  
Holden      MA      01520  
 e. City/Town      f. State      g. Zip Code

4. Property Owner (if different from applicant):  
same  
 a. First Name      b. Last Name  
 c. Organization  
 d. Mailing Address  
 e. City/Town      f. State      g. Zip Code

5. Project Location:  
Salisbury Street and Industrial Drive      Holden  
 a. Street Address      b. City/Town  
186      7, 8, 39, 43, 48  
 c. Assessors Map/Plat Number      d. Parcel/Lot Number  
 Latitude and Longitude, if known:      42d20m11.6448s      71d50m52.998s  
 d. Latitude      e. Longitude



**Massachusetts Department of Environmental Protection**  
 Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
 183-0706  
 MassDEP File #  
 eDEP Transaction #  
 HOLDEN  
 City/Town

**A. General Information (cont.)**

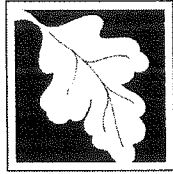
6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):  
 Worcester  
 a. County Worcester b. Certificate Number (if registered land) 0264  
 23169  
 c. Book 0264 d. Page 0264
7. Dates: October 30, 2023 February 7, 2024 February 13, 2024  
 a. Date Notice of Intent Filed b. Date Public Hearing Closed c. Date of Issuance
8. Final Approved Plans and Other Documents (attach additional plan or document references as needed):  
 INDUSTRIAL DRIVE ATHLETIC FIELDS & DAWSON RECREATION IMPROVEMENTS  
 a. Plan Title Weston & Sampson (W&S) b. Prepared By Jesse Johnson, PE  
 2-12-2024 c. Signed and Stamped by As Noted  
 d. Final Revision Date 2-12-2024 e. Scale As Noted  
 Drainage Report dated 9-25-2023 by W&S f. Scale As Noted  
 g. Date Revised 2-9-2024  
 f. Additional Plan or Document Title Drainage Report dated 9-25-2023 by W&S g. Date Revised 2-9-2024

**B. Findings**

1. Findings pursuant to the Massachusetts Wetlands Protection Act:  
 Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act (the Act). Check all that apply:
- a.  Public Water Supply b.  Land Containing Shellfish c.  Prevention of Pollution  
 d.  Private Water Supply e.  Fisheries f.  Protection of Wildlife Habitat  
 g.  Groundwater Supply h.  Storm Damage Prevention i.  Flood Control
2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

**Approved subject to:**

- a.  the following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.



Massachusetts Department of Environmental Protection  
 Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
 183-0706  
 MassDEP File # \_\_\_\_\_  
 eDEP Transaction # \_\_\_\_\_  
 HOLDEN  
 City/Town

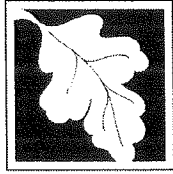
**B. Findings (cont.)**

Denied because:

- b.  the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**
- c.  the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**
- 3.  Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310 CMR 10.02(1)(a) 25  
a. linear feet

**Inland Resource Area Impacts:** Check all that apply below. (For Approvals Only)

| Resource Area   | Proposed Alteration                                    | Permitted Alteration           | Proposed Replacement           | Permitted Replacement         |
|---|--|--------------------------------|--------------------------------|-------------------------------|
| 4. <input type="checkbox"/> Bank  | a. linear feet   | b. linear feet                 | c. linear feet                 | d. linear feet                |
| 5. <input checked="" type="checkbox"/> Bordering Vegetated Wetland        | <u>1036</u><br>a. square feet                          | <u>1036</u><br>b. square feet  | <u>2300</u><br>c. square feet  | <u>2300</u><br>d. square feet |
| 6. <input type="checkbox"/> Land Under Waterbodies and Waterways          | a. square feet   | b. square feet                 | c. square feet                 | d. square feet                |
| 7. <input checked="" type="checkbox"/> Bordering Land Subject to Flooding | e. c/y dredged <u>187</u>                              | f. c/y dredged <u>187</u>      | <u>236</u>                     | <u>236</u>                    |
|   | a. square feet <u>0.6</u>                              | b. square feet <u>0.6</u>      | c. square feet <u>16</u>       | d. square feet <u>16</u>      |
|   | Cubic Feet Flood Storage e. cubic feet                 | f. cubic feet                  | g. cubic feet                  | h. cubic feet                 |
| 8. <input type="checkbox"/> Isolated Land Subject to Flooding             | a. square feet   | b. square feet                 |                                |                               |
|   | Cubic Feet Flood Storage c. cubic feet <u>79,878</u>   | d. cubic feet <u>79,878</u>    | e. cubic feet                  | f. cubic feet                 |
|   | 9. <input checked="" type="checkbox"/> Riverfront Area | a. total sq. feet <u>47654</u> | b. total sq. feet <u>47654</u> | (See B.23)                    |
| Sq ft within 100 ft   | c. square feet <u>32224</u>                            | d. square feet <u>32224</u>    | e. square feet (See B.23)      | f. square feet 0              |
| Sq ft between 100-200 ft  | g. square feet   | h. square feet                 | i. square feet                 | j. square feet                |



