



## Department of Conservation and Recreation

### **PART I**

### **INSTRUCTIONS TO BIDDERS**

CONTRACTS FOR PUBLIC WORKS PROJECTS  
AND  
FOR BUILDING PROJECTS ESTIMATED TO  
COST MORE THAN \$25,000 BUT NOT MORE THAN \$100,000  
SUBJECT TO THE PROVISIONS OF M.G.L. CH. 30 SEC. 39M

**NOTICE TO CONTRACTORS – M.G.L. C. 30, sec. 39M CONSTRUCTION  
ADVERTISEMENT OF INVITATION FOR BIDS  
COMMONWEALTH OF MASSACHUSETTS  
DEPARTMENT OF CONSERVATION AND RECREATION  
10 PARK PLAZA, SUITE 6620, BOSTON, MA 02116  
PHONE: 617-626-1250  
www.mass.gov/dcr**

Contract No. P24-3541-C1A  
Title: Lowes Pond Dam Rehabilitation  
Location: Oxford, MA

GENERAL BID proposals shall be submitted on a form furnished by the Department and will be received until Thursday October 24, 2024 12:00 PM through DCR's E-bid room at [www.bidexpress.com/businesses/36765/home](http://www.bidexpress.com/businesses/36765/home).

Individual sets of contract documents will only be available on DCR's E-bid room at [www.bidexpress.com/businesses/36765/home](http://www.bidexpress.com/businesses/36765/home).

If any addenda are issued throughout the open period for this project, DCR will distribute these addenda via Bid Express, which will also email identified prospective at the time plans and specifications are issued.

A pre-bidding conference for prospective bidders will be held at the site on Wednesday, October 2, 2024, at 11:00 AM.

The estimated project cost is **\$ 3,000,000**

Work at the site consists of widening the existing spillway and adding operational and maintenance features, removal of the remnant sluiceway, demolishing and replacing training walls on either side of the spillway, removing woody plants from the dam embankment, construction of a stilling basing at the base of the spillway, and dredging of impounded upstream sediment.

The work is to be accomplished within **365** calendar days of a notice to proceed. Liquidated damages in the amount of \$500 per day will be assessed if the work has not been completed in accordance with the provisions of the contract within the time specified (as extended by any authorized extension of time granted in accordance with the contract provisions).

Bidders must be pre-qualified by the Massachusetts Dept. of Transportation (MassDOT) Highway Division in Dam Construction to bid on the above project. An award will not be made to a Contractor who is not pre-qualified by MassDOT prior to the opening of Proposals.

The proposed contract includes a combined requirement of 10.4% of the bid price for minority-owned business enterprises and women-owned business enterprises. Proposed MBE/WBE plans that include solely MBE or solely WBE , or do not include a reasonable amount by both MBE and WBE firms to meet the combined requirements, will not be considered responsive.

The applicable local minority workforce utilization percentage is a minimum goal of 15.3%. The applicable local women workforce utilization percentage is a minimum goal of 6.9%.

The Commonwealth requires participation of Veteran-Owned Business Enterprises (“VOBE”) on its construction projects. The Veteran-Owned Business Enterprise participation benchmark for this contract is 3.0%.

Each bid must be accompanied by a bid deposit, in the form of a bid bond, cash, certified check, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the Department of Conservation and Recreation in the amount of 5% of the bid.

Each bid must be submitted through DCR's E-Bid room at [www.bidexpress.com/businesses/36765/home](http://www.bidexpress.com/businesses/36765/home). Please ensure that your bid is complete and marked as responsive when submitting through DCR's Bid room. Any bids found to be incomplete and/or marked unresponsive will be rejected by DCR and will not be considered when awarding the project.

Bids are subject to the provisions of M.G.L. Ch. 30, Sect. 39F, G, H and M inclusive. Wages are subject to minimum wage rates as per M.G.L. Ch. 149, sections 26 to 27D inclusive. The Department reserves the right to waive any informalities in or to reject any and all bids if it be in the public interest to do so.

Brian M. Arrigo  
Massachusetts Department of Conservation and Recreation



**COMMONWEALTH OF MASSACHUSETTS  
DEPARTMENT OF CONSERVATION AND RECREATION**

**PART I  
INSTRUCTIONS TO BIDDERS**

**CONTRACTS FOR PUBLIC WORKS PROJECTS  
SUBJECT TO THE PROVISIONS OF M.G.L. C. 30. SEC. 39M**

**Awarding Authority:**

Department of Conservation and Recreation  
10 Park Plaza, Suite 6620  
Boston, MA 02116  
Telephone: 617-626-1250

DCR Contract No.: P24-3541-C1A

Title: Lowes Pond Dam Rehabilitation

Project Scope:

The proposed dam repairs would bring Lowes Pond Dam into compliance with the design parameters of the Massachusetts Dam Safety Regulations. Work at the site consists of widening the existing spillway and adding operational and maintenance features, removal of the remnant sluiceway, demolishing and replacing training walls on either side of the spillway, removing woody plants from the dam embankment, construction of a stilling basing at the base of the spillway, and dredging of impounded upstream sediment.

Deadline for filing general bids is 12:00 P.M. on Thursday October 24, 2024

The minimum wage rate and truck rate requirements for this Contract are located [www.bidexpress.com/businesses/36765/home](http://www.bidexpress.com/businesses/36765/home).

Bid forms for this Contract are located @ [www.bidexpress.com/businesses/36765/home](http://www.bidexpress.com/businesses/36765/home).

The Minority and Women Business Enterprise participation for this Contract are to be found in the Notice to Contractors section (Part I - Page 2/3).

The time for completion of the Work is specified in Article 2 of the Department of Conservation and Recreation - Contractor Agreement. Liquidated damages for failure to complete on time are as stated in Article 8 of the Department of Conservation and Recreation - Contractor Agreement.

As used herein, capitalized terms shall have the meaning assigned to them in the General Conditions of the Contract and the Department of Conservation and Recreation - Contractor Agreement unless the context clearly indicates otherwise.

## **SECTION 1 - BIDDER'S REPRESENTATION**

**1.1** Each bidder (hereinafter sometimes referred to as "Bidder") by making a bid (hereinafter sometimes referred to as "Bid") represents and warrants that Bidder has visited and examined the Site and the Contract Documents; that Bidder is familiar with the local conditions under which the Work is to be performed; that Bidder has correlated personal observations with the requirements of the Contract Documents; and that where the Contract Documents require, in any part of the Work, a given result to be produced, the Contract Documents are adequate and that Bidder will produce the required result within the Bid price and that the Bid is made in accordance therewith.

**1.2** FAILURE TO EXAMINE THE CONTRACT DOCUMENTS AND THE SITE WILL NOT RELIEVE ANY BIDDER FROM ANY OBLIGATION UNDER THE BID AS SUBMITTED. NEITHER THE COMMONWEALTH NOR THE DESIGNER WILL BE RESPONSIBLE FOR ERRORS, OMISSIONS AND/OR CHARGES FOR EXTRA WORK ARISING FROM BIDDER'S FAILURE TO FAMILIARIZE ITSELF WITH THE CONTRACT DOCUMENTS OR EXISTING CONDITIONS.

### **1.3 Pre-Bidding Conference**

- A. If applicable, a pre-bidding conference for prospective bidders will be held at the date, time and location as specified in the Notice to Contractors section (Part I – page 2/3).
- B. At the conference the project will be discussed in general. It is desirable that all prospective bidders attend. The Contract, Specifications, Drawings, and any other aspects of this project will be explained in response to questions by those attending. For interpretations of questions requiring legal, administrative, or engineering decision, prospective bidders shall comply with Section 3 herein.

## **SECTION 2 - GENERAL BIDDERS - QUALIFICATION**

**2.1** Every Bidder must submit the following documents, as required:

Special certification may be required as required by the Department on a contract-specific basis.

Refer to the Notice to Contractors for the specific qualification requirements of this contract.

## **SECTION 3 - REQUESTS FOR INTERPRETATION**

### **3.1 Interpretation**

**A.** The Plans and Specifications and other Contract Documents are to be considered together and are intended to be mutually complementary, so that any work shown on the Plans though not specified in the Specifications, and any work specified in the Specifications though not shown on the Plans, is to be executed by the Contractor as a part of this Contract.

**B.** All things that in the opinion of the Awarding Authority may be reasonably inferred from the Plans, Specifications and other Contract Documents are to be executed by the Contractor. The Awarding Authority shall determine whether the detail Plans conform to the general Plans and Contract Documents.

**C.** The tables of contents, titles, headings and marginal notes or sub-scripts contained herein are solely to facilitate references, are not intended to be construed as provisions of the Contract, and in no way affect the interpretation of the provisions to which they refer.

**D.** Where reference is made in the Contract Documents to publications, standards, or codes issued by associations or societies, such reference shall be interpreted to mean the current edition of such publications, standards, or codes, including revisions in effect on the date of the Advertisement, notwithstanding any reference to a particular date. The foregoing sentence shall not apply to the dates, if any, specified with respect to insurance policy endorsement forms.

**E.** In case of any conflict among the Contract Documents, unless the context clearly otherwise requires, the Contract Documents shall be construed according to the following priorities:

First Priority: Contract Modifications

Second Priority: Department of Conservation and Recreation - Contractor Agreement

Third Priority: General Conditions of the Contract

Fourth Priority: Drawings - Schedules take precedence over enlarged detail Drawings and enlarged Detail Drawings take precedence over reduced scale Drawings; figured dimensions shall prevail over scale.

Fifth Priority: Specifications

**3.2** Any questions by prospective Bidders concerning interpretation of the Contract Documents must be submitted in writing to the Awarding Authority and should be in its possession at least five working days before the date set for the receipt of Bids. The Awarding Authority will post to Bid Express any addenda or written interpretations that it deems necessary to Bidders who have taken out plans at the address given by them before the date set for the receipt of affected Bids. Bidders may not rely upon oral communications or interpretations from the Awarding Authority or the Designer, and the Awarding Authority shall not be bound by them.

Written Questions shall be submitted to:

Attn: Dan Mortell, Project Manager  
Department of Conservation and Recreation  
180 Beaman Street  
West Boylston, MA 01583  
Email: [dan.mortell@mass.gov](mailto:dan.mortell@mass.gov)

**Questions must be received no later than 12:00 PM October 9, 2024. Response to questions will be addressed thru the addenda process if necessary.**

**3.3** It is the sole responsibility of the Bidder to ascertain the existence of any addenda issued by the Awarding Authority, all addendums are posted on Bid Express- [www.bidexpress.com/businesses/36765/home](http://www.bidexpress.com/businesses/36765/home). Copies of addenda will be made available for inspection at the locations listed in the Advertisement where the Contract Documents are on file.

**3.4** Wherever in the Contract Documents reference is made to Massachusetts General Laws, it shall be construed to include all amendments thereto effective as of the date of the issuance of the invitation to bid on the proposed work.

#### **SECTION 4 - PREPARATION OF BIDS; ALTERNATES**

**4.1** Bids shall be submitted through the DCR E-Bid room at [www.bidexpress.com/businesses/36765/home?agency=true](http://www.bidexpress.com/businesses/36765/home?agency=true).

**4.2 All Bids submitted thru Bid Express must be deemed responsive by Bid Express to be considered**

**4.3** Where so indicated on the Bid Form, sums shall be expressed in both words and numerals. Where there is a discrepancy between the Bid sum expressed in words and the Bid sum expressed in figures, the Bid sum expressed in words shall control unless the intention of the Bidder clearly is otherwise as determined by the Awarding Authority in its sole discretion.

**4.4** Each Bidder shall acknowledge all required alternates in Section C on the Bid Express by entering the dollar amount of addition or subtraction necessitated by the alternate(s).

**4.5** If an alternate includes work within the Bidder's scope of work and does not involve a change in the cost of the Bid, the Bidder shall so indicate by writing "No Change" or "N/C" or "0" in the space provided for that alternate.

**4.6** The lowest Bidder will be determined based on the sum of the base Bid and the accepted alternates.

**4.7** Each bid must be accompanied by a bid deposit, payable to the Department of Conservation and Recreation in the amount of 5% of the bid. Bid Bonds must be submitted electronically, please ensure your company and your bonding agent's company register with one of the Bid Bond agencies affiliated with Bid Express: If you need additional assistance, please call the Bid Express Customer Support Team at [888-352-2439](tel:888-352-2439), available Monday - Friday from 7:00am – 8:00pm (EST). You can also email the team at [support@bidexpress.com](mailto:support@bidexpress.com)

**4.8** The amount of such bid deposit shall be **5% five per cent** of the value of the Bid.

## **SECTION 5 - SUBMISSION OF BIDS**

**5.1** Each bid, **including the bid deposit**, shall be submitted via DCR's Bid room at [www.bidexpress.com/businesses/36765/home?agency=true](http://www.bidexpress.com/businesses/36765/home?agency=true)

**5.2** All Bids must be received by the Awarding Authority no later than the applicable date and time specified on page 1 of these Instructions to Bidders. Any Bid not received by the applicable deadline will not be accepted.

## **SECTION 6 - WITHDRAWAL OF BIDS; REJECTION OF BIDS**

**6.1** Any Bid may be withdrawn prior to the specified deadline for the receipt of Bids provided that the withdrawal shall be made by a written request signed by a person having the authority to bind the Bidder. The written request must be hand delivered or otherwise delivered to Robert Boncore, Director of Contracts and Procurement, at 251 Causeway St., 6<sup>th</sup> Floor, Boston, MA 02114 or through email at [Robert.Boncore@Mass.Gov](mailto:Robert.Boncore@Mass.Gov), and must be received on or before the date and time appointed as the deadline for the receipt of Bids.

**6.2** A Bidder may withdraw its Bid without penalty at any time up to the time of Award as defined below in subsection 9.1 only upon demonstrating to the satisfaction of the Awarding Authority that a death or disability has occurred, or a bona fide clerical error or mechanical error of a substantial nature was made during the preparation of the bid. Failure to demonstrate conclusively that a bona fide clerical error or mechanical error of a substantial nature was made may result in forfeiture of the Bid deposit

**6.3** The Awarding Authority reserves the right to waive any informality in or to reject any and all Bids if it is in the public interest to do so. Without limiting the foregoing, the Awarding Authority reserves the right to reject unit prices which it deems unduly high or unduly low as unbalanced.

## **SECTION 7 – INSURANCE**

### **7.1 Insurance Generally**



A. The Contractor shall take out and maintain the insurance coverages listed in this Section with respect to the operations as well as the completed operations of this Contract. The insurance requirements stipulated shall cover all damage to property, whether above or below ground, and shall apply to all the Work to be performed under this Contract. This insurance shall be provided at the Contractor's expense and shall be in full force and effect for the full term of the Contract or for such longer period as this Article requires.

B. All policies shall be written on an occurrence basis and be issued by companies authorized to write that type of insurance under the laws of the Commonwealth and rated in Best's Insurance Guide (or any successor thereto or replacement thereof) as having a general policy holder rating of "A" or better and a financial rating of at least "9" or otherwise acceptable to the DCR.

C. The Contractor shall submit two (2) originals of each certificate of insurance, acceptable to the DCR, simultaneously with the execution of this Contract. Certificates shall include: **DCR Contract Number and state DCR as an additional insured as to all policies of insurance and shall state that the Contractor has paid all premiums and that none of the coverages shall be cancelled, terminated, or materially modified unless and until ten (10) days prior notice is given in writing to the DCR.** The Contractor shall submit updated certificates prior to the expiration of any of the policies referenced in the certificates so that the DCR shall at all times possess certificates indicating current coverage. Certificates shall indicate the contractual liability coverage, and the Contractor's Protective Liability coverage is in force. Certificates shall include specific acknowledgment that the coverages set forth in this Section 7 are included in the policies.

## 7.2 Types and Amounts of Insurance

### Contractor's Commercial General Liability

Bodily Injury &	<u>500,000.00</u> each occurrence
Property Damage	<u>1,000,000.00</u> general aggregate, per project

This policy shall include coverage relating to explosion, collapse, and underground property damage if blasting operations constitute part of the Work to be performed under this Contract.

If the Contract work includes work to be performed within 50 feet of a railroad, any exclusion for liability assumed under contract for work within 50 feet of a railroad shall be deleted.

### Vehicle Liability

The Contractor shall provide the following minimum coverage with respect to the operations of any employee, including coverage for owned, non-owned, and hired vehicles:

Combined Single Limit: 1,000,000.00

Worker's Compensation

The Contractor shall provide the following coverage in accordance with M.G.L. c. 149, sec. 34A and M.G.L. c. 152 as amended, unless a higher coverage is specified below:

Part One	Provide Statutory Minimum
Employer's Liability	\$500,000.00 each accident
Part Two	\$500,000.00 disease per employee
	\$500,000.00 disease policy aggregate

**SECTION 8 – MBE, WBE AND VOB PARTICIPATION**

**8.1** The apparent low Bidder's compliance with the requirements of this Section 8 is a prerequisite for receiving the Award of the Contract. The MBE, WBE and VOB participation for this Contract are as set forth on the first page of these Instructions to Bidders

**8.2.** The Awarding Authority reserves the right to reduce or waive the MBE or WBE participation established for this Contract upon written request made by a Bidder. Requests to reduce or waive the M/WBE participation for this Contract should be received by the Awarding Authority no later than Ten (10) working days before the date set for the receipt of general Bids. **THE AWARDING AUTHORITY RESERVES THE RIGHT TO REJECT ANY REQUEST TO REDUCE OR WAIVE THE M/WBE REQUIREMENTS FOR THIS CONTRACT THAT IS RECEIVED AFTER THESE DEADLINES.** Such written request must demonstrate to the satisfaction of the Awarding Authority that it is not feasible for a non-MBE or non-WBE general Bidder to meet the percentage established for this Contract based upon any or all of the following: (i) actual M/WBE availability, (ii) the geographic location of the project to the extent related to M/WBE availability, (iii) the scope of the work, (iv) the percentage of work available for subcontracting to M/WBEs and/or (v) other relevant factors, including a **documented** inability by the prospective Bidder to obtain commitments from M/WBE subcontractors sufficient to meet the M/WBE requirements after having made a diligent, good faith effort to do so. All the foregoing documentation shall accompany the Bidder's request for a reduction or waiver of the M/WBE participation requirements. Such documentation shall include, at a minimum, the following:

-- A list of all items of work under the Contract that the Bidder made available for subcontracting to M/WBEs. The Bidder shall identify all items of work that the Bidder did not make so available and shall state the reasons for not making such work available for subcontracting to M/WBEs. The Bidder shall also demonstrate that, where commercially reasonable, subcontracts were divided into units capable of being performed by M/WBEs.

-- Evidence that the Bidder sent written notices soliciting Bids or proposals to perform the items of work made available by the Bidder for subcontracting to M/WBEs to all M/WBEs qualified to perform such work. The Bidder shall identify (i) each M/WBE solicited, and (ii) each M/WBE listed in the Massachusetts Supplier Diversity Office ("SDO" formerly "SOMWBA") directory under the applicable trade category that was not solicited and reasons, therefore. The Bidder shall also state the dates that notices were mailed and provide a copy of the written notice(s) sent.

-- Evidence that the Bidder made reasonable efforts to follow up the written notices sent to M/WBEs with telephone calls or personal visits to determine with certainty whether the M/WBEs were interested in performing the work. Phone logs or other documentation must be submitted.

-- A statement of the response received from each M/WBE solicited, including the reason for rejecting any M/WBE who submitted a bid or proposal.

-- Evidence of efforts made to assist M/WBEs that needed assistance in obtaining bonding or insurance, or lines of credit with suppliers if the inability of M/WBEs to obtain bonding, insurance, or lines of credit is the reason given for the Bidder's inability to meet the M/WBE requirements.

The Bidder may also submit any other information supporting its request for a waiver or reduction in the M/WBE participation, including without limitation evidence that the Bidder placed advertisements in appropriate media and trade association publications announcing the Bidder's interest in obtaining bids or proposals from M/WBEs, and/or sent written notification to M/WBE economic development assistance agencies, trade groups and other organizations notifying them of the Contract and the work to be subcontracted by the Bidder to M/WBEs. The Bidder shall also submit any other information reasonably requested by the Awarding Authority to show that the Bidder has taken all actions that could reasonably be expected to achieve the M/WBE participation.

**8.3** Any reduction or waiver of the M/WBE participation for this Contract will be made by written addendum mailed to all persons who have taken out plans for the project.

**8.4** No later than five (5) working days after the opening of Bids, the apparent low Bidder shall submit the following documents to the Awarding Authority's Contract Officer listed in subsection 5.1: (i) a completed Schedule for Participation by Minority/Women Business Enterprises ("Schedule for Participation") in the form provided by the Awarding Authority showing M/ WBE participation in amounts equal to or exceeding the M/WBE requirements for this Contract, (ii) a completed Letter of Intent in the form provided by the Awarding Authority for each M/WBE listed in the Schedule for Participation, and (iii) a current SDO certification letter for each M/WBE listed in the Schedule of M/WBE Participation showing that the M/WBE is certified in the area of work for which it is listed on the Letter of Intent.

**8.5** Each Letter of Intent shall identify and describe the work to be performed by the named M/WBE (the “M/WBE Work”) with enough specificity to permit the Awarding Authority to identify the items of contract work that the M/WBE will perform for M/WBE participation credit. The Awarding Authority reserves the right to reject any Letter of Intent if the price to be paid for the M/WBE Work does not bear a reasonable relationship to the value of such work under the Contract as determined by the Awarding Authority.

**8.6** Within five (5) working days after receipt of the Schedule For M/WBE Participation, Letters of Intent, and SDO certification letters, the Awarding Authority shall review and either approve or disapprove the apparent low Bidder’s submissions. If the apparent low Bidder has not submitted an appropriate Schedule For M/WBE and appropriate Letters of Intent and SDO certification letters establishing that the M/WBE participation for the project will be met, the apparent low Bidder may be considered ineligible for Award of the Contract and the Awarding Authority will Award the Contract to the second lowest Bidder, subject to said Bidder’s compliance with these conditions.

**8.7** The Contractor is required to submit to the Awarding Authority signed subcontracts with all subcontractors prior to the commencement of work to be performed under these contracts, and/or a purchase order or invoice from each material supplier and/or manufacturer listed on the Schedule For M/WBE Participation within thirty (30) days of the issuance of the Notice to Proceed by the Awarding Authority.

#### **8.8. VOB Participation and Program Operation**

8.8.1 In order to be an eligible VOB for this Contract, the business enterprise must be listed as a veteran-owned business within the VetBiz database, located at [www.VetBiz.gov](http://www.VetBiz.gov), at the time of the bid submission deadline. Only a VOB identified as a veteran-owned small business via the VetBiz database shall count towards meeting the Program requirements.

8.8.2 The Contractor must demonstrate that VOBs are eligible for the following participation via its listing as a veteran-owned small business within the VetBiz database, located at [www.VetBiz.gov](http://www.VetBiz.gov), at the time said VOB seeks to participate in business provided under this Contract; provided, that it shall also be the responsibility of the Awarding Authority to verify the status of the VOB via said VetBiz database prior to the awarding of the Contract.

#### **8.8.3 VOB Reduction/Waiver**

8.8.3.1 The Awarding Authority reserves the right to reduce or waive the VOB participation established for this Contract upon written

request made by a Bidder using their Letterhead and addressed to Procurement Director Robert.Boncore@mass.gov

8.8.3.2 If filed Sub-Bids are solicited for this Contract, requests from prospective general Bidders to reduce or waive the VOB participation for this Contract should be received by the Awarding Authority no later than four (4) working days after the list of filed Sub-Bidders is mailed by the Awarding Authority to persons who have taken out plans for the Contract, using their Letterhead and addressed to Procurement Director Robert.Boncore@mass.gov

8.8.3.3 If there are no filed sub-Bids solicited for this Contract, requests to reduce or waive the VOB participation for this Contract should be received by the Awarding Authority no later than five (10) working days before the date set for the receipt of general Bids. **THE AWARDING AUTHORITY RESERVES THE RIGHT TO REJECT ANY REQUEST TO REDUCE OR WAIVE THE VOB REQUIREMENTS FOR THIS CONTRACT THAT IS RECEIVED AFTER THESE DEADLINES.** Such written request must demonstrate to the satisfaction of the Awarding Authority that it is not feasible for a non- VOB or non- VOB general Bidder to meet the percentage established for this Contract based upon any or all the following:

- i. actual VOB availability.
- ii. the geographic location of the project to the extent related to VOB availability.
- iii. the scope of the work.
- iv. the percentage of work available for subcontracting to VOBs; and/or
- v.
  - Other relevant factors, including a **documented** inability by the prospective Bidder to obtain commitments from VOB subcontractors sufficient to meet the VOB requirements after having made a diligent, good faith effort to do so. All the foregoing documentation shall accompany the completed Waiver Request Form. Such documentation shall include, at a minimum, the following: of efforts made to assist VOBs that needed assistance in obtaining bonding or insurance, or lines of credit with suppliers if the inability of VOB to obtain bonding, insurance, or lines of credit is the reason given for the Bidder's inability to meet the VOB requirements.

8.8.3.4 The Bidder may also submit any other information supporting its request for a waiver or reduction in the VOB requirements, including without limitation evidence that the Bidder placed advertisements in appropriate media and trade association publications announcing the Bidder's interest in obtaining bids or proposals from VOBs, and/or sent written notification to VOB economic development assistance agencies, trade groups and other organizations

notifying them of the Contract and the work to be subcontracted by the Bidder to VOBES. The Bidder shall also submit any other information reasonably requested by the Awarding Authority to show that the Bidder has taken all actions that could reasonably be expected to achieve the VOBES requirements.

- 8.8.3.5 No later than five (5) working days after the opening of general Bids, the apparent low Bidder shall submit the following documents to the Awarding Authority's Contract Officer:
- (i) a completed Schedule for Participation by VOBES ("Schedule for Participation") in the form provided by the Awarding Authority showing VOBES participation in amounts equal to or exceeding the VOBES requirements for this Contract; and
  - (ii) a completed Letter of Intent in the form provided by the Awarding Authority for each VOBES listed in the Schedule for Participation.

Each Letter of Intent shall identify and describe the work to be performed by the named VOBES (the "VOBES Work") with enough specificity to permit the Awarding Authority to identify the items of contract work that the VOBES will perform for VOBES participation credit. The Awarding Authority reserves the right to reject any Letter of Intent if the price to be paid for the VOBES Work does not bear a reasonable relationship to the value of such work under the Contract as determined by the Awarding Authority.

- 8.8.3.6 Within five (5) working days after receipt of the Schedule for VOBES Participation and Letters of Intent, the Awarding Authority shall review and either approve or disapprove the apparent low Bidder's submissions. If the apparent low Bidder has not submitted an appropriate Schedule for VOBES Participation and appropriate Letters of Intent establishing that the VOBES requirements for the project will be met, the apparent low Bidder will be considered ineligible for Award of the Contract and the Awarding Authority will Award the Contract to the second lowest Bidder, subject to said Bidder's compliance with these conditions.
- 8.8.3.7 The Contractor is required to submit to the Awarding Authority signed subcontracts with all subcontractors prior to the commencement of work to be performed under these contracts, and/or a purchase order or invoice from each material supplier and/or manufacturer listed on the Schedule for VOBES Participation within thirty (30) days of the issuance of the Notice to Proceed by the Awarding Authority.
- 8.8.3.8 A filed Sub-Bidder is not required to submit a Schedule for VOBES Participation with its Bid. A filed Sub-Bidder may, at its option, submit a Letter of Intent with its Bid if it is a VOBES. If a filed sub-Bidder intends to sub-subcontract work to a VOBES, and the filed sub-Bidder wishes that sub-subcontract to be credited toward the requirements for this Contract, the filed sub-Bidder should submit a Letter of Intent from that VOBES with its Bid. A filed sub-Bidder can subcontract out up to 20% of its work to VOBES, unless such work is designated as sub-subcontract Paragraph E work in the Bid Documents, in which case the 20% cap does not apply.

## **SECTION 9 - CONTRACT AWARD**

**9.1** "Award" means the determination, selection, and notification of the lowest, responsible, and eligible Bidder by the Awarding Authority.

**9.2** The Contract will be awarded to the lowest responsible and eligible Bidder as determined by the Awarding Authority. Bidders will be required to hold firm their respective bids for thirty (30) days, Saturdays, Sundays, and legal holidays excluded, after the opening of the Bids.

**9.3** As used herein, the term "lowest responsible and eligible Bidder" shall mean the Bidder whose Bid is the lowest of those Bidders who, in the Awarding Authority's opinion, are ready, willing and able to comply with all requirements of the Contract Documents and demonstrably possess the skill, ability, and integrity necessary for the faithful performance of the Work, based on the determination of past performance and financial soundness under M.G.L. c. 30, sec. 39M, (ii) the rules, regulations, orders, guidelines and policies promulgated from time to time by the Commissioner of the Department of Conservation and Recreation and (iii) any other relevant criteria that the Awarding Authority may prescribe.

**9.4** The Bid price shall be the price set forth in paragraph C of the Bid Form.

**9.5** Should the Contract Documents require submission of special data to accompany the Bid, the Awarding Authority reserves the right to rule the Bidder's failure to submit such data an informality and to receive said data subsequently within a reasonable time as set by the Awarding Authority, provided that no such ruling shall result in an unfair advantage to the Bidder.

**9.6** Should the Contract Documents require submission of special data to accompany the Bid, the Awarding Authority reserves the right to rule the Bidder's failure to submit such data an informality and to receive said data subsequently within a reasonable time as set by the Awarding Authority, provided that no such ruling shall result in an unfair advantage to the Bidder. **In addition**, the Department reserves the right to waive minor defects in documents or time limits

## **SECTION 10 - EXECUTION OF CONTRACTS**

**10.1** Upon receipt of the Award, the Bidder awarded the Contract shall submit two (2) properly executed originals of each of the following documents prior to execution of the Contract by the Awarding Authority. All such documents shall be in the form prescribed by the Awarding Authority and received within five working days from receipt of the Award.

- Department of Conservation and Recreation-Contractor Agreement
- Certificate of Corporate Vote
- Joint Venture Authorization (if appropriate)
- Performance and Payment Bonds with power of attorney
- Certificates of Insurance evidencing coverages in amounts required by the Contract Documents.
- Any other documents that the Awarding Authority may reasonably require in connection

with the Contractor's execution of the Contract.

**10.2 Please note that no part of the Contractor's work may be subcontracted without the prior written approval of the Awarding Authority.** The Contractor must complete a minimum of 51% of the scope of this contract by his own work force. If the Contractor desires to subcontract any part of the Work, the Contractor must promptly forward to the Awarding Authority a list in duplicate designating the work to be performed and the name of each proposed subcontractor. Approved subcontractors are eligible for direct payments under M.G.L. 30, sec. 39F, as amended. Material suppliers not involving site labor need not be submitted for approval.

## **SECTION 11 - RETURN OF BID DEPOSITS**

**11.1** All Bid deposits of Bidders, except those of the three (3) lowest responsible and eligible general Bidders, shall be returned within five days, Saturdays, Sundays, and legal holidays excluded, after the opening of the Bids. The Bid deposits of the three (3) lowest responsible and eligible Bidders shall be returned upon the execution and delivery of the Contract, or if no award is made; except that, if any Bidder fails to perform its agreement to execute the Contract and furnish performance and payment bonds as stated in its Bid, then said Bidder's Bid deposit shall become the property of the Commonwealth as liquidated damages; provided that the amount of the Bid deposit that becomes the property of the Commonwealth shall not exceed the difference between the Contractor's Bid price and the Bid price of the next lowest responsible and eligible Bidder; and provided further that, in the case of death, disability, bona fide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the Bidder, such Bidder's Bid deposit shall be returned.

**11.2** In addition to the provisions for the return of Bid deposits as provided above, upon receipt of a Bid Bond in an amount not less than the amount of the required Bid deposit, the Awarding Authority shall return any Bid deposit of a Bidder forthwith after the public opening of Bids.





**COMMONWEALTH OF MASSACHUSETTS  
DEPARTMENT OF CONSERVATION & RECREATION  
STANDARD CONSTRUCTION CONTRACT  
For Projects Subject to M.G.L. c. 149 or M.G.L. c. 30, sec. 39M**

**PART II**

**DEPARTMENT OF CONSERVATION AND RECREATION -  
CONTRACTOR AGREEMENT**

Awarding Authority: The Massachusetts Department of Conservation and Recreation

Department Code: DCR

This agreement ("Contract") is made by and between the Commonwealth of Massachusetts acting by and through the Awarding Authority identified above with a principal place of business at 10 Park Plaza, Suite 6620, Boston, MA 02116, and hereinafter called the "Contractor".

Terms used in this Department of Conservation and Recreation - Contractor Agreement, which are defined in the General Conditions of the Contract shall have the meanings designated therein.

The Awarding Authority and the Contractor agree as follows:

**Article 1. Scope of Work.** The Work under this Contract is defined as all work required by the Contract Documents for the construction of, Contract No:P2 in accordance with and as described in the Plans and Specifications prepared by and as modified by Addenda ( ) included herein.

**Article 2. Time for Completion.** The Contractor shall commence the Work under this Contract on the date specified in the written "Notice to Proceed," and shall within Days after such date, bring the Work to Substantial Completion and to the point at which a Certificate of Agency Use and Occupancy may be issued, and shall bring the Work to Final Acceptance within 10 days after the date specified for Substantial Completion.

**Article 3. Contract Price.** The Awarding Authority shall pay the Contractor, in current funds, for the performance of the Work, subject to additions and deductions by Approved Change Order(s), the Contract Price of Dollars and Zero Cents (\$ .00). The Unit Prices, if any, approved by the Awarding Authority are those included in the Contractor's General Bid. The following Alternates have been accepted and their costs are included in the Contract Price:

**Article 4. Approved Subcontractors.** The filed Subcontractors listed in the Contractor's General Bid submitted by the Contractor have been approved for the performance of the specified portions of the Work subject to the Commonwealth's verification that they have complied with state corporation and partnership registration laws. No other filed Subcontractors and no non-filed Subcontractors shall be used for these or any other portions of the Work without the prior written approval of the Awarding Authority.

**Article 5. Certifications.** Pursuant to M.G.L. c. 62C, sec. 49A, the individual signing this Contract on behalf of the Contractor hereby certifies, under the penalties of perjury, that to the best of his or her knowledge and belief the Contractor has complied with any and all applicable state and federal tax laws. The individual signing this Contract on behalf of the Contractor further certifies under penalties of perjury that the Contractor is not presently debarred from doing public construction work in the Commonwealth under the provisions of M.G.L. c. 29, sec. 29F, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder and is not presently debarred from doing public construction work by any agency of the United States.

**Article 6. The Contract Documents:** The following documents form the Contract, are incorporated by reference herein, and are referred to as the "Contract Documents:"

- The Instructions to Bidders
- The General Bid submitted by the Contractor
- This Department of Conservation and Recreation – Contractor Agreement
- The General Conditions of the Contract
- The Special Conditions [Note: the term "Special Conditions" may also refer to Division 1 of the Specifications.]
- The Plans and Specifications, including Addenda identified in Article 1 above
- All Approved Change Orders issued after execution of this Department of Conservation and Recreation - Contractor Agreement

**Article 7. Minority Business Enterprise, Women Business Enterprise and Veteran-Owned Business Enterprises Participation Goals and Minority/Women and Veteran-Owned Business Enterprises Workforce Utilization Percentages:** The applicable goals, if any, for minority business enterprise and women business enterprise participation, as well as those for minority and women workforce utilization percentages established for this Contract are to be found at the Notice to Contractors for this project, at Part I – Instructions to Bidders, and are incorporated by reference herein.

**Article 8. Liquidated Damages.** For the purposes of Article VI of the General Conditions of the Contract, liquidated damages for delay are to be found at the Notice to Contractors for this project at Part I – Instructions to Bidders and are incorporated by reference herein.

**Article 9. Insurance Requirements.** The insurance requirements are set forth in the Instructions to Bidders and are incorporated herein.

In witness whereof, the parties hereto have caused this instrument to be executed in duplicate under seal as of the date set forth above.

### **Forms Used During Contract Award and Execution**

PAYMENT BOND  
PERFORMANCE BOND  
CERTIFICATE OF CORPORATE VOTE OF AUTHORITY  
CERTIFICATE OF COMPLIANCE WITH STATE TAX LAWS AND WITH UNEMPLOYMENT  
COMPENSATION CONTRIBUTION REQUIREMENTS  
CERTIFICATE OF LIABILITY INSURANCE  
A. SEE PART I, SECTION 7 – ARTICLE 7.1 C.  
B. ADDING IN THE DESCRIPTION **DCR AS ADDITIONAL INSURED.**  
SCHEDULE FOR WOMEN AND MINORITY BUSINESS ENTERPRISE  
LETTER OF INTENT – MINORITY AND WOMEN BUSINESS PARTICIPATION  
SCHEDULE FOR VETERAN-OWNED BUSINESS ENTERPRISE  
LETTER OF INTENT – VETERAN-OWNED BUSINESS ENTERPRISE  
EXECUTIVE ORDER 546 – CONTRACTOR CERTIFICATION - VOB POLICY OF THE  
COMMONWEALTH  
EXECUTIVE ORDER 481 – CONTRACTOR CERTIFICATION - UNDOCUMENTED WORKERS  
POLICY OF THE COMMONWEALTH  
EQUAL EMPLOYMENT OPPORTUNITY COMPLIANCE FORM  
IF APPLICABLE FORM OF SUBCONTRACTOR(S)

**IN WITNESS WHEREOF, said Contractor has caused these presents to be signed in its name and its behalf under seal by its officers, duly authorized to do so, and the said Commonwealth has executed these presents by the Commissioner of said Department, or its authorized agent, as prescribed by law, who shall not incur any personal liability by reason of the execution of these presents or of anything herein contained, and who hereby certifies under penalties of perjury that all applicable provisions of M.G.L. c. 149, sec. 44J, have been complied with.**

**(Executed in duplicate under Seal)**

**CONTRACTOR:**

By: \_\_\_\_\_ SIGNATURE & SEAL

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**COMMONWEALTH OF MASSACHUSETTS  
DEPARTMENT OF CONSERVATION AND RECREATION**

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

Name: Brian M. Arrigo

Title: Commissioner

Date: \_\_\_\_\_

**PAYMENT BOND**

**BOND No.** \_\_\_\_\_

Know all men by these presents, that

\_\_\_\_\_ as principal and \_\_\_\_\_ as surety are held and firmly bound unto the Commonwealth of Massachusetts in the sum of Dollars and Zero Cents (\$.00) in lawful money of the United States of America, to be paid to the Commonwealth of Massachusetts, for which payments, well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

Whereas the said principal has made a Contract with the Commonwealth acting through its Department of Conservation and Recreation ("Awarding Authority") the construction of \_\_\_\_\_.

Now the condition of this obligation is such that if the principal shall pay for all labor performed or furnished and for all materials used or employed in said Contract and in any and all duly authorized modifications, alterations, extensions of time, changes or additions to said Contract that may hereafter be made, notice to the surety of such modifications, alterations, extensions of time, changes or additions being hereby waived, the foregoing to include any other purposes or items set out in, and to be subject to, the provisions of Massachusetts General Laws, Chapter 30, Section 39A, and Chapter 149, Section 29, as amended, then this obligation shall become null and void; otherwise it shall remain in full force and virtue.

In witness whereof we hereunto set our hand and seals this \_\_\_ day of \_\_\_\_\_, \_\_\_\_\_

\_\_\_\_\_  
(Print Name of General Contractor) (Seal)

\_\_\_\_\_  
(Print Name of Surety) (Seal)

By \_\_\_\_\_  
(Signature – Title)

By \_\_\_\_\_  
(Signature – Title)

Surety Address \_\_\_\_\_  
\_\_\_\_\_

**PERFORMANCE BOND**

**BOND No.** \_\_\_\_\_

Know all men by these presents, that

\_\_\_\_\_ as principal and \_\_\_\_\_ as surety are held and firmly bound unto the Commonwealth of Massachusetts in the sum of Dollars and Zero Cents (\$ .00) in lawful money of the United States of America, to be paid to the Commonwealth of Massachusetts, for which payments, well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

Whereas the said principal has made a Contract with the Commonwealth acting through its Department of Conservation and Recreation ("Awarding Authority") the construction of .

Now the condition of this obligation is such that if the principal shall well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of said Contract and any extensions thereof that may be granted by the Commonwealth, with or without notice to the surety, and during the life of any guarantee required under the Contract, and shall also well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of any and all duly authorized modifications, alterations, changes or additions to said Contract that may hereafter be made, notice to the surety of such modifications, alterations, changes or additions being hereby waived, then this obligation shall become null and void; otherwise it shall remain in full force and virtue.

In the event that the Contract is abandoned by the Contractor or is terminated by the Commonwealth under the provisions of said Contract, said surety shall, if requested in writing by the Commonwealth, take such action as is necessary to complete the Contract.

In witness whereof we hereunto set our hand and seals this \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_

\_\_\_\_\_ (Seal)  
(Print Name of General Contractor)

\_\_\_\_\_ (Seal)  
(Print Name of Surety)

By \_\_\_\_\_  
(Signature – Title)

By \_\_\_\_\_  
(Signature – Title)

Surety Address \_\_\_\_\_  
\_\_\_\_\_

**CERTIFICATE OF CORPORATE VOTE**

I hereby certify that I am the \_\_\_ clerk, \_\_\_ assistant clerk, of

\_\_\_\_\_ (the "Corporation") and that at a  
(Name of Corporation)

duly authorized meeting of the Board of Directors of the Corporation held on

\_\_\_\_\_ in \_\_\_\_\_ at which a quorum was  
(Date) (Location)

present and voting it was voted to authorize \_\_\_\_\_  
(Name)

\_\_\_\_\_ of the Corporation to execute  
(Officer Title)

and deliver on behalf of the Corporation Contract, and to act as principal to execute bonds in connection therewith,

I further certify that \_\_\_\_\_ is the duly qualified and acting  
(Name of Corporate Officer)

\_\_\_\_\_ of the Corporation and that said vote has not been  
(Officer Title)

Repealed, rescinded, or amended.

\_\_\_\_\_  
Name

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Date

(CORPORATE SEAL)

SUBSCRIBED AND SWORN TO THIS \_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_ BEFORE ME

\_\_\_\_\_  
Notary Public

My Commission Expires: \_\_\_\_\_

CERTIFICATE OF COMPLIANCE WITH STATE TAX LAWS AND WITH UNEMPLOYMENT  
COMPENSATION CONTRIBUTION REQUIREMENTS

Pursuant to MGL, c. 62C, s. 49A and MGL, c. 515A, s. 29A, I,

\_\_\_\_\_ authorized signatory for  
\_\_\_\_\_ whose principal place of business is at  
\_\_\_\_\_ do hereby certify  
under penalties of perjury that \_\_\_\_\_ has filed all  
state tax returns and paid all taxes as required by law and has complied with all state laws  
pertaining to contributions to the unemployment compensation fund and to payments  
in lieu of contributions.

The Business Organization Social Security Number or Federal Identification Number is

\_\_\_\_\_.

Signed under the penalties of perjury the \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_

Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_



**Schedule for Participation by Women and Minority Business Enterprise**

*(To be completed and submitted within five calendar days from bid opening)*

NOTE I: Participation of a Woman-owned or Minority-owned enterprise may be counted in only one category; the same participation cannot be used in computing the percentage of Minority participation and again of Women participation.

**Minority Business Enterprise Participation in the work**

Name & address of MBE	Dollar Value of Participation	Nature of Participation
1. _____ _____		
2. _____ _____		
3. _____ _____		

Total MBE Commitment: \_\_\_\_\_

Participation (divide Total Commitment by Total Bid Price) = \_\_\_\_\_ Percentage MBE

**ITEM II - Women Business Enterprise Participation in the work**

Name & address of WBE	Dollar Value of Participation	Nature of Participation
1. _____ _____		
2. _____ _____		
3. _____ _____		

Total WBE Commitment: \_\_\_\_\_

Percentage WBE Participation (divide Total Commitment by Total Bid Price) = \_\_\_\_\_

The bidder agrees to furnish implementation reports as required by the Department to indicate the M/WBE(s) which it has used or intends to use. Breach of this commitment constitutes a breach of the contract.

Name of bidder: \_\_\_\_\_

Date: \_\_\_\_\_ By: \_\_\_\_\_

# Letter of Intent – Women/Minority Business Enterprise Participation

(To be completed by W or MBE and Submitted by the Low Bidder within five calendar days of bid opening)

Project Number: \_\_\_\_\_

Circle one

Project Location: \_\_\_\_\_

To: \_\_\_\_\_

WBE MBE

Name of General Bidder

1. My company has been certified by SDO (Supplier Diversity Office) and it has not changed its women or minority ownership, control, or management without notifying SDO within thirty (30) calendar days of such a change.
2. My company understands that if your company is awarded the contract, your company intends to enter into an agreement with my company to perform the activity described below for the prices indicated. My firm also understands that your firm, as General Bidder, will make substitutions and quantity changes as allowed or required by the provisions of the contract with the Commonwealth.
3. This firm understands that under the terms of Article XIII of the contract, only work **actually performed** by an MBE/WBE will be credited toward MBE/WBE participation goals, and this firm **cannot assign or subcontract out any of its work** without prior written approval of the DCR Compliance Office, and that any such assignment or subcontracting will not be credited toward MBE/WBE participation goals.

## W or MBE PARTICIPATION

Contract Item	Description of Activity (with Notation such as "Labor Only", "Material Only", etc.)	Quantity	Unit Price	Total Amount
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Total Dollar Value: \_\_\_\_\_

*(Additional copies of this form shall be prepared by the Contractor in the quantity necessary to comply with the contract.)*

Name of MBE or WBE Firm \_\_\_\_\_ Authorized Signature \_\_\_\_\_

Business Address \_\_\_\_\_

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

Telephone No. \_\_\_\_\_ Cell: \_\_\_\_\_ Date \_\_\_\_\_

**COMMONWEALTH OF MASSACHUSETTS  
DEPARTMENT OF CONSERVATION AND RECREATION  
VETERAN OWNED BUSINESS ENTERPRISE POLICY  
AND CONTRACTOR CERTIFICATION**

In accordance with Executive Order No. 546, it is the policy of the Commonwealth and its executive agencies to promote self-reliance among veterans by offering such veterans who own and control business enterprises the opportunity to participate in state contracting activity, as well as to assist and encourage the participation of businesses owned and controlled by veterans in all areas of state procurement contracting, including contracts for public construction, design services, and commodities and services.

The Massachusetts Executive Office of Administration and Finance has therefore established the Veteran-Owned Business Enterprise (VOBE) Program (the "Program") to oversee the inclusion of business enterprises owned and controlled by veterans in all areas of state procurement contracting, including contracts for construction, design and professional services, and commodities and services. For more information on this Order, see: <http://www.mass.gov/governor/legislation/eexecorder/executiveorder/executive-order-no-546.html>.

DCR Requires Contractors to acknowledge this policy and the requirements as provided in the contract by signing this certification as well as the Contract Documents.

**CONTRACTOR CERTIFICATION**

As evidence by the signature of the Contractor's Authorized Signatory below, the Contractor certifies under the pains and penalties of perjury that the Contractor acknowledges the above-referenced policy as set forth in Executive Order 546, has read Executive Order 546, and will abide the requirements concerning the policy and order as set forth in the referenced Contract. The Contractor acknowledges that if the Contractor has not submitted an appropriate Schedule for VOB Participation and appropriate Letters of Intent establishing that the VOB participation goal for the project will be met, the Contractor may not be considered eligible for Award of the Contract unless he/she requests a waiver by completing and submitting the waiver form to the Contracts Administrator/DCR and that request is approved. The Contractor also understands and agrees that a breach of any of these terms during the period of the Contract may be regarded as a material breach, subjecting the Contractor to sanctions, including but not limited to monetary penalties, withholding of payments, contract suspension and /or termination.

\_\_\_\_\_  
Contractor Authorizing Signature

Date: \_\_\_\_\_

\_\_\_\_\_  
Print Name

Title: \_\_\_\_\_

Telephone: \_\_\_\_\_

Cell: \_\_\_\_\_

Email: \_\_\_\_\_

## Schedule for Participation by Veteran-Owned Business Enterprise

*(To be completed and submitted within five (5) calendar days from bid opening)*

NOTE: Participation of a Veteran-Owned Enterprise may be counted in only one category; the same participation cannot be used in computing the percentage of DBE/M/WBE participation.

### Veteran-Owned Business Enterprise Participation in the work

Name & address of VOB	Dollar Value of Participation	Nature of Participation
1. _____		
_____		
2. _____		
_____		
3. _____		
_____		

Total VOB Commitment: \_\_\_\_\_

Percent VOB Participation (divide Total Commitment by Total Bid Price)= \_\_\_\_\_

The bidder agrees to furnish implementation reports as required by the Department to indicate the VOB(s) which it has used or intends to use. Breach of this commitment constitutes a breach of the contract.

Name of bidder: \_\_\_\_\_

Date: \_\_\_\_\_ By: \_\_\_\_\_

## Letter of Intent – Veteran-Owned Business Enterprise Participation

(To be completed by VOB and Submitted by the Low Bidder within five (5) calendar days of bid opening; use and prepare extra forms as needed)

DCR Contract/ Project Number: \_\_\_\_\_

Project Location: \_\_\_\_\_

To: \_\_\_\_\_

VOBE

Name of General Bidder

My company has been certified by the Department of Veterans Affairs (VetBiz.gov) and or Supplier Diversity Office (SDO). it has not changed its veteran ownership, control, or management without notifying the Department of Veterans Affairs (VetBiz.gov) within thirty (30) calendar days of such a change.

1. My company understands that if your company is awarded the contract, your company intends to enter into an agreement with my company to perform the activity described below for the prices indicated. My firm also understands that your firm, as General Bidder, will make substitutions and quantity changes as allowed or required by the provisions of the contract with the Commonwealth.
2. This firm understands that under all relevant terms of the contract, only work **actually performed** by an VOB will be credited toward VOB participation goals, and this firm **cannot assign or subcontract out any of its work** without prior written approval of the DCR Compliance Office, and that any such assignment or subcontracting will not be credited toward SDVOBE participation goals.

### VOBE PARTICIPATION

Contract **Description of Activity** (with Item Notation such as “Labor Only”, Quantity, Unit Price, Total Amount, “Material Only”, etc.):

Activity	Labor or Material Only?	Quantity Unit Price	Total Dollar Value

VOBE Firm Name \_\_\_\_\_

Authorized Signature \_\_\_\_\_

Printed Name \_\_\_\_\_ Title \_\_\_\_\_

Telephone No. \_\_\_\_\_ Cell No. \_\_\_\_\_

E-mail: \_\_\_\_\_@\_\_\_\_\_ ; Date \_\_\_\_\_

**INSTRUCTIONS:**

Executive Order 481 applies to all state agencies in the Executive Branch, including all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established. As it is the policy of the Executive Branch to prohibit the use of undocumented workers in connection with the performance of state contracts, all contracts entered after February 23, 2007, require that contractors, as a condition of receiving Commonwealth funds under any Executive Branch contract, make the following certification:

**CONTRACTOR CERTIFICATION:**

As evidenced by the signature of the Contractor's Authorized Signatory below, the Contractor certifies under the pains and penalties of perjury that the Contractor shall not knowingly use undocumented workers in connection with the performance of all Executive Branch contracts; that pursuant to federal requirements, the Contractor shall verify the immigration status of all workers assigned to such contracts without engaging in unlawful discrimination; and that the Contractor shall not knowingly or recklessly alter, falsify, or accept altered or falsified documents from any such worker(s). The Contractor understands and agrees that breach of any of these terms during the period of each contract may be regarded as a material breach, subjecting the Contractor to sanctions, including but not limited to monetary penalties, withholding of payments, contract suspension or termination.

Date: \_\_\_\_\_

\_\_\_\_\_  
Contractor Authorizing Signature

\_\_\_\_\_  
Print Name

Title: \_\_\_\_\_

Telephone: \_\_\_\_\_

Cell: \_\_\_\_\_

Email: \_\_\_\_\_

**EQUAL EMPLOYMENT OPPORTUNITY COMPLIANCE FORM**

**Contractor's Certificate**

A contractor shall not be eligible for award of a contract unless such contractor has submitted the following certification to the Awarding Authority, said certification shall be deemed a part of the resulting contract:

**Contractor's Certification**

**X**

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

certifies that it intends to use the following listed **certification trades** in the work subject to this contract.

**X**

\_\_\_\_\_  
\_\_\_\_\_  
and, further, that it will comply with the minority manpower ratio and specific affirmative action steps contained herein; and will obtain from each of its subcontractors and submit to the Awarding Authority prior to the award of any subcontract under this contract, the subcontractor certification required by these bid conditions.

**X**

\_\_\_\_\_  
(Signature of authorized representative of contractor)

**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 shall be deemed a part of the resulting subcontract:

\_\_\_\_\_  
(Subcontractor)

certifies that: it intends to use the following listed construction trades in the work under the subcontract

\_\_\_\_\_  
\_\_\_\_\_  
and, further, it will comply with the manpower ratio and specific affirmative action steps contained herein and will obtain from each of the subcontractors prior to the award of any subcontract under this subcontract, the subcontractor certification required by these bid conditions.

\_\_\_\_\_  
(Signature of authorized representative of subcontractor)

In order to ensure that said subcontractor's certification becomes a part of all subcontracts under the general contract, no subcontract shall be executed unless or until an authorized representative of the Awarding Authority administering this contract has determined, in writing, that said certification has been incorporated in such subcontract, regardless of tier. Any subcontract executed without such written approval shall be void.

**Exhibit A**  
**Executive Order 504 Contractor Certification Form**

**BIDDER/CONTRACTOR LEGAL NAME:**

**BIDDER/CONTRACTOR VENDOR/CUSTOMER CODE: VC**

**Executive Order 504:** For all Contracts involving the Contractor’s access to personal information, as defined in M.G.L. c. 93H, and personal data, as defined in M.G.L. c. 66A, owned or controlled by Executive Department agencies, or access to agency systems containing such information or data (herein collectively “personal information”), Contractor certifies under the pains and penalties of perjury that the Contractor (1) has read Commonwealth of Massachusetts Executive Order 504 and agrees to protect any and all personal information; and (2) has reviewed all of the Commonwealth of Massachusetts Information Technology Division’s Security Policies available at [www.mass.gov/ITD](http://www.mass.gov/ITD) under Policies and Standards.

Notwithstanding any contractual provision to the contrary, in connection with the Contractor’s performance under this Contract, for all state agencies in the Executive Department, including all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established, the Contractor shall:

(1) obtain a copy, review, and comply with the contracting agency’s Information Security Program (ISP) and any pertinent security guidelines, standards, and policies; (2) comply with all of the Commonwealth of Massachusetts Information Technology Division’s Security Policies (“Security Policies”) available at [www.mass.gov/ITD](http://www.mass.gov/ITD) under Policies and Standards.

(2) communicate and enforce the contracting agency’s ISP and such Security Policies against all employees (whether such employees are direct or contracted) and subcontractors.

(3) implement and maintain any other reasonable appropriate security procedures and practices necessary to protect personal information to which the Contractor is given access by the contracting agency from the unauthorized access, destruction, use, modification, disclosure, or loss.

(4) be responsible for the full or partial breach of any of these terms by its employees (whether such employees are direct or contracted) or subcontractors during or after the term of this Contract, and any breach of these terms may be regarded as a material breach of this Contract.

(5) in the event of any unauthorized access, destruction, use, modification, disclosure or loss of the personal information (collectively referred to as the “unauthorized use”): (a) immediately notify the contracting agency if the Contractor becomes aware of the unauthorized use; (b) provide full cooperation and access to information necessary for the contracting agency to determine the scope of the unauthorized use; and (c) provide full cooperation and access to information necessary for the contracting agency and the Contractor to fulfill any notification requirements.

Breach of these terms may be regarded as a material breach of this Contract, such that the Commonwealth may exercise any and all contractual rights and remedies, including without limitation indemnification under Section 11 of the Commonwealth’s Terms and Conditions, withholding of payments, contract suspension, or termination. In addition, the Contractor may be subject to applicable statutory or regulatory penalties, including and without limitation, those imposed pursuant to M.G.L. c. 93H and under M.G.L. c. 214, § 3B for violations under M.G.L. c. 66A.

Bidder/Contractor Name: \_\_\_\_\_

Bidder/Contractor Authorized Signature: \_\_\_\_\_

Print Name and Title of Authorized Signatory: \_\_\_\_\_

Date: \_\_\_\_\_

This Certification may be signed once and photocopied to be attached to any Commonwealth Contract that does not already contain this Certification Language and shall be interpreted to be incorporated by reference into any applicable contract subject to Executive Order 504 for this Contractor.





COMMONWEALTH OF MASSACHUSETTS  
DEPARTMENT OF CONSERVATION & RECREATION  
STANDARD CONSTRUCTION CONTRACT

**PART III**

**GENERAL CONDITIONS OF THE CONTRACT**

FOR PROJECTS SUBJECT TO M.G.L. CH. 149 OR  
M.G.L. CH. 30, SEC. 39M

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## ARTICLE I: DEFINITION OF TERMS

The following words shall have the following meanings as used in this Contract:

**Advertisement:** The Advertisement or Notice Inviting Bids or Proposals for the Work identified in Article 1 of the Department of Conservation and Recreation - Contractor Agreement.

**Approval: (or Approved):** An approval in writing signed by the authorized signatory of the Awarding Authority.

**As directed (As permitted, as required, as determined or words of like effect):** The direction, permission, requirement, or determination of the Awarding Authority. Similarly, *approved, acceptable, satisfactory* or words of like import shall mean approved by or acceptable or satisfactory to the Awarding Authority.

**Awarding Authority:** The Department of Conservation and Recreation, the public agency awarding and administering this Contract, as identified in the Department of Conservation and Recreation - Contractor Agreement. Where the Awarding Authority is an agency of the Commonwealth, references to the Awarding Authority shall also include the Commonwealth and its agencies.

**Building Code:** All applicable rules and regulations to which the Awarding Authority is subject, and which are contained or referenced in the code authorized by M.G.L. c. 143, sec. 93 et seq., including all amendments thereto.

**Change Order:** (1) A written order not requiring the consent of the Contractor, signed by the Project Engineer, and designated as a Change Order, directing the Contractor to make changes in the Work within the general scope of the Contract, or (2) any written or oral order from the Project Engineer that causes any change in the Work, provided that the Contractor has given the Awarding Authority written notice stating the date, circumstances, and source of the order and that the Contractor regards the order as a Change Order.

**Contract:** The Contract formed by the Contract Documents as defined in Article 6 of the Department of Conservation and Recreation - Contractor Agreement.

**Contract Documents:** The documents listed in Article 6 of the Department of Conservation and Recreation - Contractor Agreement.

**Contract Modification:** Any alteration of the Contract Documents accomplished by a written agreement properly executed by the parties to this Contract.

**Contract Price:** The Contract Price stated in Article 3 of the Department of Conservation and Recreation - Contractor Agreement, which is the total sum, owed to the Contractor for all of the Work.

**DCR:** The Department of Conservation and Recreation, the public agency awarding and administering this Contract.

**Designer:** The architect or engineer who prepared the plans and specifications for the work, identified as the Designer in Article 1 of the Department of Conservation and Recreation – Contractor Agreement.

**Dispute Review Board:** A panel of three experienced impartial reviewers organized and agreed upon by the DCR and Contractor. The Board members are provided with project plans and Specifications, and become familiar with project procedures and participants. The Board meets on the job site regularly to encourage the resolution of disputes at the job level and renders non-binding recommendations on the resolution of the dispute.

**Drawings:** The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location, and dimensions of the Work, generally including Plans, elevations, sections, details, schedules, and diagrams.

**Engineer:** The Project Engineer, except that the term "Resident Engineer" shall have the meaning otherwise specified herein.

**Final Acceptance:** The written determination by the Awarding Authority that the Work has been 100% completed, except for the Contractor's indemnification obligations, warranty obligations, obligations to continue to maintain insurance coverage for the time periods provided in the Contract Documents, and any other obligations which are intended to survive Final Acceptance and/or the termination of the Contract.

**General Bid:** The completed bid form submitted by the Contractor in accordance with the requirements of either M.G.L. c. 149 or M.G.L. c. 30, sec. 39M.

**Laws:** All applicable statutes, regulations, ordinances, codes, laws, orders, decrees, approvals, certificates, and requirements of governmental and quasi-governmental authorities.

**Neutral:** An impartial third party not having an interest in the Owner, DCR, the Contractor or the Project.

**Notice to Proceed:** The written notice provided by the Awarding Authority to the Contractor which authorizes the Contractor to commence the Work as of a date specified therein and complete the entire Work of the Contract by a date specified therein.

**Or equal (or words of like import):** Equal in the opinion of the Awarding Authority, determined pursuant to the provisions of M.G.L. c. 30, sec. 39M and the provisions of these General Conditions of the Contract.

**Owner:** The Commonwealth of Massachusetts or political subdivision thereof, authority, or other instrumentality that will own the Work.

**Plan(s):** Drawing(s).

**Product Data:** Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor or its Subcontractors and suppliers to illustrate materials or equipment for some portion of the Work. Product data also include any such information or instructions produced by the manufacturer or distributor of such materials or equipment and made readily available by said manufacturer or distributor.

**Progress Schedule:** The progress schedule Approved by the Awarding Authority in accordance with Article VI of these General Conditions of the Contract.

**Project:** The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner, the Department of Conservation and Recreation, or by separate contractors.

**Project Engineer:** The Awarding Authority's representative assigned to the Project.

**Punch List:** A list of items determined by the Awarding Authority to be minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work for its intended purpose.

**Resident Engineer:** The On-Site representative of the Awarding Authority.

**Samples:** Samples are physical examples that illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.

**Schedule of Values:** The schedule Approved by the DCR pursuant to Article VIII of these General Conditions of the Contract which allocates the Contract Price to the various portions of the Work and is used as a basis for payments to the Contractor.

**Shop Drawings:** Drawings, diagrams, details, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate a portion of the Work.

**Site:** The land and, if any, building(s), space within any such building(s), or other structures on which or in which the Contractor is to perform the Work.

**Specifications:** The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards, and workmanship for the Work and performance of related services.

**Subcontractor:** Person or entity with whom the Contractor contracts in order to perform the Work, except as otherwise specifically provided or required herein or by Law.

**Substantial Completion:** For work subject to M.G.L. c. 30 sec. 39K, "substantial completion" shall occur when (1) the Contractor fully completes the Work or substantially completes the Work so that the value of the Work remaining to be done is, in the estimate of the DCR, less than one percent of the original contract price, or (2) the Contractor substantially completes the Work and the DCR takes possession for occupancy, whichever occurs first. For work subject to M.G.L. c. 30 sec. 39G, "substantial completion" shall mean either that the work required by the Contract has been fully completed, completed except for work having a Contract Price of less than one percent of the then adjusted total Contract Price, or substantially all of the Work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work.

**Superintendent:** The licensed construction supervisor who is an employee of the Contractor designated to be in full-time attendance at the Site throughout the prosecution and progress of the Work and who shall have complete authority to act for the Contractor.

**Work:** The Work defined in Article 1 of the Department of Conservation and Recreation - Contractor Agreement, Article II, Section 2 of these General Conditions of the Contract and otherwise in the Contract Documents.

**Working Hours:** 7:00 a.m. to 5:00 p.m., but not more than eight hours per day, Monday through Friday, unless otherwise specified by applicable Laws or deemed necessary by the DCR for traffic considerations or to minimize other contract impacts to the public.

All terms that this Contract defines may be used with or without initial capital letters. Other terms, abbreviations and references are defined as they appear herein. Words and abbreviations that are not defined in the Contract Documents, but which have recognized technical, or trade meanings are used in accordance with those meanings. For additional definitions of terms, abbreviations and references refer to the *Special Conditions or Specifications*.

## **ARTICLE II: EXECUTION OF THE CONTRACT, SCOPE OF WORK, INTERPRETATION OF CONTRACT DOCUMENTS**

### **1. Execution.**

The execution of the Department of Conservation and Recreation – Contractor Agreement by the Contractor is a representation that the Contractor has visited the Site, has become familiar with local conditions under which the Work is to be performed and has correlated personal observations with requirements of the Contract Documents.

### **2. Scope of Work.**

The Work consists of the Work identified in the Contract Documents. The Work comprises the completed construction required by the Contract Documents and includes all labor, tools, materials, supplies, equipment, permits, approvals, paperwork, calculations, submittals, and certificates necessary to develop, construct and complete the Work in accordance with all Laws, and all construction and other services required to be supervised, overseen, performed or furnished by the Contractor or that the Contract Documents require the Contractor to cause to be supervised, overseen, performed or furnished. The Contractor shall provide and perform for the Contract Price all of the duties and obligations set forth in the Contract Documents.

### **3. Interpretation.**

**A.** The Plans and Specifications and other Contract Documents are to be considered together and are intended to be mutually complementary, so that any work shown on the Plans though not specified in the Specifications, and any work specified in the Specifications though not shown on the Plans, is to be executed by the Contractor as a part of this Contract.

**B.** All things that in the opinion of the Project Engineer may be reasonably inferred from the Plans, Specifications and other Contract Documents are to be executed by the Contractor. The Project Engineer shall determine whether the detail Plans conform to the general Plans and Contract Documents, except as may be otherwise determined by the DCR.

**C.** The tables of contents, titles, headings and marginal notes or sub-scripts contained herein are solely to facilitate references, are not intended to be construed as provisions of the Contract, and in no way affect the interpretation of the provisions to which they refer.

**D.** Where reference is made in the Contract Documents to publications, standards, or codes issued by associations or societies, such reference shall be interpreted to mean the current edition of such publications, standards, or codes, including revisions in effect on the date of the Advertisement, notwithstanding any reference to a particular date. The foregoing sentence shall not apply to the dates, if any, specified with respect to insurance policy endorsement forms.

**E.** In case of any conflict among the Contract Documents, unless the context clearly otherwise requires, the Contract Documents shall be construed according to the following priorities:

- First Priority: Contract Modifications
- Second Priority: Department of Conservation and Recreation - Contractor Agreement
- Third Priority: General Conditions of the Contract
- Fourth Priority: Special Conditions of the Contract
- Fifth Priority: Drawings -- Schedules take precedence over enlarged detail Drawings, and enlarged Detail Drawings take precedence over reduced scale Drawings; figured dimensions shall prevail over scale.
- Sixth Priority: Specifications

#### **4. Distribution of Work.**

The distribution of the Work is intended to be described under the appropriate trades and, except for filed sub-bid work, may be redistributed, except as directed herein, provided that such redistribution shall cause no controversy among the trades and no delay in the progress of the Work.

#### **5. Contract Price.**

The Contract Price constitutes full compensation to the Contractor for everything to be performed and furnished in connection with the Work and for all damages arising out of the performance of the Work and/or the action of the elements and constitutes the maximum compensation regardless of any difficulty incurred by the Contractor in connection with the Work or in consequence of any suspension or discontinuance of the Work. The costs associated with the requirements of the General Conditions and any required in the Special Conditions or Specifications shall be included in the Contract Price and no direct or separate payment shall be made to the Contractor.

### **ARTICLE III: CONTROL OF WORK/ADMINISTRATION OF THE CONTRACT**

#### **1. DCR.**

The Project Engineer shall be responsible for the general administration of the Contract. Except as otherwise specifically provided herein, the Project Engineer shall decide all questions which may arise as to the conduct, quantity, quality, equality, acceptability, fitness, and rate of progress of the several kinds of work and materials to be performed and furnished under this Contract and shall decide all questions which may arise as to the interpretation of the Plans and Specifications and as to the fulfillment of this Contract on the part of the Contractor.

#### **2. Right of Access to Work.**

The DCR, and persons designated by it, may for any purpose enter upon the Work, the Site, and premises used by the Contractor, and the Contractor shall provide safe facilities therefor. Other contractors of the DCR may also enter upon the same for the purposes which may be required by their contracts or work. Any differences or conflicts which may arise between the Contractor and other contractors of the DCR with respect to their work shall be initially resolved by the DCR.

#### **3. Inspection No Waiver.**

No inspection by the DCR or its employees or agents, and no order, measurement, certificate, approval, payment order, payment, acceptance or any other action or inaction of any of them, shall operate as a waiver by the DCR of any provision of this Contract.

### **ARTICLE IV: GENERAL PERFORMANCE OBLIGATIONS OF THE CONTRACTOR**

The Contractor shall complete for the Contract Price all of the Work in a proper, thorough, and workmanlike manner in accordance with the Contract Documents. Without limiting the foregoing and without limiting the Contractor's obligations under any other provision of the Contract Documents, the Contractor shall for the Contract Price perform the following general obligations:

#### **1. Review of Contract Documents and Field Conditions.**

**A.** Before commencing the Work, the Contractor shall carefully study the Contract Documents and carefully compare all Specifications, Plans, Drawings, figures, dimensions, lines, marks, scales, directions of the Project Engineer, and any other information provided by the DCR and shall at once report to the Project Engineer in writing any questions, errors, inconsistencies, or omissions.

**B.** Before commencing the Work, the Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents and shall at once report to the Project Engineer in writing any questions, errors, inconsistencies, or omissions.

**C.** Any work performed by the Contractor after the discovery of said discrepancies without the written approval of the DCR shall be at the Contractor's risk and expense.

**D.** The Contractor shall be responsible for any and all errors in the Work arising from the Contractor's failure to comply with any of the requirements set forth in this section. The Contractor shall not be entitled to any extra compensation for any work or expense arising from or caused by his/her failure to comply with said requirements.



## **2. Supervision and Construction Procedures: Coordination: Cutting, and Patching.**

**A.** The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and shall have control over, construction means, methods, techniques, sequences, and procedures, and shall be responsible for coordinating all portions of the Work under the Contract.

**B.** The Contractor shall be responsible for the proper fitting of all work and the coordination of the operations of all trades, subcontractors, and material suppliers engaged upon the Work. The Contractor shall guarantee to each of its subcontractors all dimensions which they may require for the fitting of their work to all surrounding work. Where equipment and lines of piping are shown diagrammatically, the Contractor shall be responsible for the coordination and orderly arrangement of the various lines of embedded piping and conduit included in the Work. The Contractor shall coordinate the work of any Subcontractor and prevent all interferences between the equipment, lines of piping or structural and architectural features, and avoid any unsightly arrangements in exposed work.

**C.** The Contractor should note that other contractors may be working on or near the Site where the Contractor's Work is being performed. The Contractor shall coordinate his/her work and the operations of all trades, subcontractors, and material suppliers engaged upon the Work so as not to interfere with or hinder the progress or completion of work being performed under another DCR contract.

**D.** All necessary cutting, coring, drilling, grouting, and patching required to fit together the several parts of the Work shall be done by the Contractor, except as may be specifically noted otherwise under any particular filed sub-bid section of the Specifications.

**E.** The Contractor shall be responsible to the DCR for the acts and omissions of the Contractor's employees, agents and Subcontractors, and their agents and respective contractors' employees, and other persons performing portions of the Work or supplying materials therefor.

**F.** The Contractor shall be responsible for the inspection of portions of the Work already performed under this Contract to determine that such portions are in proper condition to receive subsequent Work.

**G.** The Contractor shall employ a registered land surveyor to perform any engineering required for establishing grades, lines, levels, dimensions, layouts, and reference points for the trades. The Contractor shall be responsible for maintaining benchmarks and other survey marks and shall replace any benchmarks or survey marks that may have become disturbed or destroyed. The Contractor shall verify the materials shown on the Drawings before laying out the Work and shall be responsible for any error resulting from its failure to exercise this precaution.

**H.** Unless otherwise required by the Plans and Specifications, or directed in writing by the DCR, Work shall be performed during regular Working Hours. However, if the Contractor desires to carry on the Work outside of regular working hours or on Saturdays, Sundays, or Massachusetts or federal holidays, then the Contractor shall allow ample time to allow satisfactory arrangements to be made for inspecting Work in progress and shall bear the costs of such inspection. The DCR shall bill the Contractor directly for such costs.

**I.** Work performed outside of regular Working Hours without the consent or knowledge of the DCR shall be subject to additional inspection and testing as directed by the DCR. The cost of this inspection and testing shall be borne by the Contractor whether the Work is found to be acceptable or not. The DCR at its election shall be entitled either to issue a credit Change Order to cover such cost or to withhold such cost from any further payments due the Contractor and/or to receive a payment from the Contractor of the amount of such cost.

## **3. Superintendent.**

**A.** The Contractor shall employ a Superintendent whose appointment shall be subject to the Approval of the DCR. The Superintendent shall be in attendance at the Site full-time during the performance of the Work. The Superintendent shall represent the Contractor. Communications given to and from the Superintendent shall be deemed given to and from the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed upon written request in each case. The Superintendent shall attend each job meeting. The Superintendent shall be responsible for coordinating all of the Work of the Contractor and the Subcontractors.

**B.** The Superintendent shall be a competent employee regularly employed by the Contractor. The Superintendent shall be licensed in accordance with the Building Code, if applicable, and shall have satisfactorily performed similar duties on previous construction projects similar in type, complexity, and scale to the Project. The Superintendent's resume shall be submitted to the DCR prior to commencement of construction together with such other information as the DCR may reasonably require in order to determine whether or not to Approve of his or her appointment. Any change in the Superintendent shall require the prior consent of the DCR. The Contractor shall establish an emergency telephone line by which the DCR or its agents may contact the Superintendent during non-working hours.

#### **4. Labor.**

**A.** The Contractor shall employ only competent workers. The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. Whenever the DCR shall notify the Contractor in writing that any worker is, in the DCR's opinion, incompetent, unfaithful, disorderly, or otherwise unsatisfactory, such employee shall be discharged from the Work and shall not again be employed on the Project except with the consent of the DCR.

**B.** The Contractor shall employ a sufficient number of workers to carry on the Work with all proper speed in accordance with Laws, the requirements of the Contract Documents, and the Progress Schedule.

**C.** The Contractor shall procure materials from such sources and shall manage its own forces and the forces of its Subcontractors and any sub-subcontractors in such a manner as will result in harmonious labor relations on the Project Site. If union and nonunion workers are employed to perform any part of the Work, the Contractor shall establish and maintain separate entrances to the Site for the use of union and nonunion workers. The Contractor shall cause persons to be employed in the Work who will work in harmony with others so employed. Should the Work be stopped or materially delayed in the DCR's reasonable judgment due to a labor dispute, the DCR shall have the right to require the Contractor to employ substitutes acceptable to the DCR.