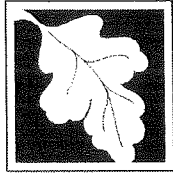
**Massachusetts Department of Environmental Protection**  
**Bureau of Resource Protection - Wetlands**  
**WPA Form 5 – Order of Conditions**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
 183-0706  
 MassDEP File # \_\_\_\_\_  
 eDEP Transaction # \_\_\_\_\_  
 HOLDEN  
 City/Town \_\_\_\_\_

**B. Findings (cont.)**

**Coastal Resource Area Impacts:** Check all that apply below. (For Approvals Only)

|  | Proposed<br>Alteration  | Permitted<br>Alteration | Proposed<br>Replacement | Permitted<br>Replacement |
|--|---|-------------------------|-------------------------|--------------------------|
| 10. <input type="checkbox"/> Designated Port Areas                 | Indicate size under Land Under the Ocean, below   |                         |                         |                          |
| 11. <input type="checkbox"/> Land Under the Ocean                  | _____   | _____                   |                         |                          |
|  | a. square feet  | b. square feet          |                         |                          |
|  | _____   | _____                   |                         |                          |
|  | c. c/y dredged  | d. c/y dredged          |                         |                          |
| 12. <input type="checkbox"/> Barrier Beaches                       | Indicate size under Coastal Beaches and/or Coastal Dunes below  |                         |                         |                          |
| 13. <input type="checkbox"/> Coastal Beaches                       | _____   | _____                   | _____ cu yd             | _____ cu yd              |
|  | a. square feet  | b. square feet          | c. nourishment          | d. nourishment           |
| 14. <input type="checkbox"/> Coastal Dunes                         | _____   | _____                   | _____ cu yd             | _____ cu yd              |
|  | a. square feet  | b. square feet          | c. nourishment          | d. nourishment           |
| 15. <input type="checkbox"/> Coastal Banks                         | _____   | _____                   |                         |                          |
|  | a. linear feet  | b. linear feet          |                         |                          |
| 16. <input type="checkbox"/> Rocky Intertidal Shores               | _____   | _____                   |                         |                          |
|  | a. square feet  | b. square feet          |                         |                          |
| 17. <input type="checkbox"/> Salt Marshes                          | _____   | _____                   | _____                   | _____                    |
|  | a. square feet  | b. square feet          | c. square feet          | d. square feet           |
| 18. <input type="checkbox"/> Land Under Salt Ponds                 | _____   | _____                   |                         |                          |
|  | a. square feet  | b. square feet          |                         |                          |
|  | _____   | _____                   |                         |                          |
|  | c. c/y dredged  | d. c/y dredged          |                         |                          |
| 19. <input type="checkbox"/> Land Containing Shellfish             | _____   | _____                   | _____                   | _____                    |
|  | a. square feet  | b. square feet          | c. square feet          | d. square feet           |
| 20. <input type="checkbox"/> Fish Runs                             | Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above |                         |                         |                          |
|  | _____   | _____                   |                         |                          |
|  | a. c/y dredged  | b. c/y dredged          |                         |                          |
| 21. <input type="checkbox"/> Land Subject to Coastal Storm Flowage | _____   | _____                   |                         |                          |
|  | a. square feet  | b. square feet          |                         |                          |
| 22. <input type="checkbox"/> Riverfront Area                       | _____   | _____                   |                         |                          |
|  | a. total sq. feet   | b. total sq. feet       |                         |                          |
| Sq ft within 100 ft  | _____   | _____                   | _____                   | _____                    |
|  | c. square feet  | d. square feet          | e. square feet          | f. square feet           |
| Sq ft between 100-200 ft   | _____   | _____                   | _____                   | _____                    |
|  | g. square feet  | h. square feet          | i. square feet          | j. square feet           |