**D.** The Contractor shall bear the entire expense, and no separate or direct payment shall be made by the DCR, as a result of extra work which may be necessary because of inferior workmanship, or for specific items of work which are normally considered a part of good workmanship in completing any particular phase of the work.

#### **5. Notices and Permits.**

**A.** The Contractor at its sole cost shall take out and pay for all approvals, permits, certificates and licenses required by Laws, pay all charges and fees, and pay for (or cause the appropriate Subcontractor to pay for) all utilities required for the proper execution of the Work. All permits secured by the Contractor, complete with the application and orders of conditions, shall be kept on file in the Contractor's office and field office with copies submitted to the Project Engineer.

**B.** The Contractor shall comply with all Laws and shall give all notices required thereby.

**C.** Except as otherwise specified in this Contract, it is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable Laws. However, if the Contractor observes that portions of the Contract Documents are at variance with the requirements of Laws, the Contractor shall promptly notify the DCR in writing, and necessary changes shall be accomplished by an appropriate Contract Modification.

**D.** If the Contractor performs work knowing it to be contrary to Laws without giving such notice to the DCR, the Contractor shall bear full responsibility for such Work and all costs attributable thereto, including, without limitation, corrections to the Work.

#### **6. Lines, Marks etc.**

The Contractor shall furnish batter boards and stakes and shall cause to be placed and maintained thereon so as to be easily read, such lines, marks and directions relating to the Work as the Project Engineer shall from time to time direct. The Project Engineer shall establish base lines and benchmarks on the Drawings for the locations of the Work but all other lines and grades in the field shall be determined by the Contractor.

#### **7. Excavation.**

The Contractor shall prevent by sheeting and shoring or bracing, if necessary, any caving or bulging of the sides of any excavation made by the Contractor, leaving sheeting, and shoring in place, or if any is removed, filling solid the spaces left thereby.

#### **8. Dewatering/Hoisting/Staging.**

The Contractor shall provide pumping, drainage, and disposal of all water and other flows so that no puddle, nuisance, or damage will be caused by water or flooding. If pumping results in contaminated water the Contractor shall take appropriate measures to treat this water prior to discharge and shall seek appropriate permits for discharge of water. The Contractor shall provide all hoisting equipment and machinery required for the proper execution of the Work. The Contractor shall provide all exterior and interior staging required to be over eight feet in height, except as may be otherwise provided in the Contract Documents.

### **9. Corrections to the Work: Inspection No Bar to Subsequent Corrections.**

The DCR's inspection of the Work shall not relieve the Contractor of its responsibilities to fulfill the Contract obligations. Defective work may be rejected by the DCR whether or not such work and/or materials have been previously overlooked or misjudged by the Resident Engineer or Project Engineer and accepted for payment. If the Work or any part thereof shall be found defective at any time before the Final Acceptance of the whole Work, the Contractor shall forthwith cease the performance of any defective work in progress and, whether or not such work is still in progress, shall forthwith correct such defect in a manner satisfactory to the Project Engineer. If any material brought upon the Site for use in the Work, or selected for the same, shall be rejected by the Project Engineer as unsuitable or not in conformity with the Contract Documents, or as damaged by casualty or deteriorated due to improper storage at the Site or to any other factor, the Contractor shall forthwith remove such materials from the Site. The Contractor shall pay for the cost of making good all work or property of other contractors, the Owner or of the Department of Conservation and Recreation destroyed or damaged by such removal or replacement; repair any injury, defect, omission, or mistake in the Work as soon as it is discovered; finish and immediately make good any defect, omission, or mistake in the Work; and complete and leave the Work in perfect condition.

### **10. Sanitary Facilities.**

The Contractor shall provide and maintain sanitary facilities for all persons employed on the Work, beginning with the first worker at the Site. Said facilities shall meet the following requirements unless otherwise specified in the Special Conditions or Specifications.

**A.** There shall be no fewer facilities than the number required by applicable Laws.

**B.** Facilities shall be always kept in a clean sanitary condition and shall be adequately screened to be inaccessible to flies. (**Note:** If existing sanitary facilities at the Site are to be used by the Contractor, this requirement will be modified accordingly in the Special Conditions or Specifications.)

### **11. Temporary Offices.**

**A. Contractor's Field office.** The Contractor shall erect a temporary field office at or near the Site of the Work at which the Contractor's authorized representative shall be always present while the Work is in progress. Instructions, notices, and other communications delivered there by the DCR shall be deemed delivered to the Contractor. The Contractor shall adequately furnish and maintain this office in a clean, orderly condition.

**B. Resident Engineer's Office.** The Contractor shall erect an Office for the Resident Engineer if, and as required by the Special Conditions or Specifications of the Contract.

### **12. Telephones.**

**A.** The Contractor shall provide and maintain telephone service in the Contractor's field office. The Contractor shall pay for all calls and costs relating to this service. The DCR and its employees and authorized agents shall always be allowed the use of this telephone service without charge. Telephone service and equipment shall meet the requirements, if any, of the Special Conditions or Specifications.

**B.** The Contractor shall also provide and maintain telephone service in the Resident Engineer's Office, when the Contractor is required to erect such office, for the use of the DCR and its employees and authorized agents. The Contractor shall pay for all calls and costs relating to this service. Telephone service and equipment shall meet the requirements, if any, of the Special Conditions or Specifications.

### **13. Project Sign.**

**A.** The Contractor shall furnish and erect at a suitable location, Approved by the Project Engineer, at the start of the work, a sign having dimensions of at least eight (8) feet long by four (4) feet high, bearing the words: Massachusetts Department of Conservation and Recreation. Also included may be the project title, expected completion date, and facility name.

**B.** The Contractor shall submit the design of the sign to the Project Engineer for review and approval prior to posting.

#### **14. Contract Documents and Samples at the Site.**

The Contractor shall maintain at the Site for the use and information of the DCR one record copy of the Drawings, Specifications, Addenda, Change Orders, Approved Shop Drawings, Product Data, Samples, updated Progress Schedule, and all other submittals, all in good order and marked currently to record changes and selections made during construction. These shall be available to the DCR and shall be delivered to the DCR upon completion of the Work.

#### **15. Safety Laws, Regulations, and Practices.**

**A.** The Contractor shall comply with all health and safety Laws applicable to the Work. Without limitation,

(1) If the Contractor uses or stores toxic or hazardous substances it shall comply with M.G.L. c. 111F, sec. 2, the "Right to Know" law and regulations promulgated by the Department of Public Health, 105 CMR 670, the Department of Environmental Protection, 310 CMR 33, and the Department of Labor and Workforce Development, 441 CMR 21; and shall post a Workplace Notice obtainable from the Department of Labor and Workforce Development.

(2) The Contractor shall comply with the Federal Resource Conservation and Recovery Act, the Federal Comprehensive Environmental Response, Compensation and Liability Act, M.G.L. c. 21C, M.G. L. c. 21E, and any other Laws affecting toxic or hazardous materials, solid, special, or hazardous waste (collectively "Hazardous Materials Laws"). Should the Contractor discover unforeseen materials subject to Hazardous Materials Laws at the Site, the Contractor shall immediately notify the DCR of such discovery.

(3) The Contractor shall be responsible for the location of all utilities in connection with the Work. Without limiting the foregoing, the Contractor shall comply with Dig Safe Laws. Dig Safe is the Utility Underground Plant Damage Prevention System established pursuant to M.G.L. c. 164, sec. 76D. This System is operated by Dig Safe Systems, Inc., located at 331 Montvale Avenue, Woburn, MA 01801, whose toll-free telephone number is 1-888-DIG-SAFE (1-888-344-7233). The Contractor shall notify Dig Safe of contemplated excavation, demolition, or explosive work in public or private ways, and in any utility company right of way or easement, by certified mail, with a copy to Department of Environmental Protection (DEP). This notice shall be given at least 72 hours prior to the work, but not more than sixty days before the work is to be done. Such notice shall state the name of the street or the route number of the way and shall include an accurate description of the location and nature of the proposed work. Dig-Safe is required to respond to the notice within 72 hours of receipt by designating the location of pipes, mains, wires, or conduits at the Site. The Contractor shall not commence work until Dig-Safe has responded. The work shall be performed in such manner and with reasonable precautions taken to avoid damage to utilities under the surface at the work location. The Contractor shall provide the Superintendent with current Dig-Safe regulations, and a copy of M.G.L. c. 82, sec. 40. Any costs related to the services performed by Dig-Safe shall be borne by the Contractor.

(4) The Contractor shall comply with Public Law 92-596, "Occupational Safety and Health Act of 1970" (OSHA), with respect to all rules and regulations pertaining to construction, U.S. Code Title 29, sections 651 et seq. including Volume 36, numbers 75 and 105 of the Federal Register as amended, and as published by the U.S. Department of Labor.

(5) The Contractor shall comply with M.G.L. c. 149, sec. 129A, relative to shoring and bracing of trenches.

**B.** The Contractor shall take reasonable precautions to prevent damage, injury, or loss to persons (whether under his management, DCR staff, or the general public) or property. Nothing herein shall relieve Subcontractors of their responsibility for the safety of persons and property, and for compliance with all Laws applicable to the Work and their activities in connection therewith. Without limitation, the Contractor shall take all reasonable precautions for the safety of, and the prevention of injury or damage to (1) all agents and employees and contractors on the Work and all other persons who may be affected thereby including the general public, (2) all the Work and all materials and equipment to be incorporated therein, whether in storage on or off the Site, under the care custody or control of the Contractor or any of its Subcontractors or any contractors directly or indirectly contracting through any of them, and (3) other property at the Site or adjacent thereto, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of the Work. The Contractor shall promptly remedy all damage or loss to any such property caused in whole or in part by the Contractor, any Subcontractor, or anyone directly or indirectly contracted or employed by any of them or by anyone for whose acts any of them may be liable. Without limiting the foregoing, the Contractor shall:

(1) post and maintain adequate danger signs and other warnings against hazards.

(2) promulgate safety regulations and give appropriate notices to the DCR and users of adjacent utilities and property.

- (3) ensure the adequate strength and safety of all scaffolding, staging and hoisting equipment, temporary shoring, bracing, and tying.
- (4) protect adjoining private or public property.
- (5) provide barricades, temporary fences, and covered walkways required by prudent construction practices, Laws and/or the Contract Documents.
- (6) furnish approved hard hats and other personal protective equipment, furnish approved first aid supplies, furnish the name of the first aid attendant, and maintain a posted list of emergency facilities.
- (7) provide proper means of access to property where the existing access is cut off by the Contractor, including maintaining traffic over, through or around the Work included in this contract, with the maximum safety, and practicable convenience to such traffic suspended temporarily.
- (8) maintain from the beginning of any darkness or twilight through the whole of every night sufficient lights on or near any obstruction to guard or protect travelers from injury from such obstruction.
- (9) maintain adequate security at the Site so as not to expose the Work, the materials to be incorporated in the Work, DCR's materials stored or otherwise located upon the Site, and surrounding property to vandalism or malicious mischief.
- (10) provide adequate fire protection procedures during the use of cutting torches, welding equipment, plumbers' torches and other flame and spark producing apparatus.
- (11) take prompt action to correct any dangerous or hazardous conditions.

**C. Use of Explosives:** The use of explosives will not be permitted in the Work unless specifically authorized in the technical Specifications, Special Conditions and/or Drawings or approved by the DCR in writing. If such approval is given, the Contractor shall comply with all Laws and obtain all permits, approvals, and certificates required in connection with the same and shall exercise best efforts, including but not limited to the employment and supervision of properly qualified personnel, to prevent damage, injuries, and accidents involving said explosives.

**D.** Written notice shall be given by the Contractor to all public service corporations or officials owning or having charge of public or private utilities of his/her intention to commence operations affecting such utilities at least seventy-two (72) hours exclusive of Saturdays, Sundays, and legal Holidays in advance of the start of such operations, and the Contractor shall at the same time file a copy of said notice with the DCR.

**E.** When necessary, the Contractor shall cooperate with representatives of public service companies to avoid damage to their structures by furnishing and erecting suitable supports, props, shoring or other means of protection. Fire hydrants adjacent to the work always shall be readily accessible to fire apparatus and no materials or other obstructions shall be placed within a radius of 10 feet of a fire hydrant.

**F.** Although the drawings may indicate the approximate location of existing subsurface utilities in the vicinity of the work, the accuracy and completeness of the information is not guaranteed by the DCR. Before commencing any work, or operations which may endanger or damage any subsurface structures, the Contractor shall carefully locate all such structures and conduct his/her operations in such manner as to avoid damage thereto. He/she shall not interrupt live services until new services have been provided. All abandoned services shall be plugged or otherwise made secure.

**G.** If the Contractor wishes to have any utilities temporarily relocated for his/her convenience, other than those specified by DCR, he/she shall submit such a request in writing to the Project Engineer. If the DCR approves this request, the Contractor shall pay for the cost of the relocation at his/her sole expense.

**H.** Land monuments and property markers shall be carefully protected. If is necessary to remove land monuments and/or property markers to perform the contract Work, the Contractor shall do so only at the DCR's direction and after an authorized agent of the DCR has referenced their location.

**I.** The Contractor shall not injure or remove trees or shrubs without authorization from the DCR.

**J.** Disturbance or damage to any above- or below-ground structures, conduits, cables, or the like, caused by any act of omission, neglect or misconduct in the execution or non-execution of work thereof by the Contractor shall be repaired, and/or replaced by the Contractor to the satisfaction of the DCR and at no additional expense to the DCR.

**K.** Disturbance or damage to any structure shall be replaced or repaired by the Contractor to the satisfaction of the DCR and at no additional expense to the DCR.

**L.** The Contractor shall receive no extra compensation for protection and restoration of property unless said compensation is authorized in writing by the DCR, as specified under Article VI I of the Contract General Conditions.

**M.** The Contractor shall not permit cutting or welding in or immediately adjacent to existing property of the Department of Conservation and Recreation or of anyone else without the DCR's prior approval in each instance.

**N.** The Contractor shall designate by notice to the DCR a responsible member of its organization at the Site whose duties shall include preventing accidents.

**O.** The Contractor shall submit to the DCR without delay verbal and written reports of all accidents involving bodily injury or property damage arising in connection with the Work.

**P.** In any emergency affecting the safety of persons or property the Contractor shall immediately act in the exercise of reasonable judgment to prevent threatened damage, injury, or loss. The Contractor shall immediately notify the DCR of such emergency.

## **16. Environmental Protection**

**A.** The DCR shall secure the required environmental permits required under M.G.L. Chapters 131 and 91, including the National Pollutant Discharges Elimination System (NPDES) Construction General Permit and those issued by the Army Corps of Engineers under Section 404 of the Clean Water Act (33 U.S.C. 1344) and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403). The Contractor is obligated to conform to all the requirements of the permits and subsequent requirements issued by the governing agencies.

**B.** Contractors operating under a DEP permit shall post on the Site a sign in a format consistent with that enclosed.

**C.** Prevention of Water Pollution:

1. The Contractor shall take such precautions in the conduct of the Work as may be necessary to avoid contaminating water in adjacent watercourses, water resources or wetlands. All earthwork, moving of equipment, water control for excavation or foundation areas, and other operations likely to create silting shall be conducted to avoid pollution of watercourses, water resources and wetlands.

2. Erosion Control: The Contractor shall utilize such methods as may be necessary to effectively prevent erosion and sediment from entering nearby waterways.

3. Control of Surface Water Runoff: The Contractor shall keep the rate of runoff from the Site at a minimum, and control it by constructing diversion ditches, trenches, and berms, and taking any other necessary action to retard and divert runoff to protect watercourses. The Contractor shall inspect said Site controls regularly, after significant storm events (greater than one-half inch over a 24-hour period) and in accordance with a site-specific storm water pollution prevention plan (SWPPP) prepared by the Contractor. The Contractor shall repair any damage to Site controls to prevent discharge of sediments or pollutants.

4. The Contractor shall construct silt retention basins in areas of the Work adjacent to streams, or rivers, as directed by the DCR. These basins shall be removed upon completion of the Work. Water used during the Work which has become contaminated with oil, bitumen, harmful or objectionable chemicals, sewage or other pollutants shall be discharged in accordance with all Laws to avoid affecting nearby waters.

5. Under no circumstances shall the Contractor discharge pollutants into any watercourse, water resource, or wetland. When water from adjacent natural sources is used in the contract work, intake methods shall be such as to avoid contaminating the source of supply.

**D.** Protection of Land Resources

1. Prevention of Landscape Defacement: The Contractor shall not deface, injure, remove, cut, or destroy trees or shrubs, without authority from the DCR. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically approved by the DCR. Where such activity is permitted, the Contractor shall adequately wrap the tree with burlap or rags over which softwood slats shall be tied. The Contractor shall be responsible for any damage resulting from such use. Where trees may possibly be defaced, bruised, injured, or otherwise damaged by equipment, dumping, or other operations, the Contractor shall protect such trees by placing boards, planks or approved protective fencing around them.

2. Restoration of Landscape Damage: Any trees or other landscape feature scarred or damaged by equipment or operations shall be restored as nearly as possible to the original condition, as approved by DCR. All trimming or pruning shall be performed in an approved manner by licensed arborists with saws or pruning shears. Trimming with axes will not be permitted.

3. Plant Pest Control: If the Work under this contract requires the use of soil moving equipment in an area with plant infestation, the Contractor shall be subject to applicable plant quarantine regulations. In general, these regulations require the thorough cleaning of soil from equipment before such equipment is moved from regulated areas to area's noninfected

**E.** Noise Control: The Contractor shall use every effort and every means possible to minimize noise caused by his/her operations which the DCR may consider objectionable. Each Contractor shall provide working machinery and equipment designed to operate with the least possible noise, and when gearing is used, such gearing shall be of a type designed to reduce noise to a minimum. Compressors shall be equipped with silencers on intake lines. All gas or oil operated equipment shall be equipped with silencers or mufflers on intake and exhaust lines. Electricity shall be used for power to reduce noise. Dumping bins, hoppers and trucks used for disposal of excavated materials shall be lined with wood or other sound-deadening material if required. Where required by agencies having jurisdiction, certain noise-producing work may have to be performed during specified periods only.

**E. Air Pollution Control:** The Contractor shall conduct his/her operations to comply with all Laws pertaining to air pollution, including Section 142B of Chapter 111 of the Massachusetts General Laws.

1. Diesel Equipment Emission Controls

a.) All motor vehicles and construction equipment shall comply with all pertinent local, state, and federal regulations covering exhaust emission controls and safety.

b.) All Contractor and Sub-Contractor diesel-powered non-road construction equipment with engine horsepower (HP) ratings of 50 and above, which are used on the Project Site for a period in excess of 30 calendar days over the course of the construction period on the Project Site, shall be retrofitted with Emission Control Devices to reduce diesel emissions.

c.) The reduction of emissions of volatile organic compounds (VOCs); carbon monoxide (CO) and particulate matter (PM) from diesel-powered equipment shall be accomplished by installing Retrofit Emission Control Devices.

d.) Acceptable Retrofit Emission Control Devices for the Project shall consist of oxidation catalysts that are (1) included on the US Environmental Protection Agency (EPA) *Verified Retrofit Technology List* and/or the California Air Resources Board (CARB) *Currently Verified Technologies List*; and (2) are verified by EPA, CARB, or certified by the manufacturer to provide a minimum emissions reduction of 50 percent for VOCs, 40 percent for CO and 20 percent for PM. Attainment of the required reduction in PM emissions can also be accomplished by using less polluting Clean Fuels. Verified technologies can be identified on the following websites:

EPA: <http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm>

CARB: <http://www.arb.ca.gov/diesel/verdev/verifiedtechnologies/cvt.htm>

e.) The emission control equipment can be procured through the Statewide Contract #VEH71 that has fixed costs associated with retrofitting of diesel emission control devices.

f.) Construction shall not proceed until the Contractor has submitted a certified list of the non-road diesel-powered construction equipment subject to this provision which either are or will be retrofitted with emission control devices. The list shall include (1) the equipment number, type, make, and Contractor/Sub-Contractor name; and the emission control device make, model, and EPA verification number. Contractors shall also submit a receipt or other documentation from a manufacturer or installer that verifies that appropriate equipment has been installed. The Contractor shall also identify any vehicles that will use Clean Fuels. Equipment that has been retrofitted with an emission control device shall be stenciled or otherwise clearly marked as "Low Emission Equipment".

g.) The Contractor shall submit monthly reports, updating the same information stated in Paragraph f above, including the quantity of Clean Fuel utilized. The addition or deletion of non-road diesel equipment shall be indicated in the report.

h.) The Contractor shall use methods to control nuisance odors associated with diesel emissions from construction equipment including but not limited to the following: (1) turning off diesel combustion engines on construction equipment not in active use and on trucks that are idling for five minutes or more; and (2) locating diesel equipment away from the general public and sensitive receptors.

i.) All costs associated with implementation of the diesel equipment emissions control shall be borne by the respective Contractor or subcontractor and included in their cost for performing the work of the Contract.

## **2. Dust Control.**

**A.** The Contractor is placed on notice that blowing dust from un-stabilized earth areas of the work under his/her control will be considered a nuisance. He/she shall, by spraying with water or by other approved means, dampen the soil to hold down the dust. The use of calcium chloride as a wetting agent will not be permitted. During working hours and before leaving the work for the evening, for weekends, or for a more extended period, the Contractor shall assess the moisture content of the soil and dampen it to the extent necessary to hold down the dust. While work is suspended, he/she shall return to work, if so, directed by the DCR, to maintain the dust control.

## **17. Debris, Excavated Material and Chemical Waste.**

**A.** The Contractor shall not permit the accumulation of interior or exterior debris. The Contractor shall always keep the Work area clean. Without limitation, garbage shall be removed daily. Where no disposal area is shown on the Drawings, the Contractor shall remove and legally dispose of all materials off land owned by the Commonwealth to a location approved by the DCR. Documentation certifying proper disposal shall be submitted to the DCR.

**B.** The Contractor shall, at his/her own expense, and in accordance with all Laws, arrange for the waste of materials from excavations that are unacceptable for use in the refill or that are more than the refill materials required, in spoil banks off the lands owned by the Commonwealth of Massachusetts. Materials, if any, which cannot be placed at once in permanent positions may be deposited in storage piles at locations designated, but materials re-excavated from such storage piles shall not again be paid for as excavation.

**C.** The Contractor shall properly classify and remove debris and waste from the Site and transport and dispose of it, all in accordance with Laws, employing a qualified and properly licensed transporter, at any landfill, disposal or recycling facility licensed under applicable Laws, including without limitation, hazardous materials laws. The Contractor shall make all arrangements and give and obtain all notices, communications, documentation, permits, certificates, and approvals necessary for said disposal from the owner or officials in charge of such landfills, disposal, or recycling facilities. The Contractor shall bear all fees and costs in connection with such classification, removal, transportation, disposal, and storage, except as otherwise specifically provided or required by the Special Conditions or other Contract Document. The Contractor shall not permit any storage of debris or waste except in accordance with Laws.

**D.** The Contractor shall not permit any open fire on the Site.

**E. Chemical Waste:** Chemical waste shall be identified and labeled properly, stored in appropriate Department of Transportation approved containers in a secure location, removed from the Site, and disposed of not less frequently than monthly unless more frequently required by Laws, including without limitation hazardous materials laws, or by the Special Conditions or Specifications. Disposal of chemical waste shall be performed in accordance with requirements of the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP). Stockpiles of contaminated soils will be placed on a protective surface and covered to prevent migration or erosive loss by wind or water. Fueling and lubricating of vehicles and equipment shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants shall be disposed of in accordance with procedures meeting all applicable Laws. The Contractor shall immediately notify the DCR of any hazardous materials release large enough to require reporting under applicable Laws. The Contractor shall be responsible for immediately containing and cleaning up in accordance with Laws any oil or hazardous materials releases resulting from his/her operations. Any costs incurred in cleaning up any such releases shall be borne by the Contractor.

## **18. Nuisances.**

The Contractor shall strictly prohibit and take all necessary measures to prevent the committing of nuisances on the land of the Commonwealth and adjacent properties.



**19. Weather Protection (M.G.L. c. 149, sec. 44G and 44F(1)).**

**A.** For all building projects, the Contractor shall furnish and install "weather protection," which means temporary protection of that Work adversely affected by moisture, wind and cold. Weather protection shall be achieved by covering, enclosing and/or heating working areas such that a minimum temperature of 40 degrees Fahrenheit is maintained at the working surface during the months of November through March to permit construction to be carried on during such period in accordance with the Progress Schedule. After the building or portion thereof is completely enclosed by either permanent construction or substantial temporary materials having a resistance comparable to the specified permanent construction, the Contractor shall provide heat therein of not less than 55 degrees Fahrenheit nor more than 75 degrees Fahrenheit. The foregoing provisions do not supersede any specific requirements for methods of construction, curing of materials and the like. Concrete, masonry, plaster, and all other materials that require special considerations in temperatures below 40 degrees Fahrenheit shall be installed, applied, and cured in accordance with the specific requirements for cold weather protection as defined in the project specifications.

**B.** The general contractor may, with the approval of the Engineer, elect to utilize the permanent heating system for temporary heat after the building is enclosed and after it has been tested and ready to operate. It shall, however, be his responsibility to thoroughly clean and restore to first-class condition any portion of the permanent heating system used for heating during construction to the satisfaction of the Engineer.

**C.** The Contractor shall furnish and install one thermometer for every 2,000 square feet of floor space or fraction thereof.

**D.** Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate fire protection devices. Approved methods of heating should also provide for adequate ventilation to prevent exposing people and materials to carbon monoxide, carbon dioxide and other noxious fumes.

**E.** Within 30 calendar days after the award of this contract, the general contractor shall submit in writing to the Engineer three (3) copies of his proposed methods for "Weather Protection" for approval.

**F.** The Contractor shall give adequate notification to the Engineer and all subcontractors prior to the erection and removal of temporary protective enclosures.

**G.** Such weather protection shall be consistent with the Progress Schedule, shall permit the continuous progress of the Work necessary to maintain an orderly and efficient sequence of construction operations and shall meet such additional requirements as may be specified by the Special Conditions or Specifications.

**20. Furnishings and Equipment.**

When, in the opinion of the DCR, any portion of the Work is in a reasonable condition to receive fittings, furniture, or other property of the Department of Conservation and Recreation not covered by this Contract, the Contractor shall allow the DCR to bring such fittings, furniture, and/or other property into such portions of the Work and shall provide all reasonable facilities and protection thereof. No such occupancy shall be construed as interfering with the provisions relating to time of completion, or as constituting an acceptance of the whole or any part of the Work. Any furniture or fittings so installed shall be placed in the Work at the risk of the DCR except that the Contractor shall be liable for damages or losses to such furniture or fittings to the extent such damages or losses arise in whole or in part from the negligence or intentional misconduct of Contractor, Subcontractors, their agents and/or employees, or anyone for whose acts the Contractor is responsible.

**21. Form for Sub-contract.**

The Contractor when subcontracting with sub-bidders filed pursuant to M.G.L. c. 149, sec. 44F shall use the form for sub-Contract in M.G.L. c. 149, sec. 44F(4)(c). The Contractor shall not interpret paragraph 3 of the statutory form of Subcontract to require such sub-bidders to provide insurance with limits higher than the limits that are required by the Contract Documents, assuming that the term "Contractor" refers to the sub-bidder and that the term "Contract Price" refers to the sub-bidder's price stated in paragraph 1 of the statutory form of Subcontract.

## **22. Sales Tax Exemption and Other Taxes.**

All building materials and supplies as well as the rental charges for construction vehicles, equipment and machinery rented exclusively for use on the Site, or while being used exclusively for the transportation of materials for the Work are entitled to an exemption from sales taxes under M.G.L. c. 64H, sec. 6(f). The Contractor shall take all action required to obtain the benefit of such sales tax exemption. The Contractor shall bear the cost of any sales taxes that the Contractor incurs in connection with the Work and the DCR shall not reimburse the Contractor for any such taxes. The exemption number assigned to the Contractor as an exempt purchaser shall be provided to the Contractor by the DCR upon the written request of the Contractor.

## **23. Final Cleaning.**

At the completion of the Work, the Contractor shall remove all waste materials, rubbish, tools, equipment, machinery, and surplus materials, and professionally clean all sight-exposed surfaces so that the Work is clean and ready for occupancy and/or use. Subsequent to installation of DCR furniture, telephones, and equipment, the Contractor shall provide such additional cleaning as may be necessary to remove any soil resulting from installation of such furniture, telephones, and equipment. The costs of the required cleaning are included in the Contract price.

All permanent drainage structures such as catch basins, permanent detention or retention basins, drainage conveyances, piping, sumps, and particle separators will be cleaned of sediments and debris prior to acceptance of the Work. Any sediments or debris accumulated during construction shall be removed and disposed in accordance with local and state requirements.

## **24. Maintenance Data.**

Subject to such additional requirements as may be provided in the Special Conditions or Specifications, the Contractor shall compile 3 complete and identical binders of operating and maintenance data for the entire Work. The Contractor shall submit record maintenance data to the DCR for approval and shall instruct and train the DCR's personnel in proper inspection and maintenance procedures.

## **25. Drainage Specifications.**

Subject to such additional requirements as may be provided in the Special Conditions or Specifications, where construction involves replacement or construction of new storm water drainage systems including but not limited to catch basins, roof drains, recharge to groundwater systems and outfall structures, the Contractor shall provide drawings and electronic records in a form acceptable to the DCR that provides specifications and a site plan that identifies locations of the drainage system components and cleanout, if applicable.

## **26. Closeout Procedures.**

The Contractor shall take all actions and submit all items required for Final Acceptance as specified in the Contract Documents.

## **27. Risk of Loss.**

The Contractor shall bear all risk of loss to the Work during the term of the Contract except for any portion of the Work as to which the DCR has given final acceptance. Nothing herein shall limit the Contractor's responsibilities under Article IX or XV of these General Conditions of the Contract.

## **28. Photographs.**

**A.** At the request of the DCR, the Contractor shall furnish the DCR suitable 4" X 6" color photographs and/or digital image files of the construction area, and any related work areas.

**B.** If the DCR requires the Contractor to provide photographs of the Work, the areas to be photographed and the locational reference point from which they are to be taken will be designated by the DCR, and shall be taken according to the following schedule:

- a. Before construction operations have been started.
- b. Each month during the performance of the Work.
- c. After construction has been completed.

**C.** Each photograph shall have permanently written on its face a legible description or title indicating date, location, direction from which taken, project title and item of work photographed.

**D.** Upon completion of all work under this contract, the Contractor shall deliver all negatives, clearly identified, to the DCR. Photographs will be placed in acetate sleeves and bound in three booklet form.

**E.** The cost of furnishing photographs shall be included in the prices bid for the various items scheduled in the Proposal.

## **ARTICLE V: MATERIALS AND EQUIPMENT**

### **1. Materials Generally.**

**A.** Unless otherwise specifically provided in the Contract Documents, the Contractor shall provide and pay for materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether incorporated or to be incorporated in the Work.

**B.** Materials and equipment to be installed as part of the Work (both or either of which are hereinafter referred to as "materials") shall be new, unused, of recent manufacture, assembled, and used in accordance with the best construction practices. The Contractor shall inform himself/herself as to, and shall comply with, the provisions of M.G.L. c. 7, sec. 23A, as amended, and shall abide by the same and all applicable rules, regulations, and orders made thereunder in relation to the purchase of supplies and materials in the execution of the Work, including the provisions of M.G.L. c. 7, sec. 22, paragraph 17, which provides that there be *"a preference in the purchase of supplies and materials, other considerations being equal, in favor, first, of supplies and materials manufactured and sold within the Commonwealth, and, second, of supplies and materials manufactured and sold elsewhere within the United States."*

**C.** All materials furnished by the DCR to the Contractor for installation in the work will be delivered by freight train, truck, or other means of common carrier to the nearest convenient public railroad siding, freight station, trucking terminal or such other designated delivery point of which he will receive due notification. The Contractor, at his/her own expense, shall do all handling and conveying of such materials at and from the noted deliver site. He shall unload and remove them promptly from the cars, trucks, or terminals upon notification of their arrival and he shall be responsible for any demurrage, delay charges, damage done or loss of materials from the time of delivery to the final acceptance of the work. Materials previously delivered shall be turned over to the Contractor as soon as possible after the date ordered to begin work. He shall make a complete inventory with the Resident Engineer as to content and condition; thereafter he shall be responsible for the care, custody, and handling until the final acceptance of the work.

### **2. Shop Drawings, Product Data, and Samples.**

**A.** The Contractor shall furnish to the Project Engineer all samples of the materials to be used in the execution of the Work as required by the Contract Documents. The Contractor shall furnish to the DCR in a timely manner all coordination Drawings, shop details, Shop Drawings, and setting diagrams which may be necessary for acquiring and installing materials. These shall be reviewed as required by the DCR. A minimum of six (6) copies shall be submitted for final approval, one of which shall be returned to the Contractor, one given to the Resident Engineer, and four maintained by the DCR. The inspection and approval by the DCR of Shop Drawings, etc. shall be general and shall in no way relieve the Contractor from responsibility for proper fitting, coordinating, construction, and construction sequencing. The Contractor shall furnish to the DCR such information and vouchers relative to the Work, the materials therefore, and the persons employed thereon, as the DCR shall from time-to-time request.

**B.** Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. The purpose of their submission is to demonstrate for those portions of the Work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents.

**C.** The Contractor shall review, approve, and submit to the DCR, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the DCR or of separate contractors. Submittals made by the Contractor which are not required by the Contract Documents, or which do not comply with the Contract Documents may be returned without action. The Contractor's attention is directed to the provisions of Section 4 of this Article V and to the Specifications.

**D.** The Contractor shall prepare and keep current for the DCR's approval a schedule of submittals which is coordinated with the Progress Schedule and allows the DCR reasonable time to review submittals.

**E.** The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples, or similar submittals until the respective submittal has been approved by the DCR. Such Work shall be in accordance with Approved submittals.

**F.** By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements, and field construction criteria related thereto and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

**G.** The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the DCR's approval of Shop Drawings, Product Data, Samples, or similar submittals unless the Contractor has specifically informed the DCR in writing of such deviation at the time of submittal and the DCR has given explicit written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals by the DCR's actions.

**H.** The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the DCR on previous submittals.

**I.** Informational submittals upon which the DCR is not expected to take responsive action may be so identified in the Contract Documents.

**J.** When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, such certification must be stamped by a registered Massachusetts professional in the discipline required. The DCR shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.

**K.** Materials furnished or used or employed under the Contract must be equal in quality to the samples furnished and be satisfactory to the DCR.

### **3. Tests.**

**A.** Any material to be used in the Work may be tested or inspected at any time, on or off Site, by or under direction of the DCR, and may be rejected if it fails to comply with specified tests. The Contractor shall test all materials unless specified otherwise in the Special Conditions or Specifications. The Contractor shall also pay for all testing of specified material unless specified otherwise in the Special Conditions or Specifications. If the Contractor requests permission to use a material that was not specified, then the Contractor in all cases shall pay for such testing. The cost of testing of materials that fail the testing criteria shall be borne by the Contractor

**B.** The Contractor shall notify the DCR of the proposed sources of materials in time to permit all required testing and inspection before the material is needed for incorporation into the Work. The Contractor shall have no claim arising from the Contractor's failure to designate the proposed source or to order the material in time for adequate testing and inspection. Necessary arrangements shall be made to permit the DCR to make factory, shop or other inspection of materials or equipment ordered for the Work in the process of manufacture or fabrication, as required by the Contract Documents. The DCR will not assume any obligation for the sampling and testing of materials other than on the Site, unless so required by the Specifications.

**C.** Where tests of materials will be made by the DCR or under its direction, the Contractor or his/her suppliers shall furnish such facilities as the DCR may require for collecting and forwarding samples and shall not make use of, nor incorporate into the Work, any material represented by the samples until the required tests have been made and the material accepted, unless otherwise directed. The Contractor in all cases shall furnish the required samples without charge. In the event of failure of materials to meet the Contract Documents, any retesting of new materials or of the same materials after reworking, shall be paid for by the Contractor.

**D.** The testing of the Work shall not relieve the Contractor of any of his/her obligations to fulfill the terms of the Contract as herein prescribed by the Contract Documents. Failure to reject any defective work or materials shall in no way prevent later rejection when such defect is discovered, notwithstanding that such defective work or materials had been previously overlooked or misjudged by the DCR and accepted or estimated for payment, nor shall such obligate the DCR to make final acceptance thereof. If sampling and testing reveal that the material is unsatisfactory, it will then be the responsibility of the Contractor to remove it from the Work, replace it, or blend it with such other material so that an acceptable material will be produced. The removal, replacement and blending of such material shall be done by the Contractor without additional compensation.

#### **4. "Or Equal" Submissions.**

**A.** Where products or materials are prescribed by manufacturer name, trade name, or catalog reference, the words "or Approved equal" shall be understood to follow. An item shall be considered equal to the item so named or described if in the opinion of the DCR (a) it is at least equal in quality, durability, appearance, strength, and design, (b) it performs at least equally the function imposed in the general design for the Work, and (c) it conforms substantially, even with deviations, to the detailed requirements for the items as indicated by the Specifications. Any structural or mechanical changes made necessary to accommodate products or materials substituted as an "or equal" shall be at the expense of the Contractor. If the cost of the material substituted as an "or equal" is less than the cost of the material specified, such savings in cost shall be credited to the DCR and deducted from the price. "Approved equal" shall mean an item with respect to which the DCR shall have issued a written statement to the Contractor to the effect that the item is, in the DCR's opinion, equal within the meaning of this paragraph to that prescribed in the Contract Documents.

**B.** The Contractor shall be responsible for providing the DCR with any information and test results that the DCR reasonably requires to determine whether a material is equal to a material named or described in the Contract Documents.

**C.** The Contractor shall make all requests for substitution of a material named or described in the Contract Documents in writing, and at least thirty (30) days prior to the date the materials will be used in the Work, or immediately upon becoming aware of the following exigencies: (1) the non-availability of the specified material, (2) delay of the delivery of the specified material that will preclude the completion of the Work or any part thereof within the time specified in the Contract or (3) unforeseen field conditions that necessitate the substitution of the specified material. In no event shall the Contractor maintain a claim for delays based upon the DCR's review of such substituted materials if the Contractor failed to submit a written request for such substitution in accordance with the provisions of this paragraph. A written request for a material substitution due to an exigency set forth above shall be accompanied with documentation of the exigency, including but not limited to, a photocopy of a letter from the supplier or manufacturer stating that he/she is unable to furnish the specified materials and the reasons that he/she is unable to furnish the materials, as required by the DCR. If the Contractor's proposed substitution due to an exigency is declined, the DCR shall, at its discretion, specify an "or equal" substitution.

**D.** The Contractor shall have the burden of proof with respect to any claimed increases in the Contract Price resulting from the improper rejection by the DCR of any material proposed by the Contractor as an equal. No increase in the Contract Price shall be permitted unless the Contractor submits documentary evidence sufficient to prove to the reasonable satisfaction of the DCR that the rejection increased the Contractor's costs over the costs provided for in the Bid pricing documents, net of all savings the Contractor obtained by substituting other "or equal" items. The Contractor shall submit copies of all pricing materials, calculations, plans, Specifications, Drawings, and other design documents that the DCR deems necessary or desirable to evidence such increased costs. In calculating the Contractor's increased costs, a deduction shall be made for the amount of all costs that the Contractor would have incurred making structural or mechanical changes to include within the Work the item later found to have been improperly rejected.

#### **5. Delivery and Storage of Materials: Inspection.**

**A.** Materials and equipment shall be progressively delivered to the Site so that there will be neither delay in the progress of the Work nor an undue accumulation of materials that are not to be used within a reasonable time, and stored so that their security, quality, and fitness of the materials for the Work is preserved.

##### **B. Vehicle Weight Limits**

1. The Contractor's attention is directed to Chapter 90, Section 19A of the General Laws as amended concerning the weight limits for construction type motor vehicles.
2. No materials supplied for the project shall be accepted in vehicles whose gross weight exceed the legal load limits as determined by the regulatory agencies of the Commonwealth and Federal Government
3. Weight slips that indicate the load exceeding the legal load limit will not be countersigned by the DCR.

**C.** If the Engineer so requests, the Contractor, at any time before final acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering or removing and the replacing of the covering or making good of the parts removed, will be at the Contractor's expense.

**D.** Necessary arrangements shall be made to permit the DCR to perform all required inspection and testing of materials or equipment ordered for the Work at the factory or shop during the process of manufacture or fabrication, or in storage on or off Site. The Contractor shall have no claims because of his/her failure to designate the proposed source of the material in time for adequate testing and inspection.

**E.** Materials stored off Site shall be insured and stored at the expense of the Contractor so as to guarantee the preservation of their security, quality, and fitness for the Work. Without derogating from the Contractor's responsibilities in the previous sentence, when necessary to avoid deterioration or damage, material (on or off Site) shall be placed on wooden platforms or other hard clean surfaces and not on the ground and shall be properly protected.

**F.** Expenses for inspection of material by DCR personnel including travel, quarters, and subsistence shall be borne by the Contractor requesting the inspection of material stored outside the Commonwealth of Massachusetts as part of the Contract Price. The policy of the DCR precludes the payment for material stored outside the boundaries of Massachusetts except in extremely limited circumstances with the express written consent of the DCR. If the Contractor requests an inspection of material stored outside the Commonwealth of Massachusetts, the DCR will initially pay for all expenses of inspecting the material incurred by DCR's personnel including travel, quarters, and subsistence. The DCR will then give Contractor an invoice for those costs and the Contractor shall submit a credit Change Order for the amount of those expenses.

**G.** Stored materials either at the Site or at some other location agreed upon in writing shall be so located as to facilitate prompt inspection and even though approved before storage, may again be inspected prior to their use in the Work.

**H.** Where no inspection of materials is arranged by the DCR and before such materials are incorporated into the work, the Contractor shall be required to submit to the DCR for approval, three copies of the Manufacturer's or Supplier's statement for each kind of material furnished, which shall contain the following information:

1. Work for which the material is consigned.
2. Name of the Contractor to which the material is supplied.
3. Description of material supplied.
4. Quantity of material supplied.
5. Means of identifying the consignment, such as label, marking, seal number, etc.
6. Date and method of shipment.
7. Statement to the effect that the material has been tested and found in conformance with the Contract Documents.
8. Results of all required tests, or in lieu of said results, the Manufacturer's, or Supplier's guarantee that he/she shall maintain said results, and make them available to the DCR for a period of not less than three years from the date of final acceptance of final payment by the Commonwealth.
9. Signature of a person duly authorized to bind the Manufacturer or Supplier.

**I.** All storage sites shall be restored to their original condition by the Contractor at the Contractor's expense. This shall not apply to the stripping and storing of topsoil, or to other materials salvaged from the work.

**J.** The Contractor shall take charge of and be liable for any loss of or injury to the materials for his/her use delivered to or in the vicinity of the place where the Work is being done, whether furnished by the DCR or otherwise. The Contractor shall notify the DCR as soon as any such materials are so delivered, allow them to be examined by the DCR, and furnish workers to assist therewith.

**K.** Private property shall not be used for storage purpose without the written permission of the property owner, and if requested by the DCR copies of such written permission shall be furnished by the Contractor.

## **6. Defective, Damaged, or Deteriorated Materials and Rejection Thereof.**

The DCR may reject materials if the DCR reasonably determines that such materials do not conform to the Contract Documents in any manner, including but not limited to materials that have become damaged or deteriorated from improper storage whether or not such materials have previously been accepted. The Contractor at its own expense shall remove rejected materials from the Work. No rejected material, the defects of which have been subsequently corrected, shall be used except with the written permission of the DCR. Should the Contractor fail to remove rejected material within a reasonable time, the DCR may, in addition to any other available remedies, remove and/or replace the rejected material, and deduct the cost of such removal and/or replacement from any moneys due or to become due the Contractor. No extra time shall be allowed for completion of Work by reason of such rejection. The inspection of the Work shall not relieve the Contractor of any of its obligations herein prescribed, and any defective Work shall be corrected. Work not conforming to the Contract Documents may be rejected notwithstanding that such Work and materials have been previously overlooked or misjudged by the DCR and accepted for payment. If the Work or any part thereof shall be found defective at any time before Final Acceptance of the whole Work, the Contractor shall forthwith make good such defect in a manner satisfactory to the DCR. Nothing in the Contract shall be construed as vesting in the Contractor any property rights in the materials used after they have been attached or affixed to the Work or the Site; but all such materials shall upon being so attached or affixed become a property of the DCR.

## **7. Measurement**

**A.** The method of measurement for materials necessary for the proper execution of the Work is set forth at the end of each Section of these Specifications. The computations to be used in determination of quantities of material furnished and of work performed under the Contract shall be selected by the DCR.

**B.** For the estimating of quantities in which the computations or areas by analytic and geometric methods would be comparatively laborious, it is stipulated and agreed that the planimeter shall be considered an instrument of precision adapted to the measurement of such area.

**C.** To aid the Resident Engineer in determining the quantities and weights of cement and other materials to be paid for, the Contractor shall, whenever so required, give him access to the proper invoices, bills of lading, etc., and shall provide scales and assistance for weighing, or assistance for measuring, any of the materials.

**D.** All measurements shall be confirmed by the DCR as they are made to determine the quantities of the various items of work performed. All measurements shall be made according to the United States Standard Units of Measurement.

**E.** Unless otherwise specified, longitudinal measurements for area computations will be made horizontally. Unless otherwise specified transverse measures for area computations will be the dimensions shown on the Drawings or in writing by the DCR.

**F.** All items which are measured by the linear foot, including, but not limited to pipe, culverts, guardrail, curbing, will be measured parallel to the base or foundation upon which such structures are placed, unless otherwise shown on the Drawings.

**G.** In computing volumes of excavation, the average end area method, or other methods acceptable to the DCR will be used.

**H.** A sworn weigher shall weigh all materials required to be weighed. The weighing of such materials may be witnessed by the DCR.

**I.** If materials are shipped by rail or trucks, the car weights or quarry weights may be accepted. Weight slips shall be provided for each shipment of material weighed. Each weight slip shall be signed by the sworn weigher, and countersigned, on delivery, by the DCR. Material listed on weight slips that are not countersigned by the DCR shall not be included for payment under the Contract.

**J.** When requested by the Contractor and approved by the DCR in writing, material specified to be measured in weight may be weighed and converted to volume measurement for payment purposes.

## **ARTICLE VI: PROSECUTION AND PROGRESS**

### **1. Beginning, Progress Schedule, and Completion of Work.**

**A.** The Contract time shall commence the work upon the date specified in the Notice to Proceed. The Contractor shall begin Work at the Site within ten (10) days of said date unless otherwise ordered in writing by the DCR.

**B.** Within seven (7) days after the issuance of the Notice to Proceed, Saturdays, Sundays and legal holidays excluded, the Contractor shall submit to the DCR a progress schedule for the term of the Contract as required by the Contract Documents, showing in detail his/her proposed progress for the construction of the various parts of the Work and the proposed times for receiving required materials. Upon approval by the DCR, said schedule shall constitute the Progress Schedule. The Contractor shall at the end of each month, or more often if required, furnish to the DCR a schedule meeting the requirements of the Specifications showing the actual progress of the parts of the Work in comparison with the Progress Schedule.

**C.** Time is of the essence of this Contract. The Work shall be completed within the time specified in Article 2 of the Department of Conservation and Recreation - Contractor Agreement. Should the Contractor require additional time to complete the Work, the Contractor shall document the reasons therefor and submit a written request for an extension of time within 20 days of the occurrence of the event alleged to be the cause of the delay, as provided in this Article and in Article VII of these General Conditions of the Contract. Failure to submit said written request within the time required by the preceding sentence shall preclude the Contractor from subsequently claiming any time extension due to said delay.

**D.** If, in the opinion of the DCR, the Contractor fails to comply with the construction schedule as set forth in the Contractor's bid or the Project specifications, the DCR may give the Contractor a notice specifying the time limits and performance standards that the Contractor is failing to meet whereupon (1) the Contractor shall, if the notice requires, discontinue all or any portion of the Work (which discontinuance shall neither terminate the Contract nor give the Contractor any claim for an increase in the Contract Price, damages, or an extension of any completion deadlines); or (2) at Contractor's sole cost increase the work force, equipment and plant, or any of them, employed on the whole or any part of the Work, to the extent required by such notice, and employ the same from day to day until the completion of the Work or such part thereof, or until the failure regarding the rate of progress, in the opinion of the DCR, shall have been sufficiently corrected.

**E.** If, in the opinion of the DCR, the Contractor fails to comply with the construction schedule, and whether or not the DCR shall have given the Contractor a notice described in D above, the DCR may (but shall not be required to) give the Contractor notice of such failure and five (5) days to cure the same. Unless the Contractor shall within that five days take all necessary steps to do so (including, if the DCR requires, increasing its forces, equipment and plant) and continue to do so until in the opinion of the DCR the failure is corrected, the DCR may at the Contractor's expense and without terminating this Contract take exclusive or joint possession of all or a portion of the Site and employ and direct the labors of existing or such additional forces, equipment and plant as may in the DCR's opinion be necessary to insure the completion of the Work or such part thereof within the time specified in the Contract Documents or at the earliest possible date thereafter. The DCR may exercise its rights under this Article at any time and from time to time without waiving any of its rights under this Contract, at law or in equity, including, without limitation, the right to deem this Contract terminated or to order the Contractor to discontinue the Work at any time thereafter. The Contractor shall continue to perform the remaining Work under this Contract even if the DCR elects to have another contractor perform a portion of the Work under this Article.

**F.** The DCR shall deduct the cost of any actions the DCR takes under this Article from any amount then due or which might have become due to the Contractor under this Contract had the Contractor performed as required. On demand, the Contractor shall pay the DCR any amount by which the cost of completing all or any portion of the Work exceeds the amount attributable to that Work under the Contract Documents. The DCR's sole goal will be to complete the Work that it elects to complete within the time limits stated in the Contract or at the earliest possible date thereafter. Consequently, the DCR shall have no obligation to obtain competitive bids or the lowest cost for completing the Work or any part thereof, except when it is required by law. The DCR's election to complete all or part of the Work shall not release the Contractor from any liability for failure to complete the Work as the Contract Documents require and shall not entitle the Contractor to a claim for an increase in the Contract Price or an extension of the time for completing the Work. If the cost that the DCR incurs in completing all or any portion of the Work is less than the amount that the Contract Documents attribute to that Work, the DCR will pay or credit the difference to the Contractor, less any other costs and expenses that the DCR incurs, including the cost of supervision, and attorneys' fees and costs.



## **2. Failure to Complete Work on Time - Liquidated Damages.**

**A.** If liquidated damages are specified in the Department of Conservation and Recreation - Contractor Agreement, the DCR has determined that its damages as a result of Contractor's failure to complete the Work fully within the time specified will be difficult or impracticable to ascertain. Accordingly, if the Work is not completed to such point by the date specified in this Contract, the Contractor shall pay to the DCR the sum designated as liquidated damages in the Contract for each and every calendar day that the Contractor is in default in completing the Work to such point. Such moneys shall be paid as liquidated damages, not as a penalty, to cover losses and expenses to the DCR resulting solely from the fact that the Work is not completed on time.

**B.** Similarly, if the Contract states that by a specified date a designated portion of the Work shall be fully completed, and if such portion has not been prosecuted to such point by said date, the Contractor shall pay to the DCR the sum designated in the Contract for each calendar day that the Contractor is in default in completing such portion of the Work to such point. Such moneys shall also be paid as liquidated damages, not as a penalty, to cover losses and expenses to the Department of Conservation and Recreation resulting solely from the fact that the Work is not completed on time.

**C.** The DCR may recover such liquidated damages by deducting the amount thereof from any moneys due or that might become due the Contractor, and if such moneys shall be insufficient to cover the liquidated damages, then the Contractor or the Surety shall pay to the DCR the amount due.

**D.** Permitting the Contractor to continue and finish the Work or any portion of it after the time fixed in the Contract for its completion shall not be deemed as a waiver of any of the DCR's rights hereunder, at law or in equity.

**E.** Liquidated damages or a portion thereof may be waived by the DCR if the Contractor submits evidence satisfactory to the DCR that the delay was caused solely by conditions beyond the control of the Contractor and that the DCR has not suffered any damages as a result of said delay.

**F.** Failure by the DCR to specify a sum as liquidated damages in the Department of Conservation and Recreation - Contractor Agreement, or the insertion of "N/A" or "none" in the space provided therein for liquidated damages, shall not be deemed a waiver of the DCR's right to recover actual damages arising from the Contractor's failure to complete the Work on time.

## **3. Delays: Statutory Provisions (M.G.L. c. 30, sec. 39O).**

**A.** Notwithstanding any provision of this Contract to the contrary, except as otherwise provided by law as set forth in paragraph B below, the Contractor shall not be entitled to increase the Contract Price or to receive damages on account of any hindrances or delays, avoidable or unavoidable; but if any delay is caused in the opinion of the DCR, the Contractor shall be entitled to an extension of time. The length of the extension shall be sufficient in the opinion of the DCR for the Contractor to complete the Work. Although no delay shall increase the Contract Price, the DCR may require that any change in the date by which the Contractor must complete all or any part of the Work be processed on a Change Order form.

**B.** If a suspension, delay, interruption or failure to act of the DCR increases the cost of performance to any Subcontractor, that Subcontractor shall have the same rights against the Contractor with respect to such increase as the Contractor shall have against the DCR by virtue of (a) and (b) of M.G.L. c. 30, s. 39O set forth below, but nothing in provisions (a) and (b) shall alter any other rights which the Contractor or the subcontractor may have against each other. As used in the statutory language of (a) and (b) below, "contract" means this Contract, "general contractor" means the Contractor and "awarding authority" means the DCR:

*"(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided, however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.*

*(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim."*

#### **4. Occupancy and/or Use of Project Prior to Final Acceptance.**

**A.** The Contractor agrees to the occupancy and/or use of the Project or any portion thereof before Final Acceptance of the Work by the DCR.

**B.** The DCR will cooperate with the Contractor with respect to the completion of the Work by taking such reasonable steps as may be possible to avoid interference with the Contractor's Work provided that they do not interfere with the proper functioning of the facility.

**C.** The Contractor shall not be responsible for wear and tear or damage resulting solely from temporary occupancy.

**D.** Occupancy and/or use of any part of the Work prior to Final Acceptance by the DCR shall not relieve the Contractor from maintaining the required payment and performance bonds and insurance (to the extent that insurance is required to be maintained after Substantial Completion) required by this Contract.

#### **5. Substantial Completion – Punch List.**

**A.** When the Work, or portion thereof which the DCR agrees to accept separately has reached the state of Substantial Completion as shown on an Approved payment request, the Contractor shall develop, with the participation of the DCR, the Punch List identifying those items of unfinished or unacceptable Work that remain to be performed or corrected under the Contract.

**B.** Before the Work shall be deemed completed to the point where it is ready for the issuance of Final Acceptance, the Contractor shall:

- (1) Provide Contractor's proposed Punch List containing a statement of the reason for each item listed thereon.
- (2) Advise the DCR of proposed changes in insurance in accordance with the provisions of this Contract, and provide to the DCR evidence of the Contractor's Completed Operations insurance coverage to the extent required by the Contract Documents.
- (3) Execute and submit a notarized warranty on a form provided by the DCR meeting the requirements of Article IX of these General Conditions of the Contract, to commence upon the date of the Certificate of Final Acceptance, unless otherwise provided in the Certificate of Final Acceptance.
- (4) Submit signed special warranties and warranties of longer than one year as required by the Contract Documents.
- (5) Submit signed maintenance agreements for all portions of the Work specified to receive maintenance after the issuance of the Certificate of Final Acceptance.
- (6) Submit all preliminary record Drawings to the DCR and documents and framed data in the forms required by the Contract Documents.
- (7) Complete all items required to be completed by the Department of Public Safety and obtain a Certificate of Occupancy from the Department of Public Safety and similar releases which permit the full and unrestricted use of the areas claimed to be ready for occupancy.
- (8) Deliver specified maintenance stocks of materials, required spare parts, and all special tools furnished by manufacturers to persons designated by the DCR and obtain written receipts for same.
- (9) Make final changes of lock cylinders or cores and advise the DCR of the change of project security responsibility.
- (10) Complete start-up of systems, and instruct DCR personnel on proper operation and routine maintenance of all systems and equipment.
- (11) Remove all remaining temporary facilities that are no longer needed, surplus materials, and debris; (the Contractor shall not remove construction offices and trailers without the prior Approval of the DCR).
- (12) Submit final utility meter readings and similar information and advise the DCR of the change of responsibility for utility charges and payments upon occupancy and/or use,
- (13) Complete final clean-up of all Work, restoration of damaged land and property, including finishes, and replacement of all damaged and broken glass not listed on the Contractor's Punch List.
- (14) Complete such other items as may be called for in the Special Conditions, if any, or Specifications.

C. After completing the items specified in subsection A above, the Contractor shall make a written request for the DCR's inspection for a Certificate of Final Acceptance in accordance with the Contract Documents. The DCR shall review the submittals and the Work and shall either 1) sign a Certificate of Final Acceptance or 2) notify the Contractor of incomplete and/or incorrect Work that must be completed and corrected prior to the issuance of the Certificate of Final Acceptance. The DCR shall notify the Contractor of any additions to the Punch List. In connection with the execution of the Certificate of Final Acceptance, the DCR shall assign dollar values to each item on the Punch List. Failure to include any incomplete or defective item on the Punch List shall not relieve the Contractor of the obligation to complete all Work in accordance with the Contract Documents.

## **6. Final Acceptance of the Work.**

A. Prerequisites for Final Acceptance. After the Contractor has completed all of the Work required by this Contract, including Change Orders and Punch List Items, the Contractor shall submit the following completed items to the DCR together with such additional items as may be specified in the Contract Documents:

- (1) A final request for payment showing a final accounting of all changes in the Work.
- (2) Certification and satisfactory evidence that all taxes, fees, and similar obligations have been paid.
- (3) Consent of the Surety to Final Payment executed by applicable bonding companies.
- (4) Certified copy of the Punch List stating that the Contractor has completed or corrected every item listed.
- (5) Evidence of the Contractor's continuing Completed Operations Insurance coverage to the extent required by the Contract Documents.
- (6) All final record Drawings and documents in the forms specified by the Contract Documents.
- (7) A notarized certification that all purchases made under the tax exemption certificate were legitimate and entitled to exemption.
- (8) Written certifications from the Department of Public Safety and/or the DCR, where required, to the effect that: a) the Work has been inspected for compliance with the Contract Documents and has satisfied the Department of Public Safety; b) all equipment and systems included in the Work have been tested in the presence of the DCR and are operational and satisfactory; c) the Work is completed and ready for final inspection.
- (9) Such other items as may be required by the Contract Documents.

B. Reinspection; Final Acceptance. After notification from the Contractor that all remaining contract exceptions, omissions, and incompletions have been completed (with the exception of the Contractor's continuing warranty, insurance, indemnification, and such other obligations as are intended by the terms of the Contract Documents to extend beyond the date of Final Acceptance), the DCR shall inspect the Work to verify the completion of the same. If the Work is satisfactory, the DCR shall prepare a Certificate of Final Acceptance or shall notify Contractor of items which remain to be completed prior to Final Acceptance.

## **7. One-Year Warranty Repair List and Inspection.**

Approximately 30 days prior to the expiration of the comprehensive one-year warranty period, the Contractor shall schedule an appointment with the DCR for a re-inspection of the Work with the DCR and shall thereafter inspect the Work at the time scheduled. Based on this inspection and on prior inspections, the DCR shall issue a "Warranty Repair List" of items to be corrected by the Contractor. The Contractor shall make the repairs and/or replacements listed within 30 days of the issuance of the Warranty Repair List unless otherwise agreed by the DCR in writing.

## **ARTICLE VII: CHANGES IN THE WORK**

### **1. Change Orders Generally.**

**A.** The DCR may, pursuant to the provisions of M.G.L. c. 30, sec. 39K, authorize in writing, alterations in the line, grade, plans, form, dimensions or materials of the work, or any part thereof, either before, or after the commencement of construction. If such alterations diminish or increase the quantity included to be done and paid for at a unit price, or work substituted for the work specified is of a different cost and quality, the parties shall be governed by the aforesaid provisions of Law. No changes in the Work shall be made in absence of a Change Order defined in Article I of these General Conditions of the Contract, directing the Contractor to perform such changes. A request for a change in the provisions of this Contract may be submitted to the DCR by the Contractor, Project Engineer or Resident Engineer. The request must be made in writing and in accordance with the provisions of this Contract, Laws, and the procedures of the DCR. The DCR reserves the right to increase or decrease quantities, to eliminate portions of the work or add work of similar nature, and to direct the commencement and order of prosecution of various portions of the work.

**B.** A Change Order may be issued by the DCR for changes in the Work within the scope of the Contract, including but not limited to, changes in: (1) the Plans and Specifications; (2) the method or manner of performance of the Work; (3) the DCR-furnished facilities, equipment, materials, services, or Site; (4) the schedule for performance of the Work.

**C.** The Contractor shall immediately perform any Change Order work that is ordered by the DCR.

**D.** Whenever a Change Order is issued and said Change Order will cause a change in the Contractor's cost, the Contractor or the DCR may request an equitable adjustment in the Contract Price. A request for such an adjustment shall be in writing and shall be submitted by the party making such claim to the other party before commencement of the pertinent work or as soon thereafter as possible.

**E.** The DCR and the Contractor shall negotiate in good faith an agreement on an equitable adjustment in the Contract Price, and/or time if appropriate, before commencement of the pertinent work or as soon thereafter as is possible. In the absence of an agreement for an equitable adjustment, the DCR shall unilaterally determine the costs attributable to the change and provide the Contractor with a written notice to that effect. The determination of the DCR shall be final as to all questions of the amount and value of extra work, where the Contractor does not appeal said decision pursuant to the process set forth in this paragraph. The Contractor may appeal the decision of the DCR within thirty days of receipt of said notice, to the Commissioner of the DCR or his designee. The Contractor shall have the right to such further appeal as is provided in M.G.L. c. 30, sec. 39Q set forth in Section 4.D of this Article VII. However, if the Contractor shall exercise its rights to appeal the decision of the DCR as aforesaid, the Contractor shall be required to engage in the mediation procedures set forth in Section 5 of this Article VII, should the DCR require such mediation.

**F.** During the negotiation of an equitable adjustment in the Contract Price, the Contractor shall, if requested, provide the DCR with all cost and pricing data used by him in computing the amount of the equitable adjustment, and the Contractor shall certify that the pricing data used was accurate, complete, and current. If the DCR subsequently determines that the data submitted by the Contractor was incomplete, incorrect, or not current, the DCR may exclude such data from consideration under the equitable adjustment request.

### **2. Methods of Computing Equitable Adjustments.**

**A.** Equitable adjustments in the Contract Price shall be determined according to one of the following methods, or a combination thereof, as determined by the DCR: (1) fixed price basis, provided that the fixed price shall be inclusive of items (a) through (e) below and shall be computed in accordance with those provisions; (2) estimated lump sum basis to be adjusted in accordance with Contract unit prices or other agreed upon unit prices provided that the unit prices shall be inclusive of all costs related to such equitable adjustment; (3) time and materials basis to be subsequently adjusted on the basis of actual costs (but subject to a predetermined "not to exceed limit") calculated as follows:

(a) the direct cost (or credit) for labor at the minimum wage rates established for this Contract pursuant to M.G.L. c. 149, sections 26-27H, and the direct cost for material and use of equipment.

(b) plus (or minus) the cost of Workmen's Compensation Insurance, Liability Insurance, Federal Social Security and Massachusetts Unemployment Compensation, or as an alternative the Contractor may elect to use a flat 30% of the total labor rate computed in accordance with subparagraph (a) above.

(c) plus, an allowance equal to 20% of the amount of (a) above for overhead, superintendence, and profit; (In the case of Item 1 work, which is the work of the Contractor and all his non-filed Subcontractors, said 20% allowance shall be paid to the Contractor and the Contractor and said non-filed Subcontractors shall agree upon the distribution of this amount as a matter of contract between them. In the case of Item 2 work, which is work performed by a Subcontractor filed pursuant to M.G.L. c. 149, sec. 44F, said 20% allowance shall be paid to the filed Subcontractor, it being understood that this provision does not apply to other Subcontractors including sub-Subcontractors listed under paragraph E of the form for sub-Bid).

(d) plus, for work performed by a Subcontractor filed pursuant to M.G.L. c. 149, sec. 44F, an additional allowance equal to 7% of the sum of (a) through (c) above as full compensation to the Contractor for processing forms and assuming full responsibility for the faithful performance of such work by said filed Subcontractor(s).

(e) plus (or minus) the actual direct additional premium costs and expenses incurred as a result of collective bargaining agreements or other agreements between organized labor and employers, and plus (or minus) the actual direct premium cost of payment and performance bonds required of the Contractor and filed Subcontractors for this Contract.

**B.** If the net change is an addition to the Contract Price, it shall include the Contractor's overhead, superintendence, and profit. On any change that involves a net credit, no allowance for overhead, superintendence and profits shall be included. For any change that does not include labor performed or materials installed in the Project, there will be no markup for the Contractor's overhead, superintendence, and profit, even though there may be a net increase in the Contract Price. Charges for small tools known as "tools of the trade" are not to be computed in the amount of any change in the Contract Price.

**C.** Statutory Contract adjustments made under the provisions of M.G.L. c. 149, sec. 44F shall not be considered Change Orders and shall not entitle the Contractor to any adjustments for overhead, profit, and superintendence, although the DCR may require that such Contract adjustments be processed on standard Change Order and equitable adjustment forms.

### **3. Work Performed Under Protest.**

The Contractor agrees to perform all Work as directed by the DCR, and if the Project Engineer determines that certain Work that the Contractor believes to be or to warrant a Change Order under this Article does not represent a change in the Work, the Contractor shall perform said Work. The Contractor shall be deemed to have concurred with the Project Engineer's determination as aforesaid unless the Contractor shall perform Work under protest in compliance with the following sub-paragraphs (1) and (2) below:

(1) If the Contractor claims compensation for a change in the Work that is not deemed by the Project Engineer to be a change or to warrant additional compensation as claimed by the Contractor, the Contractor shall within one week after the commencement of any such work or the sustaining of any such damage submit to the Resident Engineer a written statement of the nature of such work or claim. The Contractor shall not be entitled to additional compensation for any work performed or damage sustained for which written notice is not given within the time limit specified in the preceding sentence, even though similar in character to work or damage with respect to which notice is timely given.

(2) On or before the fifteenth day of the month succeeding that in which any such extra work shall have been done or any such damage shall have been sustained, the Contractor shall file to the extent possible with the Resident Engineer, itemized statements of the details and costs of such work performed, or damage sustained. If the Contractor shall fail to make such statement to the extent possible, then the Contractor shall not be entitled to additional compensation for any such work or damages.

#### **4. False Claims. Statutory Provisions Regarding Changes.**

**A. Criminal Penalties:** The Contractor's attention is directed to M.G.L. c. 30, sec. 39I which provides criminal penalties for unauthorized deviations from the Plans and Specifications, and to M.G.L. c. 30, sec. 39J, and if performing work on a capital facility project, M.G.L. c. 7, sec. 42E-42I. The Contractor's attention is also directed to M.G.L. c. 266, sec. 67B which provides criminal penalties for false claims by Contractor under this Contract: *"Whoever makes or presents to any employee, department, agency or public instrumentality of the commonwealth, or of any political subdivision thereof, any claim upon or against any department, agency, or public instrumentality of the commonwealth, or any political subdivision thereof, knowing such claim to be false, fictitious, or fraudulent, shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than five years, or in the house of correction for not more than two and one-half years, or both."*

**B. Differing Site Conditions (M.G.L. c. 30, sec. 39N):** *"If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the Site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing Site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly."*

**C. Timely Decision by Awarding Authority. (M.G.L. c. 30, sec. 39P):** *"Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the awarding authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made."*

**D. Change Order / Contract Interpretation Appeal Procedure (M.G.L. c. 30, sec. 39Q):** The following provisions apply to every contract awarded by any state agency as defined by M.G.L. c. 7, sec. 39A for the construction, reconstruction, alteration, remodeling, repair, or demolition of any capital facility as defined by the aforesaid section 39A:

*"(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay, suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute.*

*"(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefore, and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his/her designee shall be final and conclusive unless an appeal is taken as provided below.*

*"(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subparagraph, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one-day period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, he shall notify all parties of the reasons for the delay and the date when the decision will issue. Failure to issue a decision within the one-hundred-and-twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.*

*"(d) When the amount in dispute is less than ten thousand dollars, a contractor who is party to the dispute may elect to submit the appeal to a hearing officer experienced in construction law for expedited hearing in accordance with the informal rules of practice and procedure of the division of hearing officers. An expedited hearing under this subparagraph shall be available at the sole option of the contractor. The hearing officer shall issue a decision no later than sixty days following the conclusion of any hearing conducted pursuant to this subparagraph. The hearing officer's decision shall be final and conclusive and shall not be set aside except in cases of fraud."*

## **5. Mediation.**

In the case of every dispute where the dollar amount in dispute (or the estimated dollar value of the extension of time in dispute) is \$50,000 or more and the Contractor appeals the decision of the DCR or his designee described in Section 4.B above, the DCR shall retain the option at its sole discretion of initiating a process whereby the DCR and the Contractor shall engage in good faith in a non-binding mediation process, which process shall be concluded within sixty days from the date that the Contractor files an appeal from said decision as provided in Section 4.B above.

## **ARTICLE VIII: PAYMENT PROVISIONS**

### **1. Schedule of Values.**

Before the first application for payment the Contractor shall submit to the DCR a schedule of values allocated to various portions of the Work in sufficient detail to reflect the various major components of each trade (with filed Subcontractors as well as MBE/WBE noted), including quantities when requested, aggregating the total Contract Price, and divided so as to facilitate payments for work under each section of the Specifications. The schedule shall be prepared in such form and supported by such data to substantiate its accuracy as the DCR may require. Each item in the schedule shall include its proper share of overhead and profit. When approved by the DCR, it shall constitute the Schedule of Values and shall be used only as a basis for the Contractor's requests for payments.

### **2. Payment Liabilities of Contractor.**

**A.** The Contractor shall pay to the DCR all expenses, losses, and damages, as determined by the DCR, incurred in consequence of any default, defect, omission or mistake of the Contractor or his/her employees or Subcontractors or the making good thereof.

**B.** If the Work (or a portion thereof) is not completed to Substantial Completion and the Contractor has not fully completed the Work by the date specified in Article 2 of the Department of Conservation and Recreation - Contractor Agreement, the Contractor shall pay to the DCR liquidated damages as provided in Article VI, Section 2 of these General Conditions of the Contract.

### **3. Retention of Moneys by the DCR.**

**A.** The DCR may keep any moneys which would otherwise be payable at any time hereunder, and apply the same, or so much as may be necessary therefor, to (1) the DCR's expenditures for the Contractor's account, (2) to secure the DCR's remedies against the Contractor for the Contractor's breach of its obligations under this Contract or the breach of any person performing any part of the Work and (3) the payment of any expenses, losses or damages incurred by the DCR as a result of the failure of the Contractor to perform its obligations hereunder. The DCR may retain, until all claims are settled, such moneys as the DCR estimates to be the fair value of the DCR's claims against the Contractor, and of all claims for labor performed or furnished and for materials used or employed in or in connection with the Work and for the rental of vehicles, appliances and equipment employed and for the employment of substitute contractors and labor in connection with the Work, in accordance with M.G.L. c. 30, sections 39A and 39F. The DCR may make such settlements and apply thereto any moneys retained under this Contract.

**B.** The Contractor shall each week examine all claims so filed, and if the same are in any respect incorrect or do not correctly show the amount due from the Contractor to the claimant for such labor and materials, the Contractor shall forthwith file with the DCR a separate written statement of all inaccuracies in each claim and of the correct amount due from the Contractor to each claimant therefor, and shall immediately file a statement of all payments thereafter made to such claimants. Each such statement shall be sworn to and contain a detailed breakdown as required by M.G.L. c. 30 s. 39F(d). Unless such statements are so filed by the Contractor the amount shown by the claims filed shall at the option of the DCR be conclusively deemed to be the accurate amount due from the Contractor therefor in all accounting with the DCR. If the moneys retained under this Contract are insufficient to pay the sums found by the DCR to be due under the claims for labor and materials filed as aforesaid, the DCR may, at its discretion, pay the same, and the Contractor shall repay to the DCR all sums paid out. The DCR may also at its discretion use any moneys retained, due or to become due under this Contract, for the purpose of paying for both labor and materials used or employed in the Work for which claims have not been filed with the DCR.

**C.** No moneys retained under the provisions of this Article shall be held to be statutory security for the payment of claims filed in accordance with the provisions of M.G.L. c. 149, sec. 29, as amended, for which security is provided by bond.

### **4. Applications for Payment.**

**A.** The Contractor shall, once in each month on the day of the month corresponding to the day of the month specified in the Notice to Proceed referenced in Article 2 of the Department of Conservation and Recreation - Contractor Agreement, in writing and in the manner prescribed by the DCR, submit to the Resident Engineer a statement showing the total amount of Work done to the time of such estimate and the value thereof as approved by the Resident Engineer and the Project Engineer. It shall be the sole responsibility of the Contractor to deliver or cause to be delivered to the Resident Engineer said periodic estimate in proper form, approved as provided above and arithmetically correct. All periodic estimates shall contain such certifications and other evidence supporting the Contractor's right to payment as the DCR may require, including without limitation, lien waivers and other evidence, on such forms as the DCR may require, establishing that title to the equipment or materials is unencumbered and has been transferred to the Department of Conservation and Recreation. If there is no Resident Engineer assigned to the Contract, the DCR shall designate a person at the project field office or alternatively the home office of the DCR. The Contractor shall include in such periodic estimate only such materials as are incorporated in the Work, except as provided in paragraph C below. The DCR shall retain no more than five percent of such estimated value as part security for the completion of the Work and shall pay to the Contractor while carrying on the Work the balance not retained as aforesaid, subject to the approval of the DCR after deducting therefrom all previous payments and all sums to be kept under the provisions of this Contract.