**Massachusetts Department of Environmental Protection**  
 Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
 183-0706  
 MassDEP File # \_\_\_\_\_  
 eDEP Transaction # \_\_\_\_\_  
 HOLDEN  
 City/Town \_\_\_\_\_

**B. Findings (cont.)**

\* #23. If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c (BWV) or B.17.c (Salt Marsh) above, please enter the additional amount here.

23.  Restoration/Enhancement \*:  
 Permanent plantings are to be established within RA (See Plan Sheet L602) \_\_\_\_\_ b. square feet of salt marsh \_\_\_\_\_
24.  Stream Crossing(s):  
 0 \_\_\_\_\_ 0 \_\_\_\_\_  
 a. number of new stream crossings b. number of replacement stream crossings

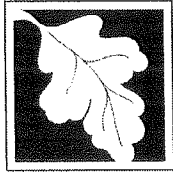
**C. General Conditions Under Massachusetts Wetlands Protection Act**

**The following conditions are only applicable to Approved projects.**

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
  - a. The work is a maintenance dredging project as provided for in the Act; or
  - b. The time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
  - c. If the work is for a Test Project, this Order of Conditions shall be valid for no more than one year.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order. An Order of Conditions for a Test Project may be extended for one additional year only upon written application by the applicant, subject to the provisions of 310 CMR 10.05(11)(f).
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Order will expire on NA unless extended in writing by the Department.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.







Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

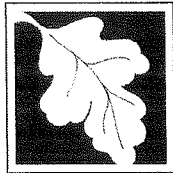
Provided by MassDEP:  
183-0706  
MassDEP File #  
eDEP Transaction #  
HOLDEN  
City/Town

**C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)**

17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.
19. The work associated with this Order (the "Project")
- (1)  is subject to the Massachusetts Stormwater Standards
- (2)  is NOT subject to the Massachusetts Stormwater Standards

**If the work is subject to the Stormwater Standards, then the project is subject to the following conditions:**

- a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Construction General Permit as required by Stormwater Condition 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.
- b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that:
- i.* all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures;
  - ii.* as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized;
  - iii.* any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10;

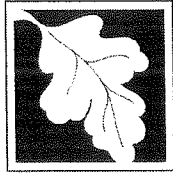


**Massachusetts Department of Environmental Protection**  
 Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
 183-0706  
 \_\_\_\_\_  
 MassDEP File #  
 \_\_\_\_\_  
 eDEP Transaction #  
 HOLDEN  
 \_\_\_\_\_  
 City/Town

**C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)**

- iv. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition;
- v. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.
- c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement") for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following:
  - i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and
  - ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.
- d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Multi-Sector General Permit.
- e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 18(f) through 18(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 18(f) through 18(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.
- f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.



**Massachusetts Department of Environmental Protection**  
**Bureau of Resource Protection - Wetlands**  
**WPA Form 5 – Order of Conditions**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
 183-0706  
 MassDEP File #  
 \_\_\_\_\_  
 eDEP Transaction #  
 HOLDEN  
 City/Town

**C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)**

- g) The responsible party shall:
  1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
  2. Make the maintenance log available to MassDEP and the Conservation Commission (“Commission”) upon request; and
  3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.
- h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.
- i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
- j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
- k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
- l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):

**SEE ATTACHMENT A - SPECIAL CONDITIONS, DEP FILE #183-0706**

- 20. For Test Projects subject to 310 CMR 10.05(11), the applicant shall also implement the monitoring plan and the restoration plan submitted with the Notice of Intent. If the conservation commission or Department determines that the Test Project threatens the public health, safety or the environment, the applicant shall implement the removal plan submitted with the Notice of Intent or modify the project as directed by the conservation commission or the Department.