**B.** Each periodic estimate shall constitute the Contractor's representation that (1) the payment then requested to be disbursed has been incurred by the Contractor on account of the Work and is justly due to Subcontractors or, to the Contractor in the case of other Work performed by the Contractor on account thereof, (2) the materials, supplies and equipment for which Application for Payment is being submitted have been installed or incorporated into the Work or have been stored at the Site or at such off Site storage locations as the DCR shall have Approved, (3) the materials, supplies and equipment are insured in accordance with the provisions of this Contract, (4) the materials, supplies and equipment are owned by the Department of Conservation and Recreation and are not subject to any liens or encumbrances, (5) the Work which is the subject of such periodic estimate has been performed in accordance with the Contract Documents and (6) that all due and payable bills with respect to the Work have been paid to date or shall be paid from the proceeds of such periodic estimate. The Contractor's attention is directed to the criminal penalties for false claims referenced in paragraph A above.



C. The Contractor may include in a periodic estimate the value of materials or equipment delivered at the Site (or at some location agreed to in writing) only upon delivery to the DCR of: (1) an acceptable transfer of title on the form provided by the DCR; (2) written certification by the Contractor (or applicable subcontractor) on the form provided by the DCR that the Contractor (or the Subcontractor which executed the transfer of title) is the lawful owner and that the materials or equipment are free from all encumbrances, accompanied by receipted invoices or other acceptable proof of encumbrance-free ownership if such proof is deemed necessary by the DCR; (3) a stored materials insurance binder that covers the materials for which payment is requested, that names the Department of Conservation and Recreation as an insured party should the stored materials be subjected to any casualty, loss, or theft prior to their inclusion in the Work. The material(s) or equipment must, in the judgment of the DCR (1) meet the requirements of the Contract, including prior drawing, product data, and sample approval, (2) be ready for use, and (3) be properly stored by the Contractor and be adequately protected until incorporated into the Work. See also Article V.5.C of these General Conditions of the Contract concerning the cost of inspections.

D. The DCR may make changes in any periodic estimate submitted by the Contractor in accordance with M.G.L. c. 30, sec. 39K for building projects (see below), and in accordance with M.G.L. c. 30, sec. 39G for public works projects (see below), and the payment due shall be computed in accordance with the changes so made. The provisions of said section 39K shall govern payments for building projects on which the DCR has made changes, and the provisions of said section 39G shall govern payments for public works projects on which the DCR has made changes.

E. No certificate for payment and no progress payment shall constitute acceptance of Work that is not in accordance with the Contract Documents.

F. The Contractor and all Subcontractors furnishing labor on this Contract agree to furnish certified payroll reports if requested to do so, at no additional expense to the DCR. The DCR may at all reasonable times audit such reports.

#### **5. Periodic Payments (M.G.L. c. 30, sec. 39K) for Building Projects.**

For building contracts, the DCR shall make payment to the Contractor in accordance with M.G.L. c. 30, sec. 39K, which provides as follows:

*" Within fifteen days (30 days in the case of the commonwealth, including local housing authorities) after receipt from the contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority upon certification by the contractor that he is the lawful awarding authority and that the materials are free from all encumbrances, but less (1) a retention based on its estimate of the fair value of its claims against the contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five days after (a) the contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one percent of the original contract price, or (b) the contractor substantially completes the work and the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the contractor the entire balance due on the Contract less (1) a retention based on its estimate of the fair value of its claims against the contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, or based on the record of payments by the contractor to the subcontractors under this contract if such record of payment indicates that the contractor has not paid subcontractors as provided in section thirty-nine F. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days (twenty-four days in the case of the commonwealth) after receipt of such period estimate from the contractor, at the place designated by the awarding authority if such a place is so designated. The contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.*

*The awarding authority may make changes in any periodic estimate submitted by the contractor and the payment due on said periodic estimate shall be computed in accordance with the change so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the awarding authority may, within seven days after receipt, return to the contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair, or demolition of any public building to which this section applies.*

*All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed sub-trade and each sub-sub-trade listed in sub-bid form as required by specifications and column listing the amount paid to each filed subcontractor as of the date of the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for herein to each payment for each day beyond the due date of receipt marked on the estimate.*

*A certificate of the architect to the effect that the contractor has fully or substantially completed the work shall, subject to the provisions of section thirty-nine J, be conclusive for the purposes of this section.*

*Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the general contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination in the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149."*

#### **6. Payment of Subcontractors (M.G.L. c. 30, sec. 39F).**

The Contractor shall make payments to Subcontractors in accordance with the provisions of M.G.L. c. 30, sec. 39F, which is quoted in this section below, where applicable. (M.G.L. c. 30, sec. 39F requires that subparagraphs (a) through (h) be set forth in contracts awarded under M.G.L. c. 30, sec. 39M and M.G.L. c. 149, sections 44A-44H; said statute requires that subparagraph (i) be set forth in contracts awarded under M.G.L. c. 149, sections 44A-44H).

*"1(a) Forthwith after the general contractor receives payment on account of a periodic estimate, the general Contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.*

*(b) Not later than the sixty-fifth day after each subcontractor substantially completes his work in accordance with the Plans and Specifications, the entire balance due under the subcontract less amounts retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the subcontractor; and the awarding authority shall pay that amount to the general contractor. The general contractor shall forthwith pay to the subcontractor the full amount received from the awarding authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.*

*(c) Each payment made by the awarding authority to the general contractor pursuant to subparagraphs (a) and (b) of this paragraph for the labor performed and the materials furnished by a subcontractor shall be made to the general contractor for the account of that subcontractor; and the awarding authority shall take reasonable steps to compel the general contractor to make each such payment to each such subcontractor. If the awarding authority has received a demand for direct payment from a subcontractor for any amount which has already been included in a payment to the general contractor or which is to be included in a payment to the general contractor for payment to the subcontractor as provided in subparagraphs (1) and (2) the awarding authority shall act upon the demand as provided in this section.*

*(d) If, within seventy days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the general contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the subcontractor may demand direct payment of that balance from the awarding authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered to or sent by certified mail to the general contractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the subcontractor has substantially completed the subcontract work. Within ten days after the subcontractor has delivered or so mailed the demand to the awarding authority and delivered or so mailed a copy to the general contractor, the general contractor may reply to the demand. The reply shall be by a sworn statement to or sent by certified mail to the awarding authority and a copy shall be delivered to or sent by certified mail to the subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor and of the amount due for each claim made by the general contractor against the subcontractor.*

*(e) Within fifteen days after receipt of the demand by the awarding authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the awarding authority shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount (i) retained by the awarding authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the general contractor in the sworn reply; provided that the awarding authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph (d). The awarding authority shall make further direct payments to the subcontractor forthwith after the removal of the basis for deduction from direct payments made as provided in parts (i) and (ii) of this subparagraph.*

*(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (5) in an interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the general contractor and the subcontractor and shall notify the general contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the general contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.*

*(g) All direct payments and all deductions from demand for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to subparagraph (6) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the General contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the general contractor to the extent of such payment.*

*(h) The awarding authority shall deduct from payments to a General contractor amounts which, together with the deposits in interest bearing accounts pursuant to subparagraph (6) are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the general contractor.*

*(i) If the subcontractor does not receive payment as provided in subparagraph (1) or if the general contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subparagraph (1), the subcontractor may demand direct payment by following the procedure in subparagraph (4) and the general contractor may file a sworn reply as provided in that same subparagraph. A demand made after the first day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the general contractor. Thereafter the awarding authority shall proceed as provided in subparagraph (e), (f), (g) and (h).*

*(2) Any assignment by a subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of section twenty-nine of chapter one hundred forty-nine shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the awarding authority, or which are on deposit pursuant to subparagraph (6) shall be subordinate to the rights of all subcontractors who are entitled to be paid under this section and who have not been paid in full.*

*(3) "subcontractor" as used in this section (l) for contracts awarded as provided in sections forty-four A to forty-four L, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and received a subcontract as a result of that filed sub-bid or who is approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, (ii) for contracts awarded as provided in paragraph (1) of section thirty-nine M of chapter thirty shall mean a person approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, and (iii) for contracts with the commonwealth not awarded as provided in sections forty-four A to forty-four L, inclusive, of chapter one hundred forty-nine shall also mean a person contracting with the general contractor to supply materials used or employed in a public works project for a price in excess of five thousand dollars.*

*(4) A general contractor or a subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposit as provided in subparagraph (6) by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subparagraph (6) by a petition in equity in the superior court against the awarding authority and the general contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one shall apply to such petitions. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to sections fifty-nine and fifty-nine B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any subcontractor with the petition of one or more subcontractors or the same general Contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a subcontractor filing a demand for direct payment for which no funds due the general contractor are available for direct payment shall have a right to file a petition in court of equity against the awarding authority claiming a demand for direct payment is premature and such subcontractor must file the petition before the awarding authority has made a direct payment to the subcontractor and has made a deposit of the disputed portion as provided in part (iii) of subparagraph (5) and in subparagraph (6).*

*(5) In any petition to collect any claim for which a subcontractor has filed a demand for direct payment the court shall, upon motion of the general contractor, reduce by the amount of any deposit of a disputed amount by the awarding authority as provided in part (iii) of subparagraph (5) and in subparagraph (6) any amount held under a trustee writ or pursuant to a restraining order or injunction."*

## **7. Contracts for Public Works Governed by M.G.L. c. 30, sec. 39G:**

The following statutory provision applies only to contracts for public works governed by M.G.L. c. 30, sec. 39G: *"Upon substantial completion of the work required by a Contract with the Owner, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges, and other highway structures, sewers and water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the Contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such a list a notice setting forth a reasonable time, which shall not in any event be prior to the Contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one-day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.*

*Within sixty-five days after the effective date of a declaration of a substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one percent retainage of that undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payments filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to section thirty-nine F, but no Contract subject to said section thirty-nine F shall contain any other provision authorizing the awarding authority to deduct any amount by virtue of claims asserted against the Contract by subcontractors, material suppliers or others.*

*If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.*

*Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five days after the receipt of such list or before the then Contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven days' written notice to the contractor by certified mail, return receipt requested, terminate the Contract, and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.*

*Within thirty days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the Contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a final estimate for the quantity and price of the work done and all retainage on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the Contract remain incomplete or unsatisfactory, or that documentation required by the Contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date of payment therefore, whichever occurs first, provided that the awarding authority's inspection shows that no work items required by the Contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.*

*The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment. Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the Site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on the estimate of the fair value of its claims against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.*

*No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the awarding authority to approve a quantity and amount of, all or part of any work item or extra work item.*

*Substantial completion, for the purposes of this section, shall mean either that the work required by the Contract has been completed except for work having a Contract Price of less than one percent of the then adjusted total Contract Price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract”*

## **8. Liens**

Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, delivers to the DCR a complete release of all liens arising out of this Contract, or receipts in full in lieu thereof and, if required in either case, an affidavit that so far as he/she has knowledge or information, the releases and receipts include all labor and material for which a lien could be filed; but the Contractor may, if any Subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the DCR, to indemnify him against any lien. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the DCR, all moneys that the latter may be compelled to pay in discharging such a lien, including all costs and a reasonable attorney's fee.

## **9. Final Payment: Release of Claims by Contractor.**

Upon Final Acceptance of the Work the Contractor shall be entitled to payment of the balance of the Contract Price. Final payment shall be as provided in this Article above and in accordance with any process set forth in the Special Conditions. The Contractor agrees to execute a Certificate of Final Inspection, Release (with Contractor's own exceptions listed thereon) and Acceptance as a condition precedent to Final Payment. The acceptance by the Contractor of the Final Payment made as aforesaid, or the execution of the Certificate of Final Acceptance by the Contractor, shall constitute a release of the Department of Conservation and Recreation, and every member and agent of it, from all claims of and liability to the Contractor for anything done or furnished for or relating to the Work, or for any act or neglect of the Department of Conservation and Recreation, or of any person relating to or affecting the Work, except the claim against the Department of Conservation and Recreation for the remainder, if any there be, of the amounts set forth by the Contractor in the Certificate of Final Inspection, Release and Acceptance. Final Acceptance shall not relieve the Contractor of the requirements of Articles IX, XIV, and XV of these General Conditions of the Contract, or of other provisions of this Contract, to the extent that the same are intended to survive Final Acceptance.

## ARTICLE IX. GUARANTEES AND WARRANTIES

### **1. General Warranty.**

If at any time during the period of one (1) year from the date of Final Acceptance, any part of such Work shall in the reasonable opinion of the DCR be defective or require replacing or repairing, or damage to other property of the DCR is caused by any defect in the Work, the DCR shall notify the Contractor in writing to make the required repairs or replacements and repair such damage. If the Contractor shall neglect to commence such repairs or replacements to the satisfaction of the DCR within ten (10) days from the date of the giving of such notice, then the DCR may employ other persons to make the same. The Contractor agrees, upon demand, to pay to the DCR all amounts which it expends for such repairs, replacements, and/or damages. During this one-year guarantee period any corrective work shall be performed under all the applicable terms of this Contract, and if Change Orders are issued in accordance with the terms of this Contract, the Contractor shall be entitled to compensation for special insurance, as required. This one-year guarantee shall not limit any express guaranty or warranty provided elsewhere in the Contract.

### **2. Special Guarantees and Warrantees.**

**A.** The Contractor's obligation to correct Work as set forth in paragraph 1 above is in addition to, and not in substitution of, such guarantees or warranties as may be required in the various sections of the Specifications.

**B.** Guarantees and warranties required in the various sections of the Specifications must be delivered to the DCR before final payment to the Contractor may be made, or in the case of guarantees and warranties which originate with a subcontractor's section of the Work, before final payment for the amount of that sub-trade or for the phase of Work to which the guarantee or warranty relates.

**C.** The failure to deliver a required guarantee or warranty shall constitute a failure to fully complete the Work in accordance with the Contract Documents.

## ARTICLE X: MISCELLANEOUS LEGAL REQUIREMENTS.

### **1. Contractor to be Informed.**

The Contractor shall inform itself of all existing and future Laws in any manner affecting those engaged or employed in the Work, or the materials used or employed in the Work, or in any way affecting the conduct of the Work, and of all orders and decrees of bodies or tribunals having any applicable jurisdiction or authority over the Work.

### **2. Compliance with all Laws.**

The Contractor shall cause all persons employed in the performance of the Work to comply with all existing and future Laws, including but not limited to those set forth below:

**A. Corporate Disclosures.** The Contractor if a foreign corporation, shall comply with M.G.L. c. 30, sec. 39L.

**B. Veterans Preference.** In the employment of mechanics and apprentices, teamsters, chauffeurs, and laborers in the performance of Work in the Commonwealth, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least six months at the commencement of their employment and who are veterans as defined M.G.L. c. 4, sec. 7(43), and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally who have been residents of the Commonwealth for at least six months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States.

**C. Prevailing Wages.** The Contractor shall comply with M.G.L. c. 149, sections 26- 27H. The prevailing wage schedule is found in Exhibit A to the Instructions to Bidders, listing the prevailing minimum wage rates that must be paid to all workers employed in the Work. The DCR is not responsible for any errors, omissions, or misprints in said schedule. Such Schedule shall continue to be the minimum rate of wages payable to workers employed in the Work throughout the term of this Contract, subject to the exceptions provided in M.G.L. c. 149, sections 26-27H. The Contractor shall not have any claim for extra compensation from the Department of Conservation and Recreation if the actual wages paid to workers employed in the Work exceeds the rates listed on the schedule or as otherwise provided by law. The Contractor shall cause a copy of said Schedule to be kept in a conspicuous place at the Site during the term of the Contract. If reserve police officers are employed by the Contractor, they shall be paid the prevailing wage of regular police officers. (See M.G.L. c.149, sec. 34B).

**D. Payroll Records and Statement of Compliance.** The Contractor shall comply and shall cause its Subcontractors to comply with Massachusetts General Law c. 149, sec. 27B, which requires that a true and accurate record be kept of all persons employed on a project for which the prevailing wage rates have been provided. The Contractor and all Subcontractors shall keep these records and preserve them for a period of three years from the date of completion of the Contract. Such records shall be open to inspection by any authorized representative of the Department of Conservation and Recreation at any reasonable time, and as often as may be necessary. The Contractor shall, and shall cause its subcontractors to, submit weekly copies of their weekly payroll records to the DCR. In addition, the Contractor and each Subcontractor shall furnish to the Executive Department of Labor within fifteen days after completion of its portion of the Work a signed statement in the form required by the DCR.

**E. Vehicle operators.** If the Director of the Department of Labor and Workforce Development has established a Schedule of wage rates to be paid to the operators of trucks, vehicles or equipment for the Work, the Contractor shall be obligated to pay such operators at least the minimum wage rate contained on such Schedule. (See M.G.L. c.149, sections 26-27H).

**F. Eight Hour Day.** The Contractor shall comply with M.G.L. c. 149, sections 30 and 34, which provide that no laborer, workman, mechanic, foreman or inspector working within the Commonwealth in the employ of the Contractor, subcontractor or other person doing or contracting to do the whole or part of the Work shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of extraordinary emergency.

**G. Timely Payment of Wages.** The Contractor shall comply with and shall cause its Subcontractors to comply with M.G.L. c. 149, sec. 148 which requires the weekly or biweekly payment of employees within six days of the end of the pay period during which wages were earned if employed for five or six days of a calendar week, and within other periods of time under certain circumstances as set forth therein.

**H. Lodging, etc.** The Contractor shall comply with, and shall cause its Subcontractors to comply with, M.G.L. c. 149, sec. 25 which provides that every employee under this Contract shall lodge, board, and trade where and with whom he elects, and neither the Contractor nor his agents or employees shall, either directly or indirectly, require as a condition of the employment of any person that the employee shall lodge, board, or trade at a particular place or with a particular person.

**I. Truck Rates.** The use by the Contractor of trucks or other motor vehicles hired from either common or contract motor carriers in the course of performance of this Contract is subject to such minimum rates and charges, and rules and regulations as may from time to time be promulgated by the Department of Public Utilities of the Commonwealth of Massachusetts or other agency of the State or Federal government which may be authorized by law to set rates or otherwise regulate the use of such vehicles. The Contractor expressly assumes the risk of any additional expense that may arise by reason of any change in such minimum rates and charges, and rules and regulations, and shall be entitled to no additional compensation or reimbursement by reason thereof.

**J. Anti-Boycott Covenant (Executive Order #130).** The Contractor warrants, represents and agrees that during the time this Contract is in effect, neither it nor any affiliated company, as hereafter defined, participates in or cooperates with an international boycott, as defined in Section 999(b) (3) and (4) of the Internal Revenue Code of 1954, as amended, or engages in conduct declared to be unlawful by M.G.L. c. 151E, sec. 2. If there shall be a breach in the warranty, representation or agreement contained in this paragraph, then without limiting such other rights as it may have the DCR shall be entitled to rescind this contract. As used herein, an affiliated company shall be any business entity of which at least 51% of the ownership interests are directly or indirectly owned by the Contractor or by a person or persons or business entity or entities directly or indirectly owning at least 51% of the ownership interests of the Contractor; or which directly or indirectly owns at least 51% of the ownership interests of the Contractor.



**K. Contractor's Agreements with Suppliers--Anti-Boycott and Anti-Discrimination Provisions.**

(1) The Contractor shall not purchase or rent any materials, equipment, machinery, vehicles or supplies for or in connection with the Work from any person or entity who does not sign, under pains and penalties of perjury, a certificate that recites: "the undersigned warrants, represents and agrees that during the time its agreement with (insert contractor's name) is in effect for materials, supplies or equipment to be used in connection with the Department of Conservation and Recreation Contract No. (insert contract number), neither the undersigned or any affiliated company, as hereafter defined, participates in or cooperates with an international boycott, as defined in Section 999(b)(3) and (4) of the Internal Revenue Code of 1954, as amended, or engages in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws. As used herein, an affiliated company shall be any business entity of which at least 51% of the ownership interests are directly or indirectly owned by the undersigned or by a person or persons or business entity or entities directly or indirectly owning at least 51% of the ownership interests of the undersigned; or which directly or indirectly owns at least 51% of the ownership interests of the undersigned."

(2) The DCR shall not be obligated to pay the Contractor for the cost of any materials, supplies, or equipment purchased or rented from any individual or entity from whom the Contractor has not previously obtained and delivered to the DCR the certificate that the previous paragraph requires. The Contractor will immediately terminate its contract with any supplier who breaches the warranty, representation and agreement contained in the previous paragraph.

(3) The Contractor shall include in the Contractor's agreement with any person or entity from whom the Contractor intends to purchase or rent any materials, equipment, machinery, vehicles or supplies for or in connection with the Work, (a) a notice that this Contract obligates the Contractor to terminate the supply contract upon discovery of such breach of the sworn certificate delivered under subparagraph (1) and such termination shall be without liability to the Contractor or the DCR and (b) a provision which states: "The Governor or his designee, the secretary of administration and finance, and the state auditor or his designee shall have the right at reasonable times and upon reasonable notice to examine the books, records and other compilations of the undersigned vendor which pertain to the performance and requirements of this agreement to provide materials of any nature to the undersigned contractor in connection with DCR Contract No. (insert contract number)."

**L. Access to Contractor's Records (Executive Order #195).** The Governor or his/her designee, the secretary of administration and finance, and the state auditor or his/her designee shall have the right at reasonable times and upon reasonable notice to examine the books, records, and other compilations of data of the Contractor which pertain to the performance and requirements of this Contract.

**ARTICLE XI: CONTRACTOR'S ACCOUNTING METHOD REQUIREMENTS (M.G.L. c. 30, sec. 39R)**

**1. Definitions.**

The words defined herein shall have the meaning stated below whenever they appear in this Article XI:

--"Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a Contract pursuant to M.G.L. c. 30, sec. 39M, and M.G.L. c. 149, sections 44A-H.

--"Contract" means any Contract awarded or executed pursuant to M.G.L. c. 30, sec. 39M, M.G.L. c. 149, sections 44A-H.

--"Independent Certified Public Account" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his/her residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

--"Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

--"Audit", when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

## **2. Record Keeping.**

**A.** The Contractor shall make, and keep for at least six years after final payment, books, records, and accounts that in reasonable detail accurately and fairly reflect the transactions and dispositions of the Contractor.

**B.** Until the expiration of six years after final payment, the Inspector General and the DCR shall have the right to examine any books, documents, papers or records of the Contractor and Subcontractors that directly pertain to, and involve transactions relating to the Contractor and Subcontractors.

**C.** The Contractor shall describe any change in the method of maintaining records or recording transactions which materially affects any statements filed with the DCR including the date of the change and reasons therefor and shall accompany said description with a letter from the Contractor's independent certified public accountant approving or otherwise commenting on the changes.

**D.** The Contractor represents that it has, prior to the execution of the Contract, filed a statement of management on internal accounting controls as set forth in Section 3 below.

**E.** The Contractor represents that it has, prior to the execution of the Contract, filed an audited financial statement for the most recent completed fiscal year as set forth in section 4 below and will continue to file such statement annually during the term of the Contract.

## **3. Statement of Management Controls.**

**A.** The Contractor shall file with the DCR a statement of management as to whether the system of internal accounting controls of the Contractor and its subsidiaries reasonably assures that:

- (1) transactions are executed in accordance with management's general and specific authorization.
- (2) transactions are recorded as necessary: (a) to permit preparation of financial statements in conformity with generally accepted accounting principles, and (b) to maintain accountability for assets.
- (3) access to assets is permitted only in accordance with management's general or specific authorization; and
- (4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

**B.** The Contractor shall file with the DCR a statement prepared and signed by an independent certified public accountant, stating that the accountant has examined the statement of management on internal accounting controls, and expressing an opinion as to:

- (1) whether the representations of management in response to subparagraph 3 above are consistent with the results of management's evaluation of the system of internal accounting controls; and
- (2) whether such representations of management are reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statement.

## **4. Annual Financial Statement.**

**A.** Every Contractor awarded a contract under M.G.L. c. 30, sec. 39M or M.G.L. c. 149, sections 44A-44H shall annually file with the Commissioner of the Division of Capital Asset Management and Maintenance during the term of the Contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report. Such statements shall be made available to the DCR upon request.

**B.** The office of Inspector General and the DCR shall have the right to enforce the provisions of this Article. A Contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to M.G.L. c. 149, sec. 44C.

## **5. Bid Pricing Materials.**

The Contractor shall save the written calculations, pricing information, and other data that the Contractor used to calculate the bid that induced the DCR to enter into this Contract (the "Bid Pricing Materials") for at least six years after the DCR makes final payment under this Contract.

## **ARTICLE XII: EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION, AND AFFIRMATIVE ACTION PROGRAM.**

This Contract includes the provisions of the DCR's "Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program," attached as Appendix A to these General Conditions of the Contract and incorporated herein by reference.

## **ARTICLE XIII: GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES**

This Contract includes the provisions of the DCR's "Goals for Participation by Minority Business Enterprises and Women Business Enterprises (Executive Order 390), attached as Appendix B to these General Conditions, and as set forth in Section 8 of the Instructions to Bidders, and incorporates same herein by reference.

## **ARTICLE XIV: INSURANCE REQUIREMENTS**

The Contractor shall carry insurance, in the amounts and types specified in Section 7 of the Instructions for Bidders for this Contract and shall comply with all provisions relating to insurance set forth in said Section 7.

## **ARTICLE XV: INDEMNIFICATION**

### **1. Generally.**

To the fullest extent permitted by law, the Contractor shall indemnify, defend (with counsel subject to the supervision of the Attorney General of the Commonwealth of Massachusetts as required by M.G.L. c. 12, sec. 3) and hold harmless the Commonwealth of Massachusetts, its Department of Conservation and Recreation, and its officers, agents, divisions, employees, representatives, successors and assigns from and against all claims, damages, losses and expenses, including but not limited to court costs and attorneys' fees, arising out of or resulting from the performance of the Work, including but not limited to those arising or resulting from:

- labor performed or furnished and/or materials used or employed in the performance of the Work.
- violations by the Contractor, any subcontractor, or by any person directly or indirectly employed or used by any of them in the performance of the Work or anyone for whose acts any of them may be liable (Contractor, subcontractor and all such persons herein collectively called "Contractor's Personnel") of any Laws.
- violations of any provision of this Contract by any of Contractor's Personnel.
- injuries to any persons or damage to any property in connection with the Work.
- any act, omission, or neglect of Contractor's Personnel.

The Contractor shall be obligated as provided above, regardless of whether or not such claims, damages, losses and/or expenses are caused in whole or in part by the actions or inactions of a party indemnified hereunder. In any and all claims by Contractor's Personnel against parties indemnified hereunder, the Contractor's indemnification obligation set forth above shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Article XV.

### **2. DCR's Actions.**

The obligations of the Contractor under Section 1 above shall not extend to the liability of the DCR, its agents or employees, arising out of (i) the preparation or approval of maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications by the DCR, or (ii) the giving of or the failure to give directions or instructions by the DCR, its agents or employees provided such giving or failure to give is the primary cause of the injury or damage.

### **3. Survival.**

The provisions of this Article XV are intended to survive Final Acceptance and/or any termination of this Contract.

## **ARTICLE XVI: PERFORMANCE AND PAYMENT BONDS**

### **1. Contractor Bonds.**

**A.** The Contractor shall provide performance and payment (labor and materials) bonds in the form provided by the DCR, executed by a surety licensed by the Commonwealth of Massachusetts Division of Insurance. Each such bond shall be in the amount of the Contract Price.

**B.** If at any time prior to final payment to the Contractor, the Surety:

- is adjudged bankrupt or has made a general assignment for the benefit of its creditors.
- has liquidated all assets and/or has made a general assignment for the benefit of its creditors.
- is placed in receivership.
- otherwise petitions a state or federal court for protection from its creditors; or
- allows its license to do business in Massachusetts to lapse or be revoked.

then the Contractor shall, within 21 days of any such action listed above, provide the DCR with new performance and payment bonds as described in Paragraph A above. Such bonds shall be provided solely at the Contractor's expense.

### **2. Subcontractor Bonds.**

The Contractor is responsible for the costs of the payment and performance bonds of the sub-contractors for the full amount of their respective Subcontracts.

## **ARTICLE XVII: TERMINATION OF CONTRACT**

### **1. Termination for Cause.**

**A.** The DCR may without prejudice to any other right or remedy deem this Contract terminated for cause if any of the following defaults shall occur and not be cured within five days (5) days after the giving of notice thereof by the DCR to the Contractor and any surety that has given bonds in connection with this Contract:

- (1) The Contractor has filed a petition, or a petition has been filed against the Contractor with its consent, under any federal or state law concerning bankruptcy, reorganization, insolvency or relief from creditors, or if such a petition is filed against the Contractor without its consent and is not dismissed within sixty (60) days; or if the Contractor is generally not paying its debts as they become due; or if the Contractor becomes insolvent; or if the Contractor consents to the appointment of a receiver, trustee, liquidate, custodian or the like of the Contractor or of all or any substantial portion of its assets and such appointment or possession is not terminated within sixty (60) days; or if the Contractor makes an assignment for the benefit of creditors;
- (2) The Contractor refuses or fails, except in cases for which extension of time is provided under this Contract's express terms, to supply enough properly skilled workers or proper materials to perform its obligations under this Contract, or the DCR has determined that the rate of progress required for the timely completion of the Work is not being met.
- (3) The Contractor fails to make prompt payment to Subcontractors or for materials, equipment, or labor.
- (4) All or a part of the Work has been abandoned.
- (5) The Contractor has sublet or assigned all or any portion of the Work, the Contract, or claims thereunder, without the prior written consent of the Department of Conservation and Recreation, except as expressly permitted in this Contract.
- (6) The Contractor has failed to comply with Laws.
- (7) The Contractor fails to maintain, or provide to the DCR evidence of the insurance or bonds required by this Contract, or
- (8) The Contractor has failed to prosecute the Work or any portion thereof to the standards required under this Contract or has otherwise breached any material provision of this Contract.

**B.** The DCR shall give the Contractor and any surety notice of such termination for cause, but the giving of notice of such termination shall not be a condition precedent or subsequent to the termination's effectiveness. In the event of such termination, and without limiting any other available remedies, the DCR may, at its option:

- (1) hold the Contractor and its sureties liable in damages for a breach of Contract.
- (2) notify the Contractor to discontinue all work, or any part thereof, and the Contractor shall discontinue all work, or any part thereof, as the Department of Conservation and Recreation may designate.
- (3) complete the Work, or any part thereof, and charge the expense of completing the Work or part thereof, to the Contractor.

(4) require the surety or sureties to complete the Work and perform all of the Contractor's obligations under this Contract.

If the DCR elects to complete all or any portion of the Work as specified in (3) above, it may take possession of all materials, equipment, tools, machinery, implements owned by the Contractor at or near the Site and finish the Work at the Contractor's expense by whatever means the DCR may deem expedient; and the Contractor shall cooperate at its expense in the orderly transfer of the same to a new contractor or to the DCR as directed by the DCR. In such case the DCR shall not make any further payments to the Contractor until the Work is completely finished. The Department of Conservation and Recreation shall not be liable for any depreciation, loss, or damage to said materials, machinery, implements or tools during said use and the Contractor shall be solely responsible for their removal from the Site after the Department of Conservation and Recreation has no further use for them. Unless so removed within fifteen days after notice to the Contractor to do so, they may be sold at public auction, after publication of notice thereof at least twice in any newspaper published in the county where the Work is being performed, and the proceeds credited to the Contractor's account; or they may, at the option of the DCR, be stored at the Contractor's expense subject to a lien for the storage charges.

**C.** Damages and expenses incurred under paragraph B above shall include, but not be limited to, costs for the DCR's extra services and Project representative services required, in the opinion of the DCR, to successfully inspect and administer the construction contract through final completion of the Work.

**D.** Expenses charged under paragraph B above may be deducted and paid by the DCR out of any moneys then due or to become due the Contractor under this Contract.

**E.** All sums, damages, and expenses incurred by the Department of Conservation and Recreation to complete the Work shall be charged to the Contractor. In case the damages and expenses charged are less than the sum that would have been payable under this Contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference. In case such expenses shall exceed the said sum, the Contractor shall pay the amount of the excess to the Department of Conservation and Recreation.

## **2. Termination For Convenience.**

**A.** The DCR may terminate this Contract for convenience even though the Contractor is not in default by giving notice to the Contractor specifying in said notice the date of termination.

**B.** In case of such termination without cause, the Contractor shall be paid:  
(1) all sums due and owing under this Contract through the date of termination, including any retainage withheld to the date of termination, less any amount which the DCR determines is necessary to correct or complete the Work performed to the date of termination; plus (2) a reasonable sum to cover the expenses which the Contractor would not have incurred but for the early termination of the Contract, such as demobilization of the work force, restocking charges, and termination fees payable to Subcontractors.

**C.** The payment provided in paragraph B above shall be considered to fully compensate the Contractor, and any consultants, Subcontractors, and suppliers, for all claims and expenses directly or indirectly attributable to the termination, including any claims for lost profits.

## **3. Contractor's Duties Upon Termination for Convenience.**

Upon termination of this Contract for convenience as provided in Section 2 of this Article, the Contractor shall: (1) stop the Work; (2) stop placing orders and Subcontracts in connection with this Contract; (3) cancel all existing orders and Subcontracts; (4) surrender the Site to the DCR in a safe condition; (5) transfer to the DCR all materials, supplies, work in process, appliances, facilities, equipment and machinery of this Contract, and all plans, Drawings, Specifications and other information and documents used in connection with this Contract.

## **ARTICLE XVIII: MISCELLANEOUS PROVISIONS**

### **1. No Assignment by Contractor.**

The Contractor shall not assign by power of attorney or otherwise, or sublet or subcontract, the Work, or any part thereof, without the previous written consent of the DCR and shall not, either legally or equitably, assign any of the moneys payable under this Contract, or Contractor's claims hereunder, unless with the like consent of the DCR, whether said assignment is made before, at the time of, or after the execution of the Contract. The Contractor shall remain responsible for satisfactory performance of all Work sublet or assigned. Consent of the DCR shall not be deemed to constitute a representation or waiver of any right hereunder by the DCR as to the qualifications or the responsibility of the Contractor or Subcontractor(s).

**2. Non-Appropriation.**

The Commonwealth certifies that at the time of the execution of this Contract, sufficient appropriations exist and shall be encumbered to fund the Contract Price. Payments are subject to appropriation and shall be made only for work performed in accordance with the terms of this Contract. The Contractor shall not be obligated to perform, and shall not perform, work outside the scope of this Contract without an appropriate amendment to this Contract, and a sufficient appropriation(s) to support such additional work. The Commonwealth may immediately terminate or suspend this Contract in the event that the appropriation(s) funding this Contract is eliminated or reduced to an amount which will be insufficient to support anticipated future obligations under this Contract. Such termination shall be deemed a termination for convenience subject to the provisions of paragraph 2 of Article XVII of this Contract.

**3. Claims by Others Not Valid.**

No person other than the Contractor and the surety on any bond given pursuant to the terms of this Contract shall acquire any interest in this Contract or any claim against the DCR hereunder, and no claim by any other person shall be valid except as provided in M.G.L. c. 30, sec. 39F of the General Laws.

**4. No Personal Liability of Public Officials.**

No public official, employee, or agent of the DCR shall have any personal liability for the obligations of the DCR set forth in this Contract.

**5. Severability.**

The provisions of this Contract are severable, and if any of these provisions shall be held unconstitutional or unenforceable by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the other provisions of this Contract.

**6. Choice of Laws.**

This Contract shall be governed by the laws of the Commonwealth of Massachusetts for all purposes, without regard to its laws on choice of law. All proceedings under this Contract or related to the Project shall be brought in the courts of the Commonwealth of Massachusetts.

**7. Standard Forms.**

Unless directed otherwise in writing by the DCR, the Contractor shall use the standard forms in use by the Department of Conservation and Recreation.

**8. No Waiver of Subsequent Breach.**

No waiver of any breach or obligation of this Contract shall constitute a waiver of any other or subsequent breach or obligation.

**9. Remedies Cumulative.**

All remedies of the DCR provided in this Contract shall be construed as cumulative and may be exercised simultaneously or in any order as determined by the DCR in its sole discretion. The DCR shall also be entitled as of right to specific performance and equitable relief including the right to an injunction against any breach of any of the provisions of this Contract

**10. Notices.**

Notices to the Contractor shall be deemed given when hand delivered to the Contractor's temporary field office at or near the Site, or when deposited in the U.S. mail addressed to the Contractor at the Contractor's address specified in the Department of Conservation and Recreation - Contractor Agreement, or when delivered by courier to either location. Unless otherwise specified in writing by the DCR, notices and deliveries to the DCR shall be effective only when delivered to the DCR at the address specified in the Department of Conservation and Recreation - Contractor Agreement and date-stamped at the reception desk or for which a receipt has been signed by the agent or employee designated by the DCR to receive official notices.

## **APPENDIX A to General Conditions of the Contract**

**The following provisions from Article XII of the General Conditions of the Contract where DCR is the Awarding Authority.**

### **EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION, AND AFFIRMATIVE ACTION PROGRAM.**

#### **1. Compliance Generally.**

For purpose of this Article, “minority” refers to Asians, Blacks, Western Hemisphere Hispanics, Native Americans, and Cape Verdeans; “Commission” refers to the Massachusetts Commission Against Discrimination. During the performance of this Contract, the Contractor and all of its Subcontractors (hereinafter collectively referred to as the Contractor) shall comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

#### **2. Non-Discrimination and Affirmative Action.**

**A.** The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age, handicap, sexual orientation, or sex. The aforesaid provision shall include, but not be limited to, the following: employment rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship. The Contractor shall comply with the provisions of MGL, c. 151B and all other applicable anti-discrimination and equal opportunity laws.

**B.** The Contractor shall comply with the provisions of Executive Order No. 478 entitled Revoking and Superseding Executive Orders Numbers 253 and 452, with respect to affirmative action programs for handicapped individuals, which is herein incorporated by reference and made a part of this Contract.

**C.** In connection with the performance of the Work, the Contractor shall undertake in good faith affirmative action measures designed to eliminate any discriminatory religious creed, national origin, age, sexual orientation, or sex and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, and in-service or apprenticeship training programs. This affirmative action shall include all action required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, age, sexual orientation, or sex. A purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for future public construction projects.

**D.** If the Contractor shall use any subcontractor on any work performed under this Contract, the Contractor shall take affirmative steps to negotiate with qualified minority and women subcontractors. These affirmative steps shall cover both pre-bid and post-bid periods. It shall include notification to the State Office of Minority and Women Business Assistance or its designee, while bids are in preparation, of all products, work, or services for which the Contractor intends to negotiate bids. In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor’s obligations under this Contract relative to non-discrimination and affirmative action.

**E.** As part of its obligation of remedial action under this Article, the Contractor shall maintain on this project not less than the percent ratio set forth in the Owner – Contractor Agreement of minority employee worker hours to total worker hours in each job category including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers, and those “classes of work” enumerated in MGL, c. 149, Sec. 44F.

**F.** In the hiring of minority journeypersons, apprentices, trainees and advanced trainees, the Contractor shall rely on referrals from a multi-employer affirmative action program approved by the Commission, traditional referral methods utilized by the construction industry, and referrals from agencies, not more than three in number at any one time, designated by the Liaison Committee or the Awarding Authority.

### **3. Liaison Committee, Reports and Records.**

**A.** At the option of the Awarding Authority, there may be established for the term of this Contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the Awarding Authority, the Commission and such other representatives as may be designated by the Commission in conjunction with the Awarding Authority. The Contractor (or his agent, if any, designated by him as the on-site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

**B.** The Contractor shall prepare projected staffing tables on a quarterly basis. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also when updated, to the Awarding Authority and Liaison Committee. The Contractor shall prepare weekly reports in a form approved by the Awarding Authority of hours worked in each trade by each employee, identified as minority or non-minority. Copies of these shall be provided at the end of each such week to the Awarding Authority and to the Liaison Committee.

**C.** Records of employment referral orders, prepared by the Contractor, shall be made available to the Awarding Authority and to the Liaison Committee on request.

**D.** A designee of the Awarding Authority and a designee of the Liaison Committee shall each have right to access to the Site.

**E.** The Contractor shall comply with the provisions of MGL, c. 151B as amended, of the Massachusetts General Laws, both of which are herein incorporated by reference and made a part of this Contract.

**F.** The Contractor shall provide all information and reports required by the Awarding Authority or the Commission on forms and in accordance with instructions issued by either of them and will permit access to its facilities and any books, records, accounts, and other sources of information which may be determined by the Awarding Authority or the Commission to affect the employment of personnel. This provision shall apply only to information pertinent to the Owner's supplementary affirmative action Contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the Awarding Authority or the Commission as appropriate and shall set forth what efforts he has made to obtain the information.

### **4. Sanctions.**

**A.** Whenever the Awarding Authority, the Commission, or the Liaison Committee believes the Contractor, or any Subcontractor may not be operating in compliance with the terms of this Article, the Commission shall directly, or through its designated agent, conduct an appropriate investigation, and may confer with the parties to determine if such Contractor is operating in compliance with the terms of this Article. If the Commission or its agent finds the Contractor or any Subcontractor not in compliance, it may make a preliminary report on non-compliance, and notify such Contractor in writing of such steps as will in the judgment of the Commission or its agent bring such Contractor into compliance. In the event that such Contractor fails or refuses to fully perform such steps, the Commission may make a final report of non-compliance, and recommend to the Awarding Authority the imposition of one or more of the sanctions listed below. If, however, the Commission believes the Contractor or any Subcontractor has taken or is taking every possible measure to achieve compliance, it shall not make a final report of non-compliance. Within fourteen days of the receipt of the recommendations of the Commission, the Awarding Authority shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement:

**(I)** The recovery by the Awarding Authority from the Contractor of 1/100 of 1% of the Contract award price or \$1,000 whichever sum is greater, in the nature of liquidated damages or, if a Subcontractor is in non-compliance, the recovery by the Awarding Authority from the Contractor, to be assessed by the Contractor as a back charge against the subcontractor, of 1/10 of 1% of the sub-contract price, or \$400 whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply.



(2) The suspension of any payment or part thereof due under the Contract until such time as the Contractor or any subcontractor is able to demonstrate his compliance with the terms of the Contract.

(3) The termination, or cancellation, of the Contract, in whole or in part, unless the Contractor or any Subcontractor is able to demonstrate within a specified times his compliance with the terms of the contract.

(4) The denial to the Contractor or any subcontractor of the right to participate in any future contracts awarded by the Awarding Authority for a period of up to three years.

**B.** If any time after the imposition of one or more of the above sanctions a Contractor is able to demonstrate that it is in compliance with this Article, the Contractor may request the Awarding Authority, in consultation with the Commission, to suspend the sanctions conditionally, pending a final determination by the Commission as to whether the Contractor is in compliance. Upon final determination of the Commission, the Awarding Authority, based on the recommendation of the Commission, shall either lift the sanctions or reimpose them.

**C.** Sanctions recommended by the Commission and enumerated under Section 4 above shall not be imposed by the Awarding Authority except after an adjudicatory proceeding, as that term is used in MGL, c. 30A, has been conducted. No investigation by the Commission or its agent shall be initiated without prior notice to the Contractor.

**D.** Notwithstanding the provisions of 4A-4C above, if the Awarding Authority determines after investigation that the Contractor or any Subcontractor is not in compliance with the terms of this Article, it may suspend any payment or portion thereof due under the Contract until the contractor demonstrates to the satisfaction of the Awarding Authority compliance with the terms of this Article. This temporary suspension of payments by the Awarding Authority is separate from the sanctions set forth in Section 4A-4C of this Article above, which are determined by MCAD and recommend to the Awarding Authority. Payment may be suspended only after the Contractor and any other interested party shall have been given the opportunity to present evidence in support of its position at an informal hearing held by the Awarding Authority, and the Awarding Authority has concluded upon review of all the evidence that such penalty is justified. Payment shall not be suspended if the Awarding Authority finds that the Contractor made its best efforts to comply with this Article, or that some other justifiable reason exists for waiving the provisions of this Article in whole or in part.

## **APPENDIX B to General Conditions of the Contract**

**The following provisions from Article XIII of the General Conditions of the Contract where DCR is the Awarding Authority.**

### **GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES (EXECUTIVE ORDER 390, MGL, c. 7, s. 40N)**

#### **1. Goals.**

**A.** The goals for minority business enterprise and women business enterprise participation established for this Contracts are as set forth in the Owner – Contractor Agreement.

**B.** The Contractor and all Subcontractors, sub-subcontractors, and materials suppliers shall comply with all of the terms and conditions of this Article, which include the provisions pertaining to M/WBE participation set forth in the Owner – Contractor Agreement in order to meet the M/WBE participation goals established for this Contract.

#### **2. M/WBE Participation Credit.**

**A.** If the Contractor is itself an MBE or WBE, M/WBE participation credit will be given in an amount equal to the entire Contract Price. If the Contractor is not an MBE or WBE then M/WBE participation credit will be given for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.

**B.** If the Contractor is a joint venture with one or more M/WBE joint venturers, M/WBE participation credit shall be given to the joint venture as follows:

**(1)** If the joint venture is certified by SOMBWA as an MBE or WBE, M/WBE participation credit shall be given in an amount equal to the Contract Price.

**(2)** If the joint venture is not certified as an MBE or WBE by SOMWBA, M/WBE participation credit shall be given to the joint venture for the value of the Work that is performed by the M/WBE joint ventures(s), and for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.

**C.** MBE participation credit shall be given for the work performed by MBEs only, and WBE participation credit shall be given for the work performed by WBEs only. MBE participation may not be substituted for WBE participation, nor may WBE participation be substituted for MBE participation.

#### **3. Establishing M/WBE Status.**

**A.** A minority-owned business shall be considered an MBE only if it has been certified as a minority business enterprise by the State Office of Minority and Women Business Assistance (“SOMWBE”).

**B.** A woman-owned business shall be considered a WBE only if it has been certified as a woman business enterprise by SOMWBA.

**C.** Certification as a disadvantaged business enterprise (“DBE”), certification as an M/WBE by any agency other than SOMWBA, or submission of an application to SOMWBA for certification as an M/WBE shall not confer M/WBE status on a firm for the purposes of this Contract.

#### **4. Subcontracts with M/WBEs.**

Within thirty (30) days after the award of this Contract, the Contractor shall (i) execute a subcontract with each M/WBE Subcontractor which has executed a Letter of Intent approved by the Awarding Authority, (ii) cause its Subcontractors to execute a sub-subcontract with each M/WBE sub-subcontractor, and (iii) furnish the Awarding Authority with a signed copy of each such subcontract and sub-subcontract.

## **5. Performance of Contract Work by M/WBEs.**

**A.** The Contractor shall not perform with its own organization or subcontract or assign to any other firm work designated to be performed by any W/MBE in the Letters of Intent or Schedule of M/WBE Participation without the prior Approval of the Awarding Authority, nor shall any M/WBE assign or subcontract to any other firm, or permit any other firm to perform any of its M/WBE Work without the prior Approval of the Awarding Authority. Any such unapproved assignment, subcontracting, sub-subcontracting, or performances of M/WBE Work by others shall be a change in the M/WBE Work for the purposes of this Contract. The Awarding Authority WILL NOT APPLY TO THE M/WBE PARTICIPATION GOALS(S) ANY SUMS ATTRIBUTABLE TO SUCH UNAPPROVED ASSIGNMENTS, SUB-CONTRACTS, SUB-SUBCONTRACTS, OR PERFORMANCE OF M/WBE WORK BY OTHERS.

**B.** The Contractor shall be responsible for monitoring the performance of M/WBE Work to ensure that each scheduled M/WBE performs its own M/WBE Work with its own workforce.

**C.** The Contractor and each M/WBE shall provide the Awarding Authority with all information and documentation that the Awarding Authority determines is necessary to ascertain whether or not an M/WBE has performed its own M/WBE Work. At the discretion of the Awarding Authority, failure to submit such documentation to the Awarding Authority shall establish conclusively for the purpose of giving M/WBE participation credit under this Contract that such M/WBE did not perform such work.

## **6. Notification of Changes in M/WBE Work.**

**A.** If any time during the performance of the Contract the Contractor determines or has reason to believe that a scheduled M/WMBE is unable to unwilling to perform its M/WBE Work, or that there has been or will be a change in any M/WMBE Work, or that the Contractor will be unable to meet the M/WBE participation goal(s) for this Contract for any reason, the Contractor shall immediately notify the Awarding Authority Contract Compliance Office in writing of such circumstances.

**B.** Any notice of a change in M/WBE Work pursuant to subparagraph "A: above shall include a revised Schedule of M/WBE Participation, and additional or amended Letters of Intent and subcontracts, as the case may be.

## **7. Actions Required if there is a Reduction in M/WBE Participation.**

**A.** In the event there is a change or reduction in any M/WBE Work which will result in the Contractor failing to meet the M/WBE participation goal(s) for this Contract, other than a reduction in M/WBE Work resulting from a Change Order initiated by the Awarding Authority, then the Contractor shall immediately undertake a diligent, good faith effort to make up the shortfall in M/WBE participation as follows:

**(1)** The Contractor shall identify all items of the Work remaining to be performed under the Contract that may be made available for subcontracting to W/MBEs. The Contractor shall send a list of such items of work to the Awarding Authority, together with a list of the remaining items of the Work that was not made available to M/WBEs and the reason for not making such work available for subcontracting to M/WBEs.

**(2)** The Contractor shall send written notices soliciting proposals to perform the items of the Work that may be made available for subcontracting to W/MBEs to all W/MBEs qualified to perform such work. The Contractor shall advise the Awarding Authority of (i) each W/MBE solicited, and (ii) each W/MBE listed in the SOMWBA directory under the applicable trade category who was not solicited and the reasons, therefore. The Contractor shall also advise the Awarding Authority of the dates notices were mailed and provide a copy of the written notice(s) sent.

**(3)** The Contractor shall make reasonable efforts to follow up the written notices sent to M/WBEs with telephone calls or personal visits in order to determine with certainty whether the M/WBEs were interested in performing the work. Phone logs or other documentation must be submitted to the Awarding Authority evidencing this effort.

**(4)** The Contractor shall make reasonable efforts to assist M/WBEs that need assistance in obtaining insurance, bonds, or lines of credit in order to perform work under the Contract and shall provide the Awarding Authority with evidence that such efforts were made.

(5) The Contractor shall provide the Awarding Authority with a statement of the response received from each M/WBE solicited, including the reason for rejecting any M/WBE who submitted a proposal.

(6) The Contractor shall take any additional measures reasonably requested by the Awarding Authority to meet the M/WBE participation goal(s) established for this Contract, including, without limitation, placing advertisements in appropriate media and trade association publications announcing the Contractor's interest in obtaining proposals from M/WBEs, and/or sending written notification to M/WBE economic development assistance agencies, trade groups and other organizations notifying them of the project and of the work available to be subcontracted by the Contractor to M/WBEs.

**B.** If the Contractor is unable to meet the M/WBE participation goals for this Contract after complying fully with each of the requirements of paragraph "A" above, and the Contractor is otherwise in full compliance with the terms of this Article, the Awarding Authority may reduce the M/WBE participation goals for this Contract to the extent that such goals cannot be achieved.

#### **8. Suspension of Payment and/or Performance for Noncompliance.**

**A.** If at any time during the performance of this Contract, the Awarding Authority determines or has reason to believe that (1) there has been a change or reduction in any M/WBE Work which will result in the Contractor failing to meet the M/WBE participation goal(s) for this Contract, other than a reduction in M/WBE Work resulting from a change in the Contract work ordered by the Awarding Authority, and (2) the Contractor has failed to comply fully with all of the terms and conditions of paragraphs 1 through 7 above, the Awarding Authority may:

(1) suspend payment to the Contractor of an amount equal to the value of the work which was to have been performed by an M/WBE pursuant to the Contractor's Schedule of M/WBE Participation, but which was not

so performed, in order to ensure that sufficient Contract funds will be available if liquidated damages are assessed pursuant to paragraph 9 and/or

(2) suspend the Contractor's performance of this Contract in whole or in part.

**B.** The Awarding Authority shall give the Contractor prompt written notice of any action taken pursuant to paragraph A above and shall give the Contractor and any other interested party, including any M/WBEs, an opportunity to present evidence to the Awarding Authority that the Contractor is in compliance with the requirements of this Article, or that there is some justifiable reason for waiving the requirements of this Article in whole, or in part. The Awarding Authority may invite SOMWBA and the Massachusetts Commission Against Discrimination to participate in any proceedings undertaken pursuant to this paragraph.

**C.** Upon a showing that the Contractor is in full compliance with the requirements of this Article, or that the Contractor has met or will meet the M/WBE participation goals for this Contract, the Awarding Authority shall release any funds withheld pursuant to clause A(1) above and lift any suspension of the Contractor's performance under clause A(2) above.

#### **9. Liquidated Damages: Termination.**

**A.** If payment by the Awarding Authority or performance by the Contractor is suspended by the Awarding Authority as provided in paragraph 8 above, the Awarding Authority shall have the following rights and remedies if the Contractor thereafter fails to take all action necessary to bring the Contractor into full compliance with the requirements of this Article, or if full compliance is no longer possible because the default of the Contractor is no longer susceptible to cure, if the Contractor fails to take such other action as may be required by the Awarding Authority to meet the M/WBE participation goals set forth in this Contract:

(1) the Awarding Authority may terminate this Contract, and/or

(2) the Awarding Authority may retain from final payment to the Contractor, as liquidated damages, an amount equal to the difference between (x) the total of the M/WBE participation goals set forth in this Contract, and (y) the amount of M/WBE participation credit earned by the Contractor for M/WBE Work performed under this Contract as determined by the Awarding Authority, the parties agreeing that the damages for failure to meet the M/WBE participation goals are difficult to determine and that the foregoing amount to be retained by the Awarding Authority represents the parties' best estimate of such damages. Any liquidated damages will be assessed separately for MBE and WBE participation.

**B.** Before exercising its rights and remedies hereunder, the Awarding Authority may, but the Awarding Authority shall not be obligated to, give the Contractor and any other interested party another opportunity to present evidence to the Awarding Authority that the Contractor is in compliance with the requirements of this Article or that there is some justifiable reason for waiving the requirements of this Article in whole or in part. The Awarding Authority may invite SOMWBA and the Massachusetts Commission Against Discrimination to participate in any proceedings undertaken hereunder.

**10. Reporting Requirements.**

The Contractor shall submit to the Awarding Authority all information or documentation that is necessary in the judgment of the Awarding Authority to ascertain whether or not the Contractor has complied with any of the provisions of this Article.

**11. Awarding Authority's Right to Waive Provisions of this Article in Whole or in Part.**

The Awarding Authority reserves the right to waive any provision or requirement of this Article if the Awarding Authority determines that such waiver is justified and in the public interest. No such waiver shall be effective unless in writing and signed by a representative of the Awarding Authority's Compliance Office or the office of its General Counsel. No other action or inaction by the Awarding Authority shall be construed as a waiver of any provision of this Article.

**COMMONWEALTH OF MASSACHUSETTS  
DEPARTMENT OF CONSERVATION AND RECREATION**

**SPECIAL GOOD FAITH REQUIREMENTS FOR PARTICIPATION BY VETERAN OWNED  
BUSINESS ENTERPRISES**

**(Implementing Executive Order No. 546, Establishing the Veteran Owned Business  
Enterprise Program).**

**BIDDER'S INSTRUCTIONS**

THE APPARENT LOW BIDDER'S COMPLIANCE WITH THE REQUIREMENTS OF THIS SECTION IS A PREREQUISITE FOR RECEIVING THE AWARD OF THE CONTRACT.

1) Participation Goals and Program Operation

In order to be an eligible VOB for the participation goals of this Contract, the business enterprise must be listed as a veteran-owned business within the VetBiz database, located at [www.VetBiz.gov](http://www.VetBiz.gov), at the time of the bid submission deadline. Only a VOB identified as a veteran-owned small business via the VetBiz database shall count towards meeting the Program participation goal.

The Contractor must demonstrate that VOBs are eligible for the following participation goals via its listing as a veteran-owned small business within the VetBiz database, located at [www.VetBiz.gov](http://www.VetBiz.gov), at the time said VOB seeks to participate in business provided under this Contract; provided, that it shall also be the responsibility of the Awarding Authority to verify the status of the SDVOB via said VetBiz database prior to the awarding of the Contract.

a) Design Services Contracts – In furtherance of the goals and objectives of the program, commencing July 1, 2013 until such time as the Secretary for Administration and Finance has adopted a new participation goal, the participation goal, which shall be expressed in the form of a benchmark for each design services contract, shall be three (3) percent; provided, that said participation goal may be met by the veteran-owned business enterprise performing as either a general or prime contractor, a subcontractor, or both; provided further, that the awarding agency shall verify the status of business enterprise participation on a design services contract.

b) Public Construction Contracts – In furtherance of the goals and objectives of the Program, commencing July 1, 2013 until such time as the Secretary of Administration and Finance has adopted a new participation goal, the participation goal, which shall be expressed in the form of a benchmark for each public construction contract, shall be three (3) percent; provided, that said participation goal may be met by the veteran-owned business enterprise performing as either a general or prime contractor, a subcontractor, or both; provided further, that the awarding agency shall verify the status of a service veteran-owned business enterprise prior to said business enterprise participation on a public construction contract.

2) Goal Reduction/Waiver

- A) The Awarding Authority reserves the right to reduce or waive the SDVOBE participation goals established for this Contract upon written request made by a Bidder using the VOB E Waiver Request Form provided by the Awarding Authority.
- B) If filed Sub-Bids are solicited for this Contract, requests from prospective general Bidders to reduce or waive the VOB E participation goals for this Contract should be received by the Awarding Authority no later than four (4) working days after the list of filed Sub- Bidders is mailed by the Awarding Authority to persons who have taken out plans for the Contract, using the VOB E Waiver Request Form provided by the Awarding Authority.
- C) If there are no filed sub-Bids solicited for this Contract, requests to reduce or waive the SDVOBE participation goals for this Contract should be received by the Awarding Authority no later than five (5) working days before the date set for the receipt of general Bids. **THE AWARDING AUTHORITY RESERVES THE RIGHT TO REJECT ANY REQUEST TO REDUCE OR WAIVE THE VOB E PARTICIPATION GOALS FOR THIS CONTRACT THAT IS RECEIVED AFTER THESE DEADLINES.** Such written request must demonstrate to the satisfaction of the Awarding Authority that it is not feasible for a non- VOB E or non- VOB E general Bidder to meet the goals established for this Contract based upon any or all of the following:
- a) actual VOB E availability.
  - b) the geographic location of the project to the extent related to SDVOBE availability.
  - c) the scope of the work.
  - d) the percentage of work available for subcontracting to VOB Es; and/or
  - e) other relevant factors, including a **documented** inability by the prospective Bidder to obtain commitments from VOB E subcontractors sufficient to meet the VOB E goals after having made a diligent, good faith effort to do so. All of the foregoing documentation shall accompany the completed Waiver Request Form. Such documentation shall include, at a minimum, the following:
    - A list of all items of work under the Contract that the Bidder made available for subcontracting to VOB Es. The Bidder shall identify all items of work, other than work to be performed by filed sub-Bidders, that the Bidder did not make so available and shall state the reasons for not making such work available for subcontracting to VOB Es. The Bidder shall also demonstrate that, where commercially reasonable, subcontracts were divided into units capable of being performed by VOB Es.
    - Evidence that the Bidder sent written notices soliciting Bids or proposals to perform the items of work made available by the Bidder for subcontracting to all available VOB Es qualified to perform such work. The Bidder shall identify each VOB E solicited, state the dates that notices were mailed, provide a copy of the written notice(s) sent, and provide a copy of any statement or response received from each VOB E solicited, including the reason for rejecting and VOB E who submitted a bid or proposal.
    - Evidence that the Bidder made reasonable efforts to follow up on the written notices sent to VOB Es with telephone calls or personal visits in order to determine with certainty whether the VOB Es were interested in performing the work. Phone logs or other documentation must be submitted.

- Evidence of efforts made to assist VOBES that needed assistance in obtaining bonding or insurance, or lines of credit with suppliers if the inability of SDVOBE to obtain bonding, insurance, or lines of credit is the reason given for the Bidder's inability to meet the VOBES goals.

D) The Bidder may also submit any other information supporting its request for a waiver or reduction in the VOBES participation goals, including without limitation evidence that the Bidder placed advertisements in appropriate media and trade association publications announcing the Bidder's interest in obtaining bids or proposals from VOBES, and/or sent written notification to VOBES economic development assistance agencies, trade groups and other organizations notifying them of the Contract and the work to be subcontracted by the Bidder to VOBES. The Bidder shall also submit any other information reasonably requested by the Awarding Authority to show that the Bidder has taken all actions that could reasonably be expected to achieve the VOBES participation goals.

- 3) No later than five (5) working days after the opening of general Bids, the apparent low Bidder shall submit the following documents to the Awarding Authority's Contract Officer:
  - (i) a completed Schedule for Participation by VOBES ("Schedule for Participation") in the form provided by the Awarding Authority showing VOBES participation in amounts equal to or exceeding the VOBES participation goals for this Contract; and
  - (ii) a completed Letter of Intent in the form provided by the Awarding Authority for each SDVOBE listed in the Schedule for Participation.
- 4) Each Letter of Intent shall identify and describe the work to be performed by the named VOBES (the "VOBES Work") with enough specificity to permit the Awarding Authority to identify the particular items of contract work that the VOBES will perform for VOBES participation credit. The Awarding Authority reserves the right to reject any Letter of Intent if the price to be paid for the VOBES Work does not bear a reasonable relationship to the value of such work under the Contract as determined by the Awarding Authority.
- 5) Within five (5) working days after receipt of the Schedule for VOBES Participation and Letters of Intent, the Awarding Authority shall review and either approve or disapprove the apparent low Bidder's submissions. If the apparent low Bidder has not submitted an appropriate Schedule for VOBES Participation and appropriate Letters of Intent establishing that the VOBES participation goal for the project will be met, the apparent low Bidder will be considered ineligible for Award of the Contract and the Awarding Authority will Award the Contract to the second lowest Bidder, subject to said Bidder's compliance with these conditions.
- 6) The Contractor is required to submit to the Awarding Authority signed subcontracts with all subcontractors prior to the commencement of work to be performed under these contracts, and/or a purchase order or invoice from each material supplier and/or manufacturer listed on the Schedule for VOBES Participation within thirty (30) days of the issuance of the Notice to Proceed by the Awarding Authority.
- 7) A filed Sub-Bidder is not required to submit a Schedule for VOBES Participation with its Bid. A filed Sub-Bidder may, at its option, submit a Letter of Intent with its Bid if it is a VOBES. If a filed sub-Bidder intends to sub-subcontract work to a VOBES, and the filed sub-Bidder wishes that sub-subcontract to be credited toward the participation goals for this Contract, the filed sub-Bidder should submit a Letter of Intent from that VOBES with its Bid. A filed sub-Bidder can subcontract out up to 20% of its work to VOBES, unless such work is designated as sub-subcontract Paragraph E work in the Bid Documents, in which case the 20% cap does not apply.



**This is a:**

- D Design Contract**
- D Construction contract**

**The goal for this contract is Three ( 3 %) percent of the value of the contract unless waived in part or whole by DCR in writing.**

## **APPENDIX C to the General Conditions of the Contract**

### **INDEX OF THE COMMONLY USED FORMS**

**(Forms used during bidding are located in Attachment B to the Instructions to Bidders)**

**Contractor's Weekly Workforce Report**

**Minorities/Women in Contractor's Weekly Workforce Report**

**Weekly Payroll Report Form and Statement of Compliance**

**Certification of Payment by Contractor to MBE/WBE and Instructions**

**Certificate of Completion by Minority/Women Business Enterprise**

**Certificate of Final Inspection, Release and Acceptance – E-2**

**CONTRACTOR'S WEEKLY WORKFORCE REPORT**  
 THE COMMONWEALTH OF MASSACHUSETTS  
 DEPARTMENT OF CONSERVATION AND RECREATION

DCR Project No. \_\_\_\_\_ Project Name \_\_\_\_\_ Project Location \_\_\_\_\_

Name of General Contractor \_\_\_\_\_ Minority Goal % \_\_\_\_\_ Women Goal %

Name of Contractor Filing Report \_\_\_\_\_ Address \_\_\_\_\_

Week Ending \_\_\_\_\_ Report No. \_\_\_\_\_ Date Work Began \_\_\_\_\_ Date work completed \_\_\_\_\_

NOTE: **Min. = Minority** **Wom. = Women**  Check here if this is a final report

Job Category	Number of Employees	Number of Employees Who Are		Total Weekly Workforce Hours	Total Weekly Workforce Hours		Weekly % Workforce Hours		Total Workforce Hours To Date	Total Workforce Hours to Date		% Of Workforce Hours to Date	
		Min.	Wom.		Min.	Wom.	Min.	Wom.		Min.	Wom.	Min.	Wom.
<b>TOTALS:</b>													

Mail with Weekly Payroll report to the assigned Project Manager at: Department of Conservation & Recreation  
*Project Manager Name*  
 10 Park Plaza  
 Boston, MA 02116

The undersigned hereby certifies under pains and penalties of perjury that the above information is true and accurate.

Authorized Signature \_\_\_\_\_ Date \_\_\_\_\_

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

Telephone No. \_\_\_\_\_ FAX No. \_\_\_\_\_

**MINORITIES/WOMEN IN CONTRACTOR'S WEEKLY WORKFORCE REPORT**  
 THE COMMONWEALTH OF MASSACHUSETTS  
 DEPARTMENT OF CONSERVATION AND RECREATION

DCR Project No. \_\_\_\_\_ Project Name \_\_\_\_\_

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

Project Location \_\_\_\_\_

Name of Contractor Filing Report \_\_\_\_\_

Address \_\_\_\_\_

Week Ending \_\_\_\_\_ Report No. \_\_\_\_\_

<b>JOB CATEGORY</b>	<b>NAME OF EMPLOYEE</b>	<b>MINORITY GROUP</b>	<b>GENDER</b>

**In contract Article XII, "Minority" refers to: Asian-Americans, Blacks, Western Hemisphere Hispanics, Native Americans, and Cape Verdeans**

**WEEKLY PAYROLL REPORT FORM**  
**THE COMMONWEALTH OF MASSACHUSETTS**  
**DEPARTMENT OF CONSERVATION AND RECREATION**

DCR Project No. \_\_\_\_\_ Project Name \_\_\_\_\_

Project Location \_\_\_\_\_

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

Name of Contractor Filing Report \_\_\_\_\_

Address \_\_\_\_\_

Week Ending \_\_\_\_\_ Date Work Began \_\_\_\_\_ Date work completed \_\_\_\_\_

Report No. \_\_\_\_\_  Check here if this is a final report

Employee Name & Address	Work Classification	Hours Worked							(A)	(B)	Employer Contributions			(F)	(G)
		S	M	T	W	T	F	S	Total Hours	Hourly Base Wage	(C) Health & Welfare	(D) Pension	(E) Supp. unemplo yed	[B+C+D+E] Hourly Total Wage (prev.	[A*F] Weekly Total Amount

NOTE: Every contractor and subcontractor are required to submit a copy of their weekly payroll records to DCR. The undersigned states under the pains & penalties of perjury that the above provided and attached information is a true and accurate record of each person employed on the project and the hours worked and wages paid to each such employee, including payments to the referenced benefits. M.G.L. c. 149 §27B.

Authorized signature \_\_\_\_\_ Print Name \_\_\_\_\_

Print Title \_\_\_\_\_

Mail to: Department of Conservation and Recreation  
*Project Manager Name*  
 10 Park Plaza  
 Suite 6620  
 Boston, MA 02116

## WEEKLY PAYROLL RECORDS REPORT & STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works construction project for which the enclosed rates have been provided. The **Weekly Payroll Report Form** includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the project.

In addition, every contractor and subcontractor are required to submit a copy of their weekly payroll records to the awarding authority. This is required to be done on a weekly basis. Once collected, the awarding authority is also required to preserve those records for three years.

In addition, each such contractor, subcontractor, or public body shall furnish to the **Executive Office of Labor**, within fifteen days after completion of its portion of the work, a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:

### STATEMENT OF COMPLIANCE

Date: \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_

I, \_\_\_\_\_, \_\_\_\_\_  
(Name of signatory party) (Title)

do hereby state:

That I pay or supervise the payment of the persons employed by

\_\_\_\_\_ on the \_\_\_\_\_  
(Contractor, subcontractor, or public body) (Building or project)

and that all mechanics and apprentices, teamsters, chauffeurs, and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty-nine of the General Laws.

Signature \_\_\_\_\_

Title \_\_\_\_\_

# CERTIFICATE OF PAYMENT

BY CONTRACTOR/DESIGNER TO MINORITY, WOMEN BUSINESS  
& VETERAN OWNED BUSINESS ENTERPRISES

**TO:** Supplier Diversity Reports  
Department of Conservation and  
Recreation ,10 Park Plaza  
Suite 6620,Boston,MA 02116

Reporting Period: Fiscal Year 20\_\_

**RE:** Project:  
Project Number:

Contract Start Date:

The undersigned hereby certifies under the pains and penalties of perjury that the vendor named below has made the following payments to the named Minority, Women Business and Veteran Owned Enterprises for work performed on the above project:

Firm Name of General Contractor:

---

Authorized Signature Date

---

Print Name Print Title

---

Phone Number Email address

Work performed/payments made (use additional pages if needed):

	Firm Name	Work Performed	Subcontract Amount	Payments This Quarter	FY Payments to date (This fiscal year)	Cumulative Payments (Total payments over the life of the contract)
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> VOB			\$	\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> VOB			\$	\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> VOB			\$	\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> VOB			\$	\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> VOB			\$	\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> VOB			\$	\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> VOB			\$	\$	\$	\$

\* MBE, WBE and VOB payment reports are required for each quarter of the fiscal year for each of your DCR projects. Reports are to cover the following three-month periods: 1<sup>st</sup> quarter, July 1st – September 30th; 2<sup>nd</sup> quarter, October 1st – December 31st; 3<sup>rd</sup> quarter, January 1st – March 31st; 4<sup>th</sup> quarter, April 1st – June 30th. Reports must be submitted within 10 business days of your receipt of this form.

**NOTICE:** *Intentionally submitting false information in this document may subject the contractor/ designer to criminal prosecution and/ or debarment from public contracting.*

## INSTRUCTIONS FOR COMPLETING CERTIFICATE OF PAYMENT

As part of its effort to ensure reliable, up-to-date information concerning the actual payments made to certified MBE, WBE and VOB E subcontractors on all DCR projects, we have prepared these instructions to assist you in completing the enclosed form. **PLEASE READ THESE INSTRUCTIONS CAREFULLY. DCR WILL RETURN ANY CERTIFICATION OF PAYMENT THAT IS INCOMPLETE OR INACCURATE.**

**PLEASE NOTE:** IF THIS PROJECT IS COMPLETE, ON HOLD, OR YOUR FIRM PREVIOUSLY SUBMITTED A **FINAL** CERTIFICATION OF M/WBE/VOBE PAYMENT FOR THIS PROJECT, PLEASE SO, INDICATE ON THE FORM AND RETURN IT TO: SUPPLIER DIVERSITY REPORTS, DEPARTMENT OF CONSERVATION AND RECREATION, 10 Park Plaza, Suite 6620  
Boston, MA 02116

### **PLEASE INCLUDE THE FOLLOWING INFORMATION IN THE DESIGNATED SECTIONS OF THE FORM:**

**FIRM NAME:** Include the M/WBE/VOBEs listed on the project's approved Schedule for Participation and any additional M/WBE/VOBEs that worked on the project. Be sure to check M/WBE/VOBE category for which they are certified. Note that any change in M/WBE/VOBEs participation used to meet the project goals must be pre-approved by the Project Manager or Engineer responsible for this project and a revised M/WBE/VOBE Schedule of Participation will be required. Contact the DCR Supplier Diversity coordinator immediately if you anticipate or have any changes in M/WBE/VOBE participation on this project.

**WORK PERFORMED:** Include a brief description of the work performed by each subcontractor listed. The description should match the M/WBE/VOBE Letter of Intent and approved Schedule of Participation. M/WBE/VOBEs must be certified in the category of work performed on this project for firms used to meet the project M/WBE/VOBE goals.

**SUBCONTRACT AMOUNT:** Include the contract or subcontract amounts listed on the M/WBE/VOBE Letters of Intent and approved Schedule of Participation. If the value of an MBE/WBE/VOBE contract or subcontract has decreased or increased for any reason, you must contact the Project Manager or Engineer responsible for this project immediately. If additional M/WBE/VOBE firms not listed on the Schedule for Participation worked on this project list the amount of their subcontracts.

**PAYMENTS THIS QUARTER:** Include the amount you paid the M/WBE/VOBE subcontractor, either directly or indirectly, for work performed on this project during the three-month period covered by this Certification of Payment. If the amount paid was zero, please indicate that. Do not include payments from previous periods or estimated future payments in this column. Please note that you may be required to submit copies of cancelled checks to verify the amounts reported for firms used to meet the project's M/WBE/VOBE goals.

**FY PAYMENTS TO DATE:** Include the total amount you paid the M/WBE/VOBE subcontractor, either directly or indirectly, for work performed on this project for all quarters in **this fiscal year**. To ensure accurate reporting, please review the prior Certifications of Payments previously submitted for this project. Where necessary, correct any earlier mathematical or reporting errors and submit revised Certifications of Payment.

**CUMULATIVE PAYMENTS:** Include the total amount you paid the M/WBE/VOBE subcontractor, either directly or indirectly, for work performed over the entire life of this project (all quarters).