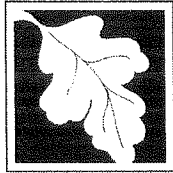
**ATTACHMENT A**  
**DAWSON-INDUSTRIAL DRIVE**  
**RECREATION IMPROVEMENTS**  
**DEP File #183-0706**

**ADDITIONAL DOCUMENTS SUBMITTED:**

1. Preliminary Geotechnical Engineering Report – W&S – 1-18-2023
2. Opinion of Exposure Risk to PFAS in Synthetic Turf - W&S - 6-2023
3. Supplemental Information for NOI – Weston&Sampson(W&S) – 10-26-23
4. 100-Year Flood Analysis – W&S – 10-9-2023
5. Supplemental Information for NOI – W&S – 1-4-2024

**SPECIAL CONDITIONS:**

21. Final plans and additional applicable documents shall indicate the use of staked, entrenched siltation fencing and straw bales (ECB) along the perimeter of work areas. The ECB shall represent the limit of work.
22. No future encroachment or disturbance (i.e. grading, vegetation removal, structures etc) shall be permitted within the 100-foot Vernal Pool Resource Area located to the south of Dawson field.
23. Permanent demarcation (*i.e. boulders*) is required along the Limit of Work (LOW) upgradient and to the north of wetland flag numbers BVW F-12 thru TOB G-3.
24. Permanent demarcation is required along the Limit of Work (LOW) north of the Dawson field from wetland flag numbers D-31 thru D-40.
25. Riverfront restoration plantings shall be provided on the Dawson Recreation side of the project, including the area south of the reconfigured drive, along the access road embankment, within the discontinued play area and on top of the culvert fill. A maintenance plan must be provided to and approved by the Commission for all RA plantings prior to the start of work. The maintenance plan must be incorporated into the Long Term Pollution Prevention Plan.
26. The Commission must review and approve the SWPPP provided by the contractor prior to the start of work.
27. SWPPP site monitoring shall be performed by a certified sediment and erosion control inspector and SWPPP reports submitted to the Commission on a weekly basis.
28. Provide the Commission with a Winter sediment & erosion control plan prior to October 15<sup>th</sup> of each construction year.
29. Provide the Commission with a final set of construction plans prior to the start of work.



**Massachusetts Department of Environmental Protection**  
 Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

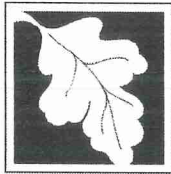
Provided by MassDEP:  
 183-0706  
 MassDEP File #  
 eDEP Transaction #  
 HOLDEN  
 City/Town

**D. Findings Under Municipal Wetlands Bylaw or Ordinance**

1. Is a municipal wetlands bylaw or ordinance applicable?  Yes  No
2. The Holden Conservation Commission hereby finds (check one that applies):
  - a.  that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw, specifically:
 

|  |             |
|--|-------------|
| 1. Municipal Ordinance or Bylaw  | 2. Citation |
| Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued. |             |
  - b.  that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:
 

|                                 |             |
|---------------------------------|-------------|
| <u>Holden Wetland Bylaw</u>     |             |
| 1. Municipal Ordinance or Bylaw | 2. Citation |
3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.  
 The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):
  - a. No future encroachment or disturbance (i.e. structures, grading, removing vegetation, etc...) is allowed within the 25-foot No Disturb Zone unless otherwise approved by the Commission.
  - b. No future encroachment or disturbance (i.e. structures, grading, removing vegetation, etc...) is allowed within the 100-foot Vernal Pool Resource Area.



**Massachusetts Department of Environmental Protection**  
**Bureau of Resource Protection - Wetlands**  
**WPA Form 5 – Order of Conditions**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
 183-0706  
 MassDEP File # \_\_\_\_\_  
 eDEP Transaction # \_\_\_\_\_  
 HOLDEN  
 City/Town

**E. Signatures**

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

2-13-2024  
1. Date of Issuance

Please indicate the number of members who will sign this form.

This Order must be signed by a majority of the Conservation Commission.

4  
2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

Holden Conservation Commission

[Signature]  
Signature

Michael Scott  
Printed Name

[Signature]  
Signature

Kenneth Strom  
Printed Name

[Signature]  
Signature

Luke Boucher  
Printed Name

[Signature]  
Signature

Elizabeth Parent  
Printed Name

[Signature]  
Signature

Heather Parry  
Printed Name

[Signature]  
Signature

Hannah Lipper  
Printed Name

[Signature]  
Signature

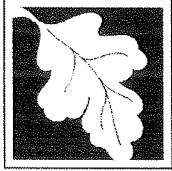
[Signature]  
Printed Name

[Signature]  
Signature

[Signature]  
Printed Name

by hand delivery on  
February 13<sup>th</sup>, 2024  
Date

by certified mail, return receipt requested, on  
Date



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

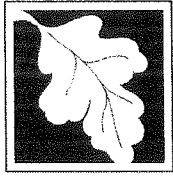
Provided by MassDEP:  
183-0706  
MassDEP File #  
eDEP Transaction #  
HOLDEN  
City/Town

## F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.



**Massachusetts Department of Environmental Protection**  
 Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
 183-0706  
 MassDEP File #  
 eDEP Transaction #  
 HOLDEN  
 City/Town

### G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

HOLDEN  
 Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

-----

To:

HOLDEN  
 Conservation Commission

Please be advised that the Order of Conditions for the Project at:

186-7,8,39,43,48  
 Project Location

183-0706  
 MassDEP File Number

Has been recorded at the Registry of Deeds of:

Worcester  
 County

Book

Page

for: Town of Holden  
 Property Owner

and has been noted in the chain of title of the affected property in:

Book

Page

In accordance with the Order of Conditions issued on:

Date

If recorded land, the instrument number identifying this transaction is:

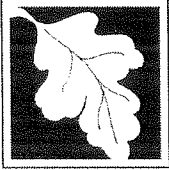
Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant





**Massachusetts Department of Environmental Protection**  
 Bureau of Resource Protection - Wetlands  
**Request for Departmental Action Fee**  
**Transmittal Form**

DEP File Number:

\_\_\_\_\_  
Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

**A. Request Information**

1. Location of Project

|                   |                   |
|-------------------|-------------------|
| _____             | _____             |
| a. Street Address | b. City/Town, Zip |
| _____             | _____             |
| c. Check number   | d. Fee amount     |

2. Person or party making request (if appropriate, name the citizen group's representative):

\_\_\_\_\_

Name

\_\_\_\_\_

Mailing Address

|              |                            |          |
|--------------|----------------------------|----------|
| _____        | _____                      | _____    |
| City/Town    | State                      | Zip Code |
| _____        | _____                      | _____    |
| Phone Number | Fax Number (if applicable) |          |

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

\_\_\_\_\_

Name

\_\_\_\_\_

Mailing Address

|              |                            |          |
|--------------|----------------------------|----------|
| _____        | _____                      | _____    |
| City/Town    | State                      | Zip Code |
| _____        | _____                      | _____    |
| Phone Number | Fax Number (if applicable) |          |

4. DEP File Number:

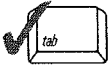
\_\_\_\_\_

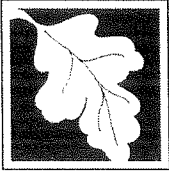
**B. Instructions**

1. When the Departmental action request is for (check one):

- Superseding Order of Conditions – Fee: \$120.00 (single family house projects) or \$245 (all other projects)
- Superseding Determination of Applicability – Fee: \$120
- Superseding Order of Resource Area Delineation – Fee: \$120

**Important:**  
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.





**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands

DEP File Number:

**Request for Departmental Action Fee  
Transmittal Form**

\_\_\_\_\_  
Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

**B. Instructions (cont.)**

Send this form and check or money order, payable to the *Commonwealth of Massachusetts*, to:

Department of Environmental Protection  
Box 4062  
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see <https://www.mass.gov/service-details/massdep-regional-offices-by-community>).
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.