IF YOU HAVE ANY QUESTIONS CONTACT DCR Supplier Diversity coordinator at 617.626.4925



**CERTIFICATE OF COMPLETION**  
**BY MINORITY/WOMEN BUSINESS/VETERAN OWNED BUSINESS ENTERPRISE**  
**DEPARTMENT OF CONSERVATION AND RECREATION**

**TO:** Supplier Diversity Reports  
 Department of Conservation and  
 Recreation 10 Park Plaza  
 Suite 6620, Boston, MA 02116

**Reporting Period: Fiscal Year**

**RE:** Project:  
 Project Number:  
 General Contractor:

**Contract Start Date:**

The undersigned hereby certifies under the pains and penalties of perjury that the vendor named below has received the payments to the named Minority, Women Business and Veteran Owned Enterprises for work performed on the above project:

Firm Name of Subcontractor:

Print Name	Print Title
Phone Number	Email address

**DESCRIPTION OF WORK (AS SHOWN IN LETTER OF INTENT)**

BRIEF DESCRIPTION OF ACTIVITY: (Note "Labor Only," "Material Only," "Material and Labor," "Complete")

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Original Subcontract Amount	\$ _____
Adjusted Subcontract Amount (Change Orders, etc.)	\$ _____
Total Payments Received to Date from Prime Contractor	\$ _____
Balance Due from Prime Contractor	\$ _____

If the completed activity is different from that listed on the Letter of Intent, please explain: \_\_\_\_\_

(If more space is needed, continue on back of sheet)

The individuals signing below hereby certify under the pains and penalties of perjury that all work listed on the Contract Letter of Intent (or approved changes thereto as explained above) was completed by the MBE/WBE/VOBE firm on \_\_\_\_\_, 20\_\_\_\_and the above amounts listed for these services are true and accurate.

**FOR CONTRACTOR**

**FOR MBE/WBE/VOBE FIRM**

\_\_\_\_\_  
 Authorized Signature

\_\_\_\_\_  
 Authorized Signature

\_\_\_\_\_  
 Print Name

\_\_\_\_\_  
 Print Name

**NOTE:** To be submitted to the DCR Compliance Office within ten (10) days after completion of work by MBE/WBE/VOBE.

**E-2 Final Acceptance  
Certificate of Final Inspection, Release and Acceptance**

Title: \_\_\_\_\_

Location: \_\_\_\_\_

Contractor: \_\_\_\_\_

This is to certify that a complete inspection of the above-referenced project was made on \_\_\_\_\_ by the undersigned, and that the entire work was completed in accordance with the plans and specifications. The undersigned recommends acceptance of the project.

\_\_\_\_\_ by: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_  
 \_\_\_\_\_ Designer Authorized  
 Signature

\_\_\_\_\_  
 Resident Engineer Date Project Manager Date

\_\_\_\_\_  
 Project Engineer Date

**CERTIFICATE OF RELEASE**

1.) The undersigned hereby certifies that all work has been completed in accordance with the plans, specifications, and contract documents and that all change orders have been supported pursuant to Article VII of the General Conditions of the Contract.

2.) Contract Award Price: \$	Adjusted Contract Price: \$
Authorized Additions: \$	Paid to Date:\$
Authorized Deductions:\$	Balance Due: \$

3.) The undersigned further certifies that in addition to the amount set forth above, there are outstanding and unsettled the following change orders as submitted to the DCR.

Request No.	Date:	Amount:
Request No.	Date:	Amount:
Request No.	Date:	Amount:

Subject to satisfactory disposition of change orders listed in Item 3 above, the undersigned releases the Commonwealth of Massachusetts from all further claims for wages or payments to subcontractors or suppliers except: (list on attached sheet).

\_\_\_\_\_ by: \_\_\_\_\_  
 Contractor Authorized Signature

The above-referenced project is accepted as of \_\_\_\_\_  
 Date

Deputy Commissioner, Engineering  
 Deputy Director  
 Project Manager  
 Resident Engineer  
 Office of Contract Administration  
 Contractor

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### DIVISION 05 – METALS

05500	Miscellaneous Metal
05510	Aluminum Stairs, Ladders, and Platforms
05519	Post-Installed Concrete Anchors
05520	Metal Railings

### DIVISION 09 – FINISHES

09940	Shop Painting
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### DIVISION 15 – MECHANICAL

15103	Stainless Steel Slide Gates and Appurtenances
15112	Stop Logs and Appurtenances

END OF SECTION

## SECTION 01010

### SUMMARY OF WORK

#### PART 1 - GENERAL

##### 1.01 LOCATION OF WORK:

- A. The work of this Contract is located in the Town of Oxford, Worcester County, Massachusetts, at the Lowes Pond Dam.
- B. Lowes Pond is a recreational pond which extends over an area of approximately 32 acres. The entire Lowes Pond is within the FEMA regulated Special Flood Hazard Area Zone AE.
- C. The Contractor shall maintain the Pond water level within the limits specified in Section 01063 and maintain a flow-by pass as specified in Section 01063.
- D. Access to the Work Area is gained via Huguenot Road. The Contractor shall note that Huguenot Road is a public road and falls under the jurisdiction of the Town of Oxford Department of Public Works. The Road must be passable at all times except for short duration disruptions as managed by a traffic flagger.

##### 1.02 SCOPE OF WORK:

- A. Furnish all labor, materials, equipment and incidentals necessary and rehabilitate the Lowes Pond Dam and the associated adjacent areas complete and ready for operation as shown on the Drawings and specified herein.
- B. The Work includes, but is not necessarily limited to, the following major items:
  - 1. Install and maintain a by-pass flow pumping system, and monitor and regulate surface elevation of Lowes Pond
  - 2. Demolish and remove existing concrete and masonry sluiceway, retaining walls, and embankment, existing building foundation, channel, concrete slab and rock ledge
  - 3. Demolish existing concrete deteriorated vertical wall down to grade
  - 4. Excavate rock required to construct spillway keyway
  - 5. Remove and retain existing boulders for re-use
  - 6. Remove and retain existing guardrail and sign for reuse
  - 7. Repair existing spillway and extend spillway section

8. Construct new training walls, footings, stilling basin, slope riprap
9. Construct a new pedestrian bridge, walkways, and parking lots.
10. Regrade the site, install loam topsoil, plant, and seed within the limits of work
11. Install a new fence along the Northeast limit of work
12. Install erosion and sedimentation control measures.
13. Comply with the conditions of Environmental Permits.

1.03 CONTRACTOR'S USE OF PREMISES:

- A. Contractor shall limit the use of the premises for the performance of the Work and storage of materials and equipment to those areas identified in the Drawings.
- B. Contractor shall assume full responsibility for security of all his and his subcontractors' materials and equipment stored on the site.
- C. If directed by the Owner, Contractor shall move any stored items which interfere with operations of Owner.
- D. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

END OF SECTION

## SECTION 01045

### CUTTING, CORING AND PATCHING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. This Section covers the cutting, coring, rough and finish patching of holes and openings in existing and new construction.
- B. All cutting, coring, and rough patching shall be performed by the Contractor. Finish patching shall be the responsibility of the Contractor and shall be performed by the trade associated with the application of the particular finish.

##### 1.02 ALTERATIONS, CUTTING, AND PROTECTION:

- A. Survey and record condition of existing facilities to remain in-place that may be affected by alteration operations. After alteration work is complete, survey conditions again and restore existing facilities to pre-alteration condition.
- B. Perform Work of moving, removal, cutting, and patching with trades qualified to perform Work in manner causing least damage to each type of Work.
- C. Cut finish surfaces such as masonry, tile, plaster or metals, by methods to terminate surfaces in a straight line at a natural point of division.
- D. Protect existing finishes, equipment, and adjacent Work which is to remain, from damage.
- E. Provide shoring, needling, and bracing to keep structures structurally secure and free of damaging deflection during cutting or coring operations.

##### 1.03 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01400.
- B. Adhere strictly to the manufacturer's current printed recommendations regarding temperature at time of application for all work involving epoxy, cement base coating and protective coating.
- C. Use only products of the specified Repair Mortar System Manufacturer(s) or equal.
- D. Any changes in the specified repair mortar work methods shall be allowed only with the written acceptance of the Engineer.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

- A. Concrete repair mortar shall be a non-shrink, commercial formulation requiring only the addition of water with minimum 28-day compressive strength of 5,000 psi.
- B. Provide a non-shrink cementitious repair mortar material as manufactured by:
  - 1. Sika Repair 224 manufactured by Sika Corporation,
  - 2. MasterEmaco S 488CI manufactured by BASF Corporation,
  - 3. Restokrete Underlayment No. F-120 by Sauereisen, Inc.,
  - 4. Or acceptable equivalent product.
- C. Materials for finish patching shall be equal to those of adjacent construction.

## PART 3 - EXECUTION

### 3.01 GENERAL:

- A. All cutting and coring shall be performed in such a manner as to limit the extent of patching.
- B. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled unless otherwise accepted. No structural members shall be cut without acceptance of the Structural Engineer of Record and all such cutting shall be done in a manner directed by the SER. No holes may be drilled in beams or other structural members. All work shall be performed by mechanics skilled in this type of work.
- C. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown. Finish patching shall match existing surfaces.
- D. Reinforcing steel cut by cutting and coring operations shall be coated with a three-component, solvent free, moisture tolerant, epoxy-modified cementitious product specifically formulated as an anti-corrosion coating; installed in accordance with the manufacturer's printed instructions.

### 3.02 CUTTING:

- A. Inspect existing conditions of Work, including components subject to damage or movement during cutting or patching.
- B. Do not cut or notch structural members without specific written acceptance of the Engineer.



- C. Cutting shall be performed with a concrete saw and diamond saw blades of proper size.
- D. Corners of square or rectangular openings shall be cored. Do not overcut corners of openings. Corners shall be chipped out square, if required, so as not to cause cracking at the corners.
- E. Provide for control of slurry generated by sawing operation on both sides of element.
- F. When cutting reinforced concrete, the cutting shall be done so as not damage bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from face of the cut.
- G. Adequate bracing and/or shoring of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.
- H. Provide equipment of adequate size to remove cut panel.

### 3.03 CORING:

- A. Coring shall be performed with an accepted non-impact rotary tool with diamond core drills. Size of holes shall be suitable for pipe, conduit, sleeve, equipment or mechanical seals to be installed.
- B. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.
- C. Slurry or tailings resulting from coring operations shall be removed from the area following drilling.

### 3.04 PATCHING:

- A. Prepare surfaces to receive cementitious repair mortar in accordance with manufacturer's instructions.
- B. Mix the cementitious repair mortar material components in accordance with the manufacturer's instructions. Concrete surfaces should be surface saturated dry (SSD) with no standing water prior to mortar application.
- C. Work a wet scrub coat of the mortar per the manufacturer's recommendations into the pores and voids in the substrate and over the substrate prior to mortar application by trowel.
- D. Apply the cementitious repair mortar using a steel trowel to work the material into the surface. Fill voids from deepest to shallowest areas as the application work proceeds. Strictly follow the manufacturer's application requirements.

- E. Once the repair areas are filled with repair mortar, strike off the mortar level with the surrounding concrete substrate. Do not leave a broom finish. Finish with a steel trowel until closed up at the surface and flat.
- F. Cure the repair mortar in strict accordance with the manufacturer's instructions.

3.05 CLEANING:

- A. Perform periodic and final cleaning as specified in Section 01740, and:
  - 1. Clean Owner-occupied areas daily.
  - 2. Clean spillage, overspray, and heavy collection of dust in Owner-occupied areas immediately.
- B. At completion of alterations work in each area, provide final cleaning and return space to condition suitable for use by Owner.
- C. Remove debris from site each day. Removed material, except that listed or marked by Engineer for retention, becomes property of Contractor.

3.06 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 01046  
CONTROL OF WORK

PART 1 - GENERAL

1.01 PLANT AND HOURS OF CONSTRUCTION:

- A. Furnish plant and equipment which will be efficient, appropriate, and large enough to secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the Contract Time. If at any time such plant appears to the Engineer to be inefficient, inappropriate, or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, he may order the Contractor to increase the efficiency, change the character, or increase the plant equipment, and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.
- B. Normal construction activity shall take place only between the hours of 7 a.m. to 6 p.m., excluding Saturdays, Sundays, and legal holidays. Work outside the above time periods will be permitted only on an emergency basis and only with the approval of the Owner.

1.02 OCCUPYING PRIVATE LAND:

- A. The Contractor shall not (except after written consent from the proper parties) enter or occupy with men, tools, materials, or equipment any land outside the rights of way or property of the Owner. A copy of the written consent shall be given to the Engineer.

1.03 DIMENSION OF EXISTING STRUCTURES

- A. Where the dimensions and locations of existing structures are of importance in the installation or connection of any part of the Work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment which is dependent on the correctness of such information.

1.04 OPEN EXCAVATIONS:

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, fencing, caution signs, lights, and other means to prevent accidents to persons and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access during construction shall be removed when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street, and requiring that the trench shall not remain open overnight.

- B. The Contractor shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be well lighted at night.

1.05 TEST PITS:

- A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the Contractor at the direction of the Engineer. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the Engineer.

1.06 INTERFERENCE WITH AND PROTECTION OF STREETS:

- A. The Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits therefor from the proper authorities. If any street, road or private way shall be rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the proper authorities.
- B. Streets, roads, private ways, and walks not closed shall be maintained passable and safe by the Contractor, who shall assume and have full responsibility for the adequacy and safety of provisions made therefor.
- C. The Contractor shall, at least 24 hours in advance, notify the Police and Fire Departments in writing, with a copy to the Engineer, if the closure of a street or road is necessary. He shall cooperate with the Police Department in the establishment of alternate routes and shall provide adequate detour signs, plainly marked and well lighted, in order to minimize confusion.

1.07 CARE AND PROTECTION OF PROPERTY:

- A. 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 restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in other manner acceptable to the Engineer.

1.08 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

- A. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains, and electric and telephone cables, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operations shall be repaired by him at his expense.

- B. Assistance will be given the Contractor in determining the location of existing services. The Contractor, however, shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, drain lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by the Contractor.
- C. Protection and temporary removal and replacement of existing utilities and structures shall be a part of the work under the Contract..

1.09 INSPECTION OF WORK AWAY FROM THE SITE:

- A. If work to be done away from the construction site is to be inspected on behalf of the Owner during its fabrication, manufacture, or testing, or before shipment, the Contractor shall give notice to the Engineer of the place and time where such fabrication, manufacture, testing, or shipping is to be done. Such notice shall be in writing and delivered to the Engineer in ample time so that the necessary arrangements for the inspection can be made.

1.10 COOPERATION WITHIN THIS CONTRACT:

- A. All firms or persons authorized to perform any work under this Contract shall cooperate with General Contractor and his Subcontractors or trades, and shall assist in incorporating the work of other trades where necessary or required.
- B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Engineer.

1.11 CLEANUP AND DISPOSAL OF EXCESS MATERIAL:

- A. During the course of the work, the Contractor shall keep the site of his operations in as clean and as neat a condition as is possible. He shall dispose of all residue resulting from the construction work and, at the conclusion of the work, he shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures, and any other refuse remaining from the construction operations, and shall leave the entire site of the work in a neat and orderly condition.
- B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor and his subcontractors shall comply with all applicable Federal, State, and local laws, and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and elsewhere in the Specifications.
- C. Dredged sediments shall be reused on-site to the maximum extent practicable. If offsite disposal is required and the sediment is determined to comply with applicable requirements, sediment may be disposed of and/or reused at a lined landfill in Massachusetts. Provided the sediments are determined to comply with applicable requirements, these materials may be reused as cover material at a non-hazardous landfill.

- D. The Contractor is advised that the disposal of excess excavated material in wetlands, stream corridors, and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him, will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. Therefore, the Contractor will be required to remove the fill at his own expense and restore the area impacted.

END OF SECTION

SECTION 01063  
MISCELLANEOUS REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The Contractor shall conform to all miscellaneous requirements as herein specified.

1.02 TRAFFIC CONTROL:

- A. Whenever and wherever, in the opinion of the Owner, traffic is sufficiently congested or public safety is endangered, the Contractor, as required, shall furnish uniformed special officers to direct traffic and to keep traffic off the roadway area affected by his construction operations. Such officers shall be in addition to the watchmen required under other provisions of the contract.
- B. The cost of such special officers will be paid for under the appropriate item in the BID.
- C. The employment or presence of special officers, or police shall in no way relieve the Contractor of any responsibility or liability which is his under the terms of the contract.

1.03 WORK IN AND AROUND PONDS AND STREAMS:

- A. Contractor shall take all necessary precautions to minimize debris and contaminants during construction. The Contractor shall notify the Engineer or Owner immediately if any contaminant enters the water supply during construction activities so proper action can immediately be taken.
- B. Contractor shall not park construction vehicles in or immediately upstream of reservoir or stream. Construction vehicles and personal vehicles shall only be parked overnight in Contractor Staging Areas.
- C. The contractor shall take all necessary precautions to prevent the leakage of petroleum products and hydraulic fluid from these vehicles. Any release of contaminants from these vehicles shall be immediately cleaned up and disposed of in accordance with Federal, State, and local regulations.
- D. Tarps shall be deployed to prevent any debris from entering the stream or pond. **Do not allow any contamination of the pond and take all necessary precautions to prevent hazardous materials from entering the pond.**
- E. Contractor shall comply with applicable local, state, and federal guidelines and regulations for work involving the containment, handling, and disposal of hazardous materials, including the demolition and removal of lead paint and asbestos containing materials.

- F. Temporary sanitary facilities shall not be placed in or immediately upstream from the reservoir or stream.
- G. Contractor must secure their equipment and materials during non working periods to prevent vandalism to the contractor's equipment and to prevent the equipment from being used to vandalize the dam.
- H. Contractor shall install temporary fencing around the Construction Staging Areas.

1.04 WATER CONTROL OF LOWES POND:

- A. Lowes Pond has a full pool water surface elevation of 474.8 feet. The Lowes Pond Dam impounds approximately 188 acre-feet (61.4 million gallons) of water.
- B. The full pool water surface elevation is established by the spillway to be rehabilitated and extended. The water that passes over the spillway flows into Lowes Brook on the downstream side of the dam and under Huguenot Road. The existing inlet and sluiceway to be demolished are currently inoperable, and all releases from Lowes Pond flow over the spillway.
- C. All construction work for demolition, excavation, surface preparation, concrete repair and placement shall be performed in the dry. Contractor shall isolate the work area within the pond and the downstream Lowes Brook by means of cofferdam(s).
- D. Installed cofferdam(s) shall have a crest at, or below elevation 474.8 to prevent raising the flood level in the FEMA regulated Special Flood Hazard Area, Zone AE contained in Lowes Pond.
- E. Lowes Pond level shall be maintained at elevation 471.0 most of the times. It is anticipated that the Lowes Pond level may rise above elevation 471.0 for short period following large precipitation events. It is estimated that if the Pond level is at elevation 471.0 the 2-year storm (3.27 inches in 24 hours) will be contained in the Pond below elevation 474.8.
- F. Contractor shall provide and operate a water by-pass facility for the work area to direct flow from Lowes Pond around the cofferdam/construction area to a discharge point downstream of the work area and just upstream of the Huguenot Road bridge.
- G. Contractor shall submit to the Engineer a plan on how they intend to maintain the Pond level and by-pass facility. The plan shall be submitted at least 2 weeks prior to start of on-site activities. The submitted plan shall include specific details with calculations supporting the plan.
- H. In order to control the pond level, when it is not raining the Contractor shall pump at a rate approximately equal to the amount of inflow to Lowes Pond. Following rainfall events, the Contractor shall provide sufficient pumping capacity to draw down Lowes Pond level to elevation 471.0 within one week.



1. The following table shows the estimated daily inflow exceedances by month to the Lowes Pond based on the 71-year record period from October 1939 to September 2019 at the USGS gaging station # 01124500 on Little River near Oxford, MA adjusted for drainage area.

**Table 1:** Estimated Daily Inflow Exceedance to Lowes Pond (CFS)

	<i>90%</i>	<i>50%</i>	<i>10%</i>
October	0.3	4.0	21.1
November	2.0	9.7	31.3
December	4.0	10.8	30.2
January	3.4	12.2	35.3
February	6.0	15.9	36.7
March	12.2	28.2	65.5
April	9.1	18.5	44.1
May	4.8	12.0	28.5
June	0.9	4.8	19.4
July	0.3	2.3	10.8
August	0.3	1.4	10.8
September	0.3	2.6	13.9

1.05 SPILLS PREVENTION PLAN:

- A. Contractor shall prepare a spills contingency plan that addresses the potential releases of oil and/or hazardous materials, including refueling of machinery and storage of fuels, and the release of hazardous materials generated by demolition activities. The contingency plan must address measures that will be taken to prevent a spill and the equipment and materials that will be stored at the site to contain and clean up a spill if it should occur.
- B. Contingency plan shall be submitted to the Engineer for review and approval at least 2 week prior to the start of construction.

1.06 SIGNAGE:

- A. Provide project signage according to DCR standards – sign detailing provided at the end of this section.

- B. Provide signage upstream on both sides of the Dam embankment, as shown on the drawings, notifying boaters of dam ahead according to Dam Safety Warning Signs Best Practices Promoting Public Awareness and Preventing Loss of Life provided by FEMA. Signage shall read “ Danger” and a pictogram of “Dam Ahead (others)” according to FEMA sign standards in Section 4.
1. The sign paneling, based on *Figure 1: Sign Paneling*, shall be a 1 Panel,
  2. The viewing distance, based on *Table 4: Sign Text and Sign Height*, shall be 83ft,
  3. The mounting height, based on *Table 8: Mounting Height for Water Viewed Signs*, shall be based on the letter height determined from Table 4
  4. The coloring shall be red.

Submit sign design for approval by the Engineer.

END OF SECTION

8'-0"



# LOWES POND DAM REHABILITATION

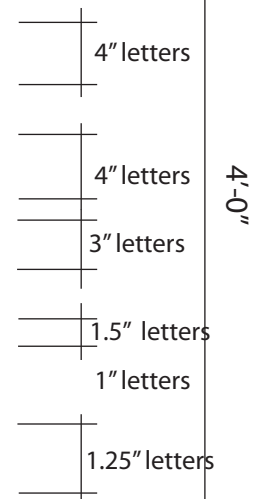
Oxford, MA

AECOM  
*Designer*

TBD  
*Contractor*

*on behalf of*

The Citizens of the Commonwealth of Massachusetts



1" = 1'-0"

**NOTES:**

- \* Sign size is 4'x8'. Substrate 3/4" MDO plywood or .080 aluminium mounted on 4'x6' wood posts of 2"x12" metal U channels. U-channels must be galvanized or painted black. A two part post system with 8ft U-Channel bolted to a 4'U-channel in the ground may be used. Use stainless hex head bolts to attach sign to posts. Install posts minimum 4' below grade. Bottom of sign 4' above grade.
- \* Data contained: Project name, Location, DCR logo, Designer, Contractor & Credits.
- \* DCR Logo: Contact project manager or sign shop for large logo in digital format.
- \* For Project names requiring three lines, the text may be reduced to 3.75" tall.
- \* Location of Sign: Site to be determined by DCR Project Manager and Site Manager.
- \* Sign background color is Sage PMS 5655 or Benjamin Moore HC318
- \* All text is Black. Logo is dark Maroon PMS 504U.
- \* All Type is Frutiger, 65 Bold and Frutiger 55 Roman. Logo is Garamond.

\_\_\_\_\_  
*DCR Project Manager*

\_\_\_\_\_  
*Approval Date*

## SECTION 01065

### STRUCTURAL TESTS AND INSPECTIONS

#### PART 1 - GENERAL

##### 1.01 GENERAL:

- A. The Structural Engineer of Record (SER) is required to prepare a program describing the structural tests and inspections that will be performed for this project. The SER is the structural engineer (an individual) who is in responsible charge of the preparation of the structural drawings and structural specifications for this project and whose professional engineering seal appears on said structural drawings. The parties responsible for the performance of the structural tests and inspections are noted on the Program of Structural Tests and Inspections prepared by the SER.
- B. The SER has prepared a Program of Structural Tests and Inspections (the "Program"), which has been or will be submitted to the building official who has jurisdiction over this project. A copy of this program is included in this specification as Attachment No 1 for reference.
- C. The Program 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, and for full compliance with the requirements of the Contract Documents. The detection of, or failure to detect, deficiencies or defects in the Work during the testing and inspection conducted pursuant to the Program shall not relieve the Contractor or its subcontractors of their responsibility to correct all deficiencies or defects, whether detected or undetected, in all parts of the Work, and to otherwise comply with all requirements of the Contract Documents. Further, while the SER, and the Resident Engineer shall perform certain tasks in the Program requiring the review of certain construction activities, the SER and Resident Engineer shall only perform such tasks to ensure compliance with the SER approved submittals and the specifications. Neither the SER nor the Resident Engineer shall assume any responsibility or liability for the means, methods, procedures or techniques used by any construction contractor.
- D. 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, and procedures, and job site safety.

##### 1.02 CONTRACTOR'S RESPONSIBILITIES:

- A. Where the Program of Structural Tests and Inspections indicates that a structural component or system is subject to structural tests and inspections and that the SER for the project has not been retained to design said component or system or to prepare a performance specification for said component of system, the Contractor shall retain, or

require others under his aegis to retain, a professional engineer registered in the jurisdiction where the project is located to design said component or system and to provide the required program of structural tests and inspections for said component or system.

- B. 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.

#### 1.03 CONTRACTOR FURNISHED TESTING LABORATORY SERVICES:

- A. An independent commercial testing laboratory acceptable to the Engineer shall perform all tests that require the services of a laboratory to determine compliance with the Contract Documents. The laboratory shall be staffed with experienced technicians, properly equipped, and fully qualified to perform the tests in accordance with the specified standards.
- B. Preliminary Testing Services: The Contractor shall be responsible for all testing laboratory services in connection with concrete materials and mix designs, the design of asphalt mixtures, gradation tests for structural and embankment fills, backfill materials, and all other tests and engineering data required for the Engineer's review of materials and equipment proposed to be used in the Work. The Contractor shall obtain the Engineer's acceptance of the testing laboratory before having services performed, and shall pay all costs for services.
- C. The Contractor shall not retain any testing laboratory against which the Owner or the Engineer have reasonable objection, and if at any time during the construction process the services become unacceptable to the Owner, or the Engineer, either the Owner or the Engineer may direct in writing that such services be terminated. The request must be supported with evidence of improper testing or unreasonable delay. If the Engineer determines that sufficient cause exists, the Contractor shall terminate the services and engage a different testing laboratory.
- D. Transmittal of Test Reports: Written reports of testing and engineering data furnished by the Contractor for the Engineer's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.
- E. The Contractor's testing laboratory shall furnish four copies of a written report of each test performed by laboratory personnel within three days after each test is completed. Distribution shall be two copies of each test report to the Engineer's Representative, one copy to the Owner, and one copy for the Contractor.

#### 1.04 OWNER FURNISHED TESTING AND INSPECTION SERVICES:

- A. The Owner will employ the services of an independent testing agency to conduct the Program of Structural Tests and Inspections as described in Section 01065 and perform

all quality control tests of materials of construction in the field or in the laboratory during and after their incorporation in the Work. Field sampling and testing shall be performed in the general manner indicated in the specifications, with minimum interference with construction operations.

- B. The Contractor shall furnish a construction schedule and a minimum of 48 hour notice of readiness for testing and inspection of the work. The Engineer shall determine the exact time and location of field sampling and testing, and may require such additional sampling and testing as necessary to determine that materials and equipment conform with data previously furnished by Contractor and to the Contract Documents.
- C. The Contractor shall schedule the work to permit adequate time for testing and re-testing should test results not conform to the contract documents. Lack of testing or inspection which is attributable to insufficient notice by the Contractor or failure of the Contractor to cooperate, will be cause for rejection of the work.
- D. The Contractor shall deliver materials in sufficient quantities to the Owner's testing agency as may be required. Laboratory testing shall be performed within a reasonable time, consistent with the specified standards.
- E. The Contractor shall furnish material samples and cooperate in the field sampling and testing activities, interrupting the work when necessary. The Contractor shall furnish personnel, facilities and access to assist in the sampling and testing activities.

## PART 2 - PRODUCTS

(Not Used)

## PART 3 - EXECUTION

(Not Used)

**ATTACHMENT NO. 1  
PROGRAM OF STRUCTURAL TESTS AND INSPECTIONS**

Project: Mass DCR Abandoned Dams Lowes Pond Dam Contract No. P19-3264-D4A

Location: Oxford, MA

Owner: Massachusetts Department of Conservation and Recreation

Owner's Address: 251 Causeway Street, Suite 600 Boston, MA 02114-2119

Structural Engineer of Record (SER): Anthony Catalano Jr., PE

This program of structural tests and inspections is submitted as a condition for issuance of the building permit in accordance with the International Building Code.

The following firms, agencies, or individuals (hereinafter referred to collectively as agents) will perform the tests and inspections under the direction of the SER:

<u>Abbreviation</u>	<u>Agent</u>
SER	Structural Engineer Of Record Listed Above
RES	The Resident Representative
ITA(C)	Independent Testing Agency Employed By Contractor
ITA	Independent Testing Agency Employed By Owner
RPE(C)	Registered Professional Engineer Employed By Contractor
GEO	The Project Geotechnical Engineer
IWI	Independent Welding Inspector

The above abbreviations will be used on the attached pages to identify which agent is performing the particular tests or inspections.

The following categories of structural tests and inspections, if checked, are included in the program for structural tests and inspections for this project. The specific tests and inspections required for each checked category are listed on the page noted opposite the category and further described in the various technical specification sections.

<u>Category</u>	<u>Page</u>	<u>Category</u>	<u>Page</u>
<input type="checkbox"/> Steel Construction		<input checked="" type="checkbox"/> Controlled Structural Fill	7
<input checked="" type="checkbox"/> Cast-in-Place Concrete	6	<input type="checkbox"/> Pile Foundations	
<input type="checkbox"/> Precast Concrete Construction		<input type="checkbox"/> Pier Foundations	
<input type="checkbox"/> Masonry Construction		<input checked="" type="checkbox"/> Aluminum Construction	7
<input checked="" type="checkbox"/> In-situ Bearing Strata	6	<input checked="" type="checkbox"/> Special Cases	8

The following items of construction, if checked, are specified in the structural plans or specifications on a performance basis. The structural design of these items will be performed by the RPEC and reviewed by the SER. The construction of these items is included in the program for tests and inspections on the attached sheets.

<u>Category</u>	<u>Category</u>
<input type="checkbox"/> Curtain Walls	<input type="checkbox"/> Metal Buildings
<input type="checkbox"/> Precast Concrete Components	<input checked="" type="checkbox"/> Metal Stairs
<input type="checkbox"/> Post-Tensioning Steel	<input checked="" type="checkbox"/> Metal Railings
<input type="checkbox"/> Structural Steel Connections	<input checked="" type="checkbox"/> Metal and Composite Gratings
<input checked="" type="checkbox"/> Structural Aluminum Connections	<input type="checkbox"/> Metal Plate Covers

The following items are excluded from this program of structural tests and inspections, since other structural engineers not under the aegis of the SER designed them and the SER has no duties or responsibilities with respect to such performance specifications or designs. The Owner shall assign other architects, or construction contractors, as applicable; to be special SER's for their respective designs and such architects and/or contractors shall be responsible for all such structural tests and inspections for their respective designs.

- Seismic design of mechanical or electrical components, systems and their anchorage to the structure.
- Excavation support systems.
- Temporary bracing, temporary platforms, scaffolding, temporary guards and railings.
- Anything related to jobsite safety or construction means and methods.

Structural Engineer of Record:

Name:

Signature: \_\_\_\_\_

Firm: AECOM

Date: \_\_\_\_\_

Registration Seal



### CAST-IN-PLACE CONCRETE CONSTRUCTION

Item	Agent	Scope	Frequency
1. Mix Design	ITA(C)	Design Concrete Mixes	Each mix
2. Materials Certification	SER	Review mix designs.	Each mix
	SER	Review for conformance to specifications.	Each product
3. Batching Plant	ITA/SER	Review to ensure that Plant quality control procedures have been adopted.	Start of project
4. Reinforcement Installation	RES	Inspect reinforcing for size, quantity, condition and placement.	Prior to each placement
5. Formwork Geometry	RES	Inspect form sizes for compliance with specifications.	Prior to each placement
6. Concrete Placement	RES	Review for conformance with specifications.	Each placement
	ITA	Perform slump, density and air content tests at point of discharge.	Each truck
7. Curing and Protection	ITA/RES	Observe procedures for conformance to the specifications.	Each placement
8. Evaluation of Concrete Strength	ITA	Test and evaluate in accordance with the specifications.	Every 50 cubic yards or part thereof
<p>Note: The Contractor may elect to have the Contractor's independent testing agency (ITA(C)) perform additional tests <u>in addition</u> to the testing by the Owner's Independent Testing Agency (ITA) at no cost to the Owner.</p>			

### IN-SITU BEARING STRATA FOR FOUNDATIONS

Item	Agent	Scope	Frequency
1. Bearing strata for foundations	GEO/ RES	Review strata for conformance to the structural drawings, specifications, and/or geotechnical report.	Prior to foundation placement
2. Bearing surfaces of foundations	GEO/ RES	Review for conformance to the requirements of the structural drawings, specifications, and/or geotechnical report.	Prior to foundation placement

**CONTROLLED STRUCTURAL FILL (PREPARED FILL)**

<b>Item</b>	<b>Agent</b>	<b>Scope</b>	<b>Frequency</b>
1. 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.	Each Material
2. Installation of Controlled Structural Fill	RES/ ITA	Provide review of the installation, in accordance with the specifications. Verify maximum lift placement thickness (ITA).	Each lift
3. Density of Fill	ITA	Perform field density tests of the in-place fill in accordance with the specifications.	Each lift
NOTE: Above testing is confirmatory testing by the Owner's independent testing agency (ITA). These tests are <u>in addition</u> to the testing required by the Contractor's independent testing agency (ITA(C)).			

**ALUMINUM CONSTRUCTION**

<b>Item</b>	<b>Agent</b>	<b>Scope</b>	<b>Frequency</b>
1. Fabricator Certification/ Quality Control Procedures.	SER	Review to ensure that quality control procedures have been adopted for each Fabricator.	Start of project
2. Fabricator Inspection	SER	Review to ensure that an Independent Inspection Agency has approved each Fabricator.	Start of project
3. Material Certification	SER	Review for conformance to the specifications.	Each product
4. Bolting	ITA	Test and inspect bolted connections in accordance with specifications. Verify bolt size and grade in accordance with AISC specifications A325/A490.	Periodic

<b>Item</b>	<b>Agent</b>	<b>Scope</b>	<b>Frequency</b>
5. Welding	IWI	Check welder qualifications. Verify filler material in accordance with AWS D1.1. Visually inspect fillet welds. Test complete and partial penetration groove welds full length by dye penetrant, ultrasonic, or radiographic testing in accordance with the contract documents.	Periodic
6. Structural Framing, Details and Assemblies	RES	Review for conformance with specifications and shop drawings.	Periodic

### **SPECIAL CASES**

<b>Item</b>	<b>Agent</b>	<b>Scope</b>	<b>Frequency</b>
1. Concrete Anchor Installation	RES	Verify diameters, depth and cleaning of holes conforms to manufacturer's instructions.	Each anchor
2. Rock Anchors	RES	Witness testing in accordance with contract documents.	Each anchor

END OF SECTION

SECTION 01080  
ABBREVIATIONS AND DEFINITIONS

PART 1 - GENERAL

1.01 RELATED SECTIONS:

- A. Section 01090: Reference Standards

1.02 ABBREVIATIONS:

- A. Where any of the following abbreviations are used in the Contract Documents, they shall have the meaning set forth opposite each. Abbreviations for trade associations and standards organizations are listed in Section 01090.

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANS	American National Standard
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American or Brown and Sharpe Wire Gage
AWPA	American Wood-Preservers' Association
AWWA	American Water Works Association

CS	Commercial Standard
IBR	Institute of Boiler and Radiator Manufacturers
IEEE	Institute of Electrical and Electronics Engineers, Inc.
Fed. Spec.	Federal Specifications issued by the Federal Supply Service of the General Services Administration, Washington, D.C.
IPS	Iron Pipe Size
JIC	Joint Industry Conference Standards
NBS	National Bureau of Standards
NEC	National Electrical Code; latest edition
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPT	National Pipe Thread
OS&Y	Outside screw and yoke
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc.
Stl. WG	U. S. Steel Wire, Washburn and Moen, American Steel and Wire or Roebbling Gage
UL	Underwriters' Laboratories
USS Gage	United States Standard Gage
WOG	Water, Oil, Gas
WSP	Working steam pressure
125-lb. ANS	American National Standard for Cast-Iron or Pipe Flanges and Flanged Fittings,
250-lb. ANS	Designation B16.1-1975, for the appropriate class

### 1.03 DEFINITIONS:

- A. Wherever the words defined in this section or pronouns used in their stead occur in the Contract Documents, they shall have the meanings herein given.

## As Directed, as Required, Etc.

Wherever in the Contract Documents, or on the Drawings, the words "as directed," "as ordered," "as requested," "as required," "as permitted," or words of like import are used, it shall be understood that the direction, order, request, requirement, or permission of the Engineer is intended. Similarly, the words "approved," "acceptable," "suitable," "satisfactory," and words of like import shall mean approved by, acceptable to, suitable to, or satisfactory to the Engineer.

## Provide

Wherever in the Contract Documents the word "provide" is used, it shall mean to furnish (or supply) and install.

## Elevation

The figures given on the Drawings or in the other Contract Documents after the word "elevation" or abbreviation of it shall mean the distance in feet above the datum adopted by the Engineer.

## Rock

The word "rock," wherever used as the name of an excavated material or material to be excavated, shall mean only boulders and pieces of concrete or masonry exceeding 1 cu. yd. in volume, or solid ledge rock which, in the opinion of the Engineer, requires, for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. No soft or disintegrated rock which can be removed with a hand pick or power-operated excavator or shovel, no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere, and no rock exterior to the maximum limits of measurement allowed, which may fall into the excavation, will be measured or allowed as "rock."

## Earth

The word "earth", wherever used as the name of an excavated material or material to be excavated, shall mean all kinds of material other than rock as above defined.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01090  
REFERENCE STANDARDS

PART 1 - GENERAL

1.01 QUALITY ASSURANCE:

A. Should specified reference standards conflict with the Contract Documents, refer to Article II, Section 3 in Part III of the General Conditions of the Contract.

B.

1.02 SCHEDULE OF REFERENCES:

AA	Aluminum Association 818 Connecticut Avenue, N.W. Washington, DC 20006
AABC	Associated Air Balance Council 1000 Vermont Avenue, N.W. Washington, DC 20005
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, N.W. Washington, DC 20001
ABMA	American Bearing Manufacturers Association 1101 Connecticut Avenue, N.W., Suite 700 Washington, DC 20036
ACI	American Concrete Institute Box 19150 Reford Station Detroit, MI 48219
ADC	Air Diffusion Council 230 North Michigan Avenue Chicago, IL 60601
AGA	American Gas Association
AGC	Associated General Contractors of America 1957 E Street, N.W. Washington, DC 20006
AI	Asphalt Institute Asphalt Institute Building

College Park, MD 20740

- AIA American Institute of Architects  
1735 New York Avenue, N.W.  
Washington, DC 20006
- AISC American Institute of Steel Construction  
Eighth Floor  
400 North Michigan Avenue  
Chicago, IL 60611
- AISI American Iron and Steel Institute  
1000 16th Street, N.W.  
Washington, DC 20036
- AITC American Institute of Timber Construction  
333 W. Hampden Avenue  
Englewood, CO 80110
- AMCA Air Movement and Control Association  
30 West University Drive  
Arlington Heights, IL 60004
- ANSI American National Standards Institute  
1430 Broadway  
New York, NY 10018
- APA American Plywood Association  
Box 11700  
Tacoma, WA 98411
- API American Petroleum Institute  
1220 L. Street, N.W.  
Washington, DC 20005
- ARI Air-Conditioning and Refrigeration Institute  
1501 Wilson Boulevard  
Arlington, VA 22209
- ASCE American Society of Civil Engineers  
1801 Alexander Bell Drive  
Reston, VA 20191
- ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers  
1791 Tullie Circle, N.E.  
Atlanta, GA 30329
- ASME American Society of Mechanical Engineers



345 East 47th Street  
New York, NY 10017

- ASPA American Sod Producers Association  
4415 West Harrison Street  
Hillside, IL 60162
- ASTM American Society for Testing and Materials  
1916 Race Street  
Philadelphia, PA 19103
- AWI Architectural Woodwork Institute  
2310 South Walter Reed Drive  
Arlington, VA 22206
- AWPA American Wood-Preservers' Association  
7735 Old Georgetown Road  
Bethesda, MD 20014
- AWS American Welding Society  
550 LeJeune Road, N.W.  
Miami, FL 33135
- AWWA American Water Works Association  
6666 West Quincy Avenue  
Denver, CO 80235
- BIA Brick Institute of America  
11490 Commerce Park Drive  
Reston, VA 22091
- BOCA BOCA International  
Headquarters Office  
4051 West Flossmoor Road  
Country, Club Hills, IL 60478-5795
- CDA Copper Development Association  
57th Floor, Chrysler Building  
405 Lexington Avenue  
New York, NY 10174
- CLFMI Chain Link Fence Manufacturers Institute  
1101 Connecticut Avenue, N.W.  
Washington, DC 20036
- CRSI Concrete Reinforcing Steel Institute  
933 Plum Grove Road  
Schaumburg, IL 60195

DHI Door and Hardware Institute  
7711 Old Springhouse Road  
McLean, VA 22101

EJCDC Engineers' Joint Contract Documents Committee  
American Consulting Engineers Council  
1015 15th Street, N.W.  
Washington, DC 20005

EJMA Expansion Joint Manufacturers Association  
25 North Broadway  
Tarrytown, NY 10591

FGMA Flat Glass Marketing Association  
3310 Harrison  
White Lakes Professional Building  
Topeka, KS 66611

FM Factory Mutual System  
1151 Boston-Providence Turnpike  
P.O. Box 688  
Norwood, MA 02062

FS Federal Specification  
General Services Administration  
Specifications and Consumer Information Distribution Section (WRSIS)  
Washington Navy Yard, Building 197  
Washington, DC 20407

GA Gypsum Association  
1603 Orrington Avenue  
Evanston, IL 60201

JIC Joint Industrial Council  
c/o National Machine Tool Builders Association  
79-1 Westpark Drive  
McLean, VA 22102

IBR Institute of Boiler and Radiator Manufacturers a/k/a Hydronics Institute  
P.O. Box 218  
35 Russo Place  
Berkeley Heights, NJ 07922

ICBO International Conference of Building Officials  
5360 S. Workman Mill Road  
Whittier, CA 90601

ICEA	Insulated Cable Engineers Association Box 1568 Carrollton, GA 30112
IEEE	Institute for Electrical and Electronics Engineers 3 Park Ave 17th Floor New York, NY 10016-5997
IMIAC	International Masonry Industry All-Weather Council International Masonry Institute 815 15th Street, N.W. Washington, DC 20005
MBMA	Metal Buildings Manufacturer's Association 1230 Keith Building Cleveland, OH 44115
MEC	Massachusetts Electric Code
MIL	Military Specifications Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
ML/SFA	Metal Lath/Steel Framing Association 221 North LaSalle Street Chicago, IL 60601
NAAMM	National Association of Architectural Metal Manufacturers 221 North LaSalle Street Chicago, IL 60601
NCMA	National Concrete Masonry Association P.O. Box 781 Hendron, VA 22070
NEBB	National Environmental Balancing Bureau 8224 Old Courthouse Road Vienna, VA 22180
NEC	National Electric Code
NECA	National Electrical Contractors Association 3 Belhesda Metro Center Suite 1100 Bethesda, MD 20814

NEMA	National Electrical Manufacturers' Association 1300 N 17th Street Suite 1847 Rosslyn VA 22209
NETA	InterNational Electrical Testing Association 106 Stone St. P.O. Box 687 Morrison, CO 80465
NFPA	National Fire Protection Association March Park Quincy, MA 02269
NFPA	National Forest Products Association 1619 Massachusetts Avenue, N.W. Washington, DC 20036
NSWMA	National Solid Wastes Management Association 1730 Rhode Island Avenue, N.W. Washington, DC 20036
NTMA	National Woodwork Manufacturers Association 205 W. Touhy Avenue Park Ridge, IL 60068
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077
PCI	Prestressed Concrete Institute 201 North Wells Street Chicago, IL 60606
PS	Product Standard U.S. Department of Commerce Washington, DC 20203
RIS	Redwood Inspection Service One Lombard Street San Francisco, CA 94111
RCSHSB	Red Cedar Shingle and Handsplit Shake Bureau 515 116th Avenue Bellevue, WA 98004

SDI Steel Deck Institute  
P.O. Box 9506  
Canton, OH 44711

SDI Steel Door Institute  
712 Lakewood Center North  
14600 Detroit Avenue  
Cleveland, OH 44107

SIGMA Sealed Insulating Glass Manufacturers Association  
111 East Wacker Drive  
Chicago, Il 60601

END OF SECTION

SECTION 01110  
ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The work covered by this Section consists of furnishing all labor materials and equipment and performing all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.
- B. The control of environmental pollution requires consideration of air, water, and land, and involves management of noise and solid waste, as well as other pollutants.
- C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, seeding, mulching, or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area. Specific requirements for erosion and sedimentation controls are specified in Section 01568.
- D. These Specifications are intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.
- E. All phases of sedimentation and erosion control shall comply with and be subject to the approval of the Massachusetts Department of Environmental Protection and local Conservation Commission.
- F. Schedule and conduct all work in a manner that will minimize the level of noise escaping the site, especially at night and on weekends.
- G. Ensure that there will be no discharge of sediment to Lowes Pond or Lowes Brook. All discharge shall be properly treated prior to being introduced to the reservoir or brook.

1.02 APPLICABLE REGULATIONS:

- A. Comply with all applicable Federal, State, and local laws and regulations concerning environmental pollution control and abatement.
- B. The Contractor shall comply with the conditions of the permits listed below which are included in **Appendix B** of the Specifications.
  - 1. Massachusetts Department of Conservation and Recreation M.G.L. Chapter 253 Dam Safety Permit.
  - 2. Massachusetts Department of Environmental Protection 401 Water Quality certification.
  - 3. Massachusetts Department of Environmental Protection Chapter 91 License.
  - 4. Oxford Conservation Commission Determination of Applicability.
  - 5. US Army Corps of Engineers Approval under General Permits for Massachusetts.
- C. Contractor shall obtain and pay for any permits required for Construction and not listed herein.

1.03 NOTIFICATIONS:

- A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectional acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. The Contractor shall, after receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.04 IMPLEMENTATION:

- A. Prior to commencement of the work, meet with the Engineer to develop mutual understandings relative to compliance with this provision and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when approved by the Engineer, and incorporate permanent control features into the project at the earliest practicable time.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.01 EROSION CONTROL:

- A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures such as siltation basins, filtering devices, check dams, mulching, jute netting, and other equivalent techniques shall be used as appropriate. Lowes Pond surface water shall be diverted around the cofferdam to discharge to the channel downstream of the dam and upstream of Huguenot Road; by-pass flow as well as pond lowering flow shall be discharged to a siltation bag as shown on the Drawings. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored as shown on Drawings. No disturbance shall occur outside limit of work shown on Drawings.

### 3.02 PROTECTION OF STREAMS, WETLANDS, AND SURFACE WATER:

- A. Care shall be taken to prevent or reduce to a minimum any damage to any stream, drainage ditch, storm drain, or sewer from pollution by debris, sediment, or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Such water will be diverted through a settling basin or filter before being directed into the streams.
- B. The Contractor shall not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water, or any storm sewer. Water from dewatering operations shall be discharged to a dewatering bag, per Drawings, to reduce the amount of sediment contained in the discharge water to allowable levels.
- C. All preventative measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action drawing or plan approved by the Massachusetts Department of Environmental Protection. Contractor shall submit copies of approved contingency drawings or plans to the Engineer.
- D. Water being flushed from structures or pipelines after disinfection, with a chlorine residual of 2 mg/l or greater, shall be treated with a dechlorination solution, in a method approved by the Engineer, prior to discharge.

### 3.03 PROTECTION OF LAND RESOURCES:

- A. Land resources within the project boundaries and the limits of permanent work shall be restored to a condition, after completion of construction, that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas within the limit of work shown on the Drawings.



- B. Outside of areas requiring earthwork for the construction of the new facilities, the Contractor shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.
- C. Where trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment, dumping or other operations, protect such trees by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly before beginning operations near them.
- D. Any trees or other landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition. 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.

All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-in. in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.

Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer, shall be immediately removed and replaced.

- E. The locations of the Contractor's storage, and other construction building, required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and shall require written approval of the Engineer and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for approval of the Engineer.
- F. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the Engineer. The disturbed areas shall be prepared and seeded as described in Section 01568, or as approved by the Engineer. Once areas are stabilized, temporary erosion and sediment control measures shall be removed from site or decommissioned in accordance with manufacturer's instructions. All measures to remain onsite permanently shall be approved by the Engineer.

- G. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

#### 3.04 PROTECTION OF AIR QUALITY:

- A. Burning. The use of burning at the project site for the disposal of refuse and debris will not be permitted.
- B. Dust Control. The Contractor will be required to maintain all excavations, embankments, stockpiles, access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded, and which would cause a hazard or nuisance to others.
- C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of chlorides may be permitted with approval from the Engineer.
- D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

#### 3.05 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION:

- A. During the life of this Contract, maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

#### 3.06 NOISE CONTROL:

- A. The Contractor shall make every effort to minimize noises caused by their operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with State and Federal (OSHA) regulations.

END OF SECTION

SECTION 02000

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 PAYMENT ITEMS

<u>ITEM</u>	<u>DESCRIPTION</u>
1.	DAM REHABILITATION AND SITE WORK
2.	CHINK AND REPOINT STONE RETAINING WALLS
3.	SEDIMENT REMOVAL
4.	PEDESTRIAN BRIDGE
5.	ROCK EXCAVATION
6.	UNSUITABLE MATERIAL
7.	EROSION CONTROL BARRIER
8.	ALLOWANCE FOR UNIFORM POLICE OFFICER
9.	MOBILIZATION

1.02 MEASUREMENT AND PAYMENT:

- A. The following subsections describe the measurement of and payment for the work to be done under the items listed in the BID.
  - 1. Estimates of lump sum items shall be based on a schedule of values dividing each such item into its appropriate component parts together with a quantity and a unit price for each part so that the sum of the products of prices and quantities will equal the Contract price for the item. This schedule shall be submitted by the Contractor for and must have the approval of the Engineer before the first estimate becomes due. Submit the schedule of values in accordance with Articles VIII of the General Conditions.
- B. Each unit or lump-sum price stated in the BID shall constitute full compensation as herein specified for each item of work completed in accordance with the drawings and specifications, including cleaning up.

- C. The prices for those items which involve excavation shall include compensation for disposal of surplus excavated material, handling water, and installation of all necessary sheeting and bracing.
- D. Unit prices established in the BID shall be adhered to and shall apply to final quantities regardless of any deviations between the estimated quantities in the BID and the final quantities at the completion of the work.

1.03 THE MEASUREMENT AND PAYMENT FOR BID ITEMS 1 THROUGH 9 ARE AS FOLLOW:

1. DAM REHABILITATION AND SITE WORK:

1.1. DESCRIPTION

- A. Dam rehabilitation and site work shall include all site work necessary for the completion of the project but not specifically listed under other bid items.

1.2. MEASUREMENT FOR PAYMENT:

- A. Dam Rehabilitation and site work shall be paid for on a lump sum basis.

1.3. PAYMENT:

- A. The lump sum price for this item shall also include but not be limited to site preparation; temporary construction entrances, site clearing, grubbing, and filling; providing temporary cofferdams, bypass pipes, and dewatering pumps as necessary to perform the work; excavation; demolition of concrete foundations, vertical walls, slabs and demolition of concrete and masonry sluiceway, retaining walls, all work to rehabilitate the dam structure including excavation of rock for keyway, surface preparation of spillway, installation of low level outlet, slide gate, stop log bays, aluminum platform, and construction of widened spillway and training walls; installation of riprap; and all site work including earthwork, bioretention basins, including filter fabric, under drains, drainage structures and pipe, construction of new parking area and 6' wide access pathway, plantings and seeding, guardrails, chain link fence and gate; seeding of disturbed areas and otherwise returning site to preconstruction conditions, and all other work that is not included for payment under bid items 2 through 9, inclusive.

2. CHINK AND REPOINT STONE RETAINING WALLS

2.1. DESCRIPTION

- A. The quantity of cement mortar joints around the stone retaining walls to be repointed, per linear foot. The work for this bid item is primarily specified in Section 03300, and 04500.

## 2.2. PRODUCTS/MATERIALS

- A. Refer to Specification section 03300 and 04500 paragraph 2.

## 2.3. SUMMARY OF SUBMITTALS

- A. Partial list of submittals from Section 03730, 04500 and related sections. Submit the following shop drawings in accordance with Section 01300.
  - 1. Cleaning materials and equipment.
  - 2. Cement mortar.

## 2.4. MEASUREMENT FOR PAYMENT

- A. The quantity of cement mortar joints at the stone retaining walls to be repointed under this bid item shall be measured by the linear foot along the horizontal plain of the retaining wall.

## 2.5. PAYMENT

- A. The unit price shall be full compensation for the cost of removing the existing cement mortar and vegetation and installing new cement mortar in the stone joints as directed by the Engineer and as indicated on the drawings and specified.

## 3. SEDIMENT REMOVAL

### 3.1. DESCRIPTION

- B. Sediment removal from dam impoundment below ordinary high water, per cubic yard. The work for this bid item is primarily specified in Section 01046, and in Appendix A – 401 Water Quality Cert.

### 3.2. PRODUCTS/MATERIALS

- B. Refer to Specification section 01046 -1.11.C and Appendix A – Water Quality Certification.

### 3.3. SUMMARY OF SUBMITTALS

- B. Partial list of submittals from Section 02850 and related sections. Submit the following shop drawings in accordance with Section 01300.
  - 1. Notification of work to DEP
  - 2. Material Shipping Records
  - 3. Material characterization testing results

4. Disposal Facility to be used.
5. Photographs of dredging activity.

### 3.4. MEASUREMENT FOR PAYMENT

- B. The quantity of sediment removed to be paid for under this item shall be the number of cubic yards of sediment, within the payment limits indicated on the drawings and as defined in this Section, unless sediment removal beyond such limits has been authorized in writing by the Engineer, in which case measurements shall be made to the authorized limits.

### 3.5. PAYMENT

- B. The unit price shall be full compensation for furnishing all labor, equipment, materials, tools, and supervision necessary for material characterization which the Disposal Facility may require (sampling and analysis plan, sampling, and chemical analysis), sediment management plan, loading, transportation by licensed hauler, tipping fees, disposal at an approved, state-licensed facility, and preparation of Material Shipping Records or manifests as applicable to the characteristics of the material and the requirements of the accepting facility, complying with all requirements of the 401 Water Quality Cert, and all work incidental thereto and not specifically included for payment under other items.

## 4. PEDESTRIAN BRIDGE

### 4.1. DESCRIPTION

- A. Design, furnish, and install the pre-fabricated clear span bridge. The work for this bid item is primarily specified in Section 02850.

### 4.2. PRODUCTS/MATERIALS

- A. The materials to be used are specified in Section 02850.

### 4.3. SUMMARY OF SUBMITTALS

- A. Partial list of submittals from Section 02850 and related sections. Submit the following shop drawings in accordance with Section 01300.
  1. Shop and erection drawings for all structural steel.
  2. Complete and checked shop and erection drawings for all aluminum components.
  3. Welding procedure for each type of weld.
  4. Qualification test reports for each welder, welding operator, and tacker.

#### 4.4. MEASUREMENT FOR PAYMENT

- A. Measurement for payment shall be on a lump sum basis.

#### 4.5. PAYMENT

- A. The lump sum price for this item shall constitute full compensation for furnishing all labor, equipment, materials, tools, for the pedestrian bridge including design, furnishing, and installation of the pre-engineered, prefinished, clear span bridge of welded construction, including connection to concrete foundations as indicated and as specified, and all work incidental thereto and not specifically included for payment under other items.

### 5. ROCK EXCAVATION

#### 5.1. DESCRIPTION

- A. Rock Excavation, per cubic yard. The work for this bid item is primarily specified in Section 02210

#### 5.2. PRODUCTS/MATERIALS:

- A. The materials to be used are specified in Section 02210.

#### 5.3. SUMMARY OF SUBMITTALS:

- A. Partial list of submittals from Section 02210 and related sections. Submit the following shop drawings in accordance with Section 01300.

1. Excavation, backfilling, and filling plan

#### 5.4. MEASUREMENT FOR PAYMENT:

- A. The quantity of rock to be paid for under this item shall be the number of cubic yards of rock, measured in place before excavation, within the payment limits indicated on the drawings and as defined in this Section, unless rock excavation beyond such limits has been authorized in writing by the Engineer, in which case measurements shall be made to the authorized limits. Where rock is encountered, it shall be uncovered but not excavated until measurements have been made by the Engineer, unless in the opinion of the Engineer, satisfactory measurements can be made in some manner. Excavated rock which has not been disposed of shall not be included for payment.

#### 5.5. PAYMENT:

- A. The bidder shall include in their bid for items involving excavation, the cost of doing the entire excavation as earth, the price for this item being intended to cover

the difference between the cost of rock excavation and the cost of earth excavation.

- B. The unit price for this item shall constitute full compensation for rock excavation and disposal, for all necessary backfilling, and for furnishing all additional material needed for backfilling, complete, as indicated on the drawings, and as specified, including all work incidental thereto and not included for payment under other items
- C. Rock excavation necessary for creating key in existing spillway is to be paid for under Bid Item 1 and not included in this bid item.

## 6. UNSUITABLE MATERIAL

### 6.1. DESCRIPTION

- A. Unsuitable Material, per cubic yard. The work for this bid item is primarily specified in Section 02210.

### 6.2. PRODUCTS/MATERIALS:

- A. The materials to be used are specified in Section 02210.

### 6.3. SUMMARY OF SUBMITTALS:

- A. Partial list of submittals from Section 02210 and related sections. Submit the following shop drawings in accordance with Section 01300.
  - 1. Qualifications of the Contractor's Independent Testing Laboratory
  - 2. Excavation, backfilling, and filling plan

### 6.4. MEASUREMENT FOR PAYMENT:

- A. The prices bid under each division of this item shall be considered as fair compensation for all labor, equipment, tools and materials necessary to complete the Work as specified which shall include excavation, sheeting or shoring not ordered left in place, dewatering, removal and legal disposal of unsuitable materials, filter cloth, furnishing and placing replacement materials, transportation, backfilling, compaction and any other incidental Work relative thereto.
- B. Measurement for replacement of unsuitable material below the limits of normal trench excavation shall be made based on the volume removed and replaced as approved by the Engineer and as follows:
  - 1. Unsuitable material below the limits of normal trench excavation shall be measured from a point two (2) feet below the invert of pipe to the bottom of the excavation and a total width of three (3) feet plus the inside diameter of



pipe for pipe twenty four (24) inches or less in diameter (minimum four (4) feet) for trench depths twelve (12) feet or less and five (5) feet plus the inside diameter of the pipe for trench depths greater than twelve (12) feet.

6.5. PAYMENT:

- A. Payment for replacement of unsuitable material below the limits of normal trench excavation shall be made at the unit price bid per cubic yard under the applicable division of this item.
  - 1. No payment will be made for replacement of unsuitable material above and below the limits of normal trench excavation when suitable excess excavated material is available from other excavations made under this Project.
  - 2. No payment will be made for unsuitable material replaced beyond the limits approved by the Engineer.

7. EROSION CONTROL BARRIER EROSION AND SEDIMENTATION CONTROL:

7.1. DESCRIPTION

- A. Erosion and sedimentation control, per linear foot. The work for this bid item is primarily specified in Section 01568.

7.2. PRODUCTS/MATERIALS:

- A. The materials to be used are specified in Section 01568 – 2.01 through 2.04.

7.3. SUMMARY OF SUBMITTALS:

- A. Partial list of submittals from Section 01568 and related sections. Submit the following shop drawings in accordance with Section 01300.
  - 1. Erosion control plan and sketches
  - 2. Silt Sock.

7.4. MEASUREMENT FOR PAYMENT:

- A. The length of erosion control barrier to be installed shall be measured by the linear foot from the beginning to the end of the silt sock.

7.5. PAYMENT:

- A. The unit price for this item shall constitute full compensation for installing, maintaining and removing the silt socks, and implementing any other erosion and

sedimentation control requirements as indicated and as specified, including all work indicated thereto and not specifically included for payment under other items.

8. ALLOWANCE FOR UNIFORM POLICE OFFICER:

8.1. DESCRIPTION

- A. Allowance for uniform police officer for traffic control, the Contractor shall be reimbursed for the costs incurred related to paying for uniform police officers at the work site.

8.2. PRODUCTS/MATERIALS:

- A. Not Applicable

8.3. SUMMARY OF SUBMITTALS:

- A. Not applicable

8.4. MEASUREMENT FOR PAYMENT:

- A. Under the allowance for uniform police officer, the Contractor shall be reimbursed for the costs incurred related to paying for uniform police officers at the work site.

8.5. PAYMENT:

- A. The lump sum price for this item established in the Bid is an estimated figure to facilitate comparison of bids. The actual amount to be paid shall be the amount for the actual charges for this work, as agreed to by the Owner.
- B. If the total cost for the work for this item is greater or less than the allowance amount stated under this item in the Bid, a debit or credit of the difference in cost shall be made to the Owner.

9. MOBILIZATION:

9.1. DESCRIPTION

- A. Mobilization (maximum 5% of items 1 thru 8), the lump sum of.

9.2. PRODUCTS/MATERIALS:

- A. Not applicable.

9.3. SUMMARY OF SUBMITTALS:

- A. Not applicable

9.4. MEASUREMENT FOR PAYMENT:

- A. Measurement for payment shall be on a lump sum basis.

9.5. PAYMENT:

- A. The lump sum price for mobilization shall constitute full compensation for initiating the contract (exclusive of the cost of materials), for mobilization of all materials, tools, all temporary facilities, and other equipment necessary to carry on and complete the work, demobilization, utility connection fees, permits, licenses, bonds, Health and Safety Plan, insurance and all other incidental work relative thereto.
- B. The lump sum price for this item shall not exceed five percent (5%) of the total amount of the base bid. An amount of seventy-five (75) percent of the amount bid under this item (exclusive of normal contract retainage) will be made when the Contractor has mobilized to the project site and is ready to start construction. The remaining twenty-five (25) percent (exclusive of normal retainage) will be made following demobilization from the project site.

END OF SECTION

SECTION 01200  
PROJECT MEETINGS

PART 1 - GENERAL

1.01 PRECONSTRUCTION CONFERENCE:

- A. A preconstruction conference will be held between the Contractor, the Engineer, and the Owner to review the Contractor's proposed methods of complying with the requirements of the Contract Documents.
- B. Contractor will be notified of the time, date and place where the preconstruction conference will be held.

1.02 PROGRESS MEETINGS WITH ENGINEER:

- A. In addition to other regular project meetings for other purposes (as indicated elsewhere in the Contract Documents), hold general progress meetings once each month with times coordinated with preparation of payment requests. Meeting dates shall be established by the Engineer. Require every entity then involved in the planning, coordination or performance of work to be properly represented at each meeting. Include (when applicable) consultants, separate contractors (if any), principal subcontractors, suppliers/manufacturers/fabricators, governing authorities, insurers, special supervisory personnel and others with an interest or expertise in the progress of the work. Review each entity's present and future needs including interface requirements, time, sequence, deliveries, access, site utilization, temporary facilities and services, hours of work, hazards and risks, housekeeping, submittals, change orders, and documentation of information for payment requests. Discuss whether each element of current work is ahead of schedule. Determine how behind-time work will be expedited, and secure commitments from the entities involved in doing so. Discuss whether schedule revisions are required to ensure that current work and subsequent work will be completed within the Contract Time. Review everything of significance which could affect the progress of the work.
- B. Within seven days after each progress meeting date, the Engineer will forward copies of the minutes-of-the-meeting, to the Contractor.
- C. Immediately following each progress meeting where revisions to the Progress Schedule have been made or recognized (regardless of whether agreed to by each entity represented), revise the Schedule. Reissue revised Schedule within 10 days after meeting. At intervals matching the preparation of payment requests, revise and reissue the Schedule to show actual progress of the work in relation to the latest revision of the Schedule.

END OF SECTION

## SECTION 01300

### SUBMITTALS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. This Section specifies the general methods and requirements of submissions applicable to the following work-related submittals.
  - 1. Shop Drawings, Product Data and Samples.
  - 2. Mock Ups.
  - 3. Construction Photographs.
  - 4. Contractor's Responsibilities.
  - 5. Submission Requirements.
  - 6. Review of Shop Drawings, Product Data, Working Drawings and Samples.
  - 7. Distribution.
  - 8. General Procedures for Submittals.
  - 9. Certificate of Design.
  - 10. Certificates of Compliance.
  - 11. Schedules.
- B. Additional general submission requirements are contained in Article V, Section 2 in Part III of the General Conditions of the Contract.
- C. Detailed submittal requirements will be specified in the technical specifications section.

##### 1.02 SHOP DRAWINGS, PRODUCT DATA, SAMPLES:

- A. Shop Drawings:
  - 1. Shop drawings, as defined in the General Conditions, and as specified in individual work Sections include, but are not necessarily limited to: custom-prepared data such as fabrication and erection/installation (working) drawings of concrete reinforcement, structural details and piping layout, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection

and test reports including performance curves and certifications as applicable to the work.

2. All shop drawings shall be submitted using the transmittal form furnished by the Engineer.
3. All shop drawings submitted by subcontractors for approval shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.
4. The Contractor shall check all subcontractor's shop drawings regarding measurements, size of members, materials, and details to satisfy themselves that they conform to the intent of the Drawings and Specifications. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission thereof.
5. All details on shop drawings submitted for approval shall show clearly the relation of the various parts of the main members and lines of the structure, and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted for approval.
6. All details on shop drawings submitted for approval shall show clearly the relation of the various parts of the main members and lines of the structure, and where correct fabrication of the work depends upon field measurements; such measurements shall be made and noted on the drawings before being submitted for approval.

B. Product Data:

1. Product data as specified in individual Sections, include but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and printed installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances including certificates of compliance and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications and recommended spare-parts listing, and printed product warranties, as applicable to the Work.

C. Samples:

1. 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 Owner for independent inspection and testing, as applicable to the Work.

1.03 MOCK UPS:

- A. Mock Up units as specified in individual Sections, include but are not necessarily limited to, complete units of the standard of acceptance for that type of work to be used on the project. Remove at the completion of the work or when directed by the Engineer.

1.04 CONSTRUCTION PHOTOGRAPHS:

- A. The Contractor shall provide construction photographs in accordance with requirements specified in Section 01380.

1.05 CONTRACTOR'S RESPONSIBILITIES:

- A. The Contractor shall review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:
  - 1. Field measurements
  - 2. Field construction criteria
  - 3. Catalog numbers and similar data
  - 4. Conformance with the Specifications
- B. Each shop drawing, sample, and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor: "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements." Shop drawings and product data sheets 11-in. X 17-in. and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package. Provide to the Engineer a copy of each submittal transmittal form for shop drawings, product data and samples at the time of submittal of said drawings, product data and samples to the Engineer.
- C. If a shop drawing shows any deviation from the requirements of the Contract Documents, the Contractor shall make specific mention of the deviations in the Transmittal Form furnished by the Engineer and provide a description of the deviations in a letter attached to the submittal.
- D. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from their responsibility with regard to the fulfillment of the

terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will not have responsibility therefor.

- E. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
- F. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.
  - 1. Manufacturer's printed installation instructions, a part of product data submitted to the Engineer will not be reviewed and are for informational purposes only.

#### 1.06 SUBMISSION REQUIREMENTS:

- A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Work or in the work of any other contractor.
- B. All submittals shall be submitted sufficiently in advance of construction requirements to provide adequate time for review from the time received at the Engineer's reviewing office.
- C. Number of submittals required:
  - 1. Shop Drawings: Unless otherwise stated in the respective Specifications Sections, submit four (4) copies.
  - 2. Product Data: Unless otherwise stated in the respective Specifications submit four (4) copies.
  - 3. Samples: Submit the number stated in the respective Specification Sections.
  - 4. Electronic Submittals: Electronic Submission of shop drawing is acceptable in lieu of hard copies, except on submittals regarding detailed drawings such as rebar placement.
- D. Submittals shall contain:
  - 1. The date of submission and the dates of any previous submissions.
  - 2. The Project title and number.
  - 3. Contractor identification.
  - 4. The names of:



- a. Contractor
  - b. Supplier
  - c. Manufacturer
5. Identification of the product, with the specification section number, page and paragraph(s).
  6. Field dimensions, clearly identified as such.
  7. Relation to adjacent or critical features of the Work or materials.
  8. Applicable standards, such as ASTM or Federal Specification numbers.
  9. Identification of deviations from Contract Documents.
  10. Identification of revisions on resubmittals.
  11. An 8-in. X 3-in. blank space for Contractor and Engineer stamps.
- E. Each shipment of drawings shall be accompanied by a transmittal form furnished by the Engineer providing a list of the drawing numbers and the names mentioned above.
- F. Submittals shall be separated by specification section. Do not combine submittals for different specification sections under the same transmittal.
- 1.07 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES:**
- A. The Engineer's review is for general conformance with the design concept and contract drawings. Markings or comments shall not be construed as relieving the Contractor from compliance with the contract plans and specifications or from departures therefrom. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
- B. The review of shop drawings, data, and samples will be general. They shall not be construed:
1. as permitting any departure from the Contract requirements;
  2. as relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;
  3. as approving departures from details furnished by the Engineer, except as otherwise provided herein.

- C. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or time for performance, the Engineer may return the reviewed drawings without noting an exception.
- D. Two (maximum) copies of shop drawings or product data will be returned to the Contractor via First Class United States Postal Service. Samples will not be returned.
- E. Submittals will be returned to the Contractor under one of the action codes indicated and defined on the transmittal form furnished by the Engineer.
- F. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing, on the letter of transmittal and on resubmitted shop drawings by use of revision triangles or other similar methods, to revisions other than the corrections requested by the Engineer, on previous submissions. Any such revisions which are not clearly identified shall be made at the risk of the Contractor. The Contractor shall make corrections to any work done because of this type revision that is not in accordance to the Contract Documents as may be required by the Engineer.
- G. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor, and will be considered "Rejected" until resubmitted. The Engineer may at his option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.
- H. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least seven working days prior to release for manufacture.
- I. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

1.08 DISTRIBUTION:

- A. Distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed 4.

1.09 GENERAL PROCEDURES FOR SUBMITTALS:

- A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work sections, of the Specifications, so that the installation will not be delayed by processing times including disapproval resubmittal (if required), coordination with other submittals, inspection, testing (off-site and on-site), purchasing,

fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.

1.10 CERTIFICATE OF DESIGN:

- A. If specifically specified in other Sections of these Specifications, the Contractor shall submit the applicable Certificate of Design for each item required, and in the form attached to this Section, completely filled in and signed and sealed by a registered professional engineer.

1.11 CERTIFICATES OF COMPLIANCE:

- A. Certificates of Compliance as specified in the specifications shall include and mean certificates, manufacturer's certificates, certifications, certified copies, letters of certification and certificate of materials.
- B. The Contractor shall be responsible for providing Certificates of Compliance as specified in the technical specifications. Certificates are required for demonstrating proof of compliance with specification requirements and shall be executed in 6 copies unless otherwise specified. Each certificate shall be signed by an official authorized to certify on behalf of the manufacturing company and shall contain the name and address of the Supplier, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the Supplier from furnishing satisfactory material, if after tests are performed on selected samples, the material is found not to meet the specific requirements.

1.12 SCHEDULES:

- A. Provide all schedules specified in Articles 2.05 B, 2.07, 14.01 and elsewhere in the General Conditions.

END OF SECTION

CERTIFICATE OF DESIGN

The undersigned hereby certifies that he/she is a Professional Engineer registered in the state of \_\_\_\_\_ and that he/she has been employed by (Name of Contractor) \_\_\_\_\_ to design \_\_\_\_\_ in accordance with Specifications Section \_\_\_\_\_ for the Lowe's Pond Dam Repair Project. The undersigned further certifies that he/she has performed similar designs previously and has performed the design of the \_\_\_\_\_; that said design is in conformance with all applicable local, state, and federal codes, rules, and regulations and professional practice standards; that his/her signature and Professional Engineer (P.E.) Stamp have been affixed to all calculations and drawings used in, and resulting from, the design; and that the use of that stamp signifies the responsibility of the undersigned for that design.

The undersigned hereby certifies that he/she has Professional Liability Insurance with limits of \$1,000,000.00 and a Certificate of Insurance is attached.

The undersigned hereby agrees to make all original design drawings and calculations available to MassDCR or Owner's representative within seven (7) days following written request therefore by the Owner.

\_\_\_\_\_  
P.E. Name

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

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

\_\_\_\_\_  
Address

\_\_\_\_\_  
Address

SECTION 01310  
CONSTRUCTION PROGRESS SCHEDULES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. CONTRACTOR shall prepare and submit to ENGINEER for review within 15 days after Notice to Proceed, a construction progress schedule.
- B. No work shall be done between 6 p.m. and 7 a.m. nor on Sundays or legal holidays without written permission of OWNER. However, emergency work may be done without prior permission.
- C. Night work may be established by CONTRACTOR as regular procedure with written permission of OWNER. Such permission, however, may be revoked at any time by OWNER if CONTRACTOR fails to maintain adequate equipment and supervision for proper prosecution and control of work at night.

1.02 FORM OF SCHEDULES:

- A. Prepare schedules in form of a horizontal bar chart.
  - 1. Provide separate horizontal bar for each trade or operation.
  - 2. Horizontal Time Scale: Identify first work day of each week.
  - 3. Scale and spacing to allow space for notations and future revisions.
- B. Format of Listings: Chronological order of start of each item of work.
- C. Identification of Listings: By major specification section numbers.

1.03 CONTENT OF SCHEDULES:

- A. Construction Progress Schedule:
  - 1. Show complete sequence of construction by activity.
  - 2. Show dates for beginning and completion of each major element of construction and installation dates for major items of equipment. Elements shall include, but not be limited to, the following:
    - a. Shop drawing receipt from supplier/manufacturer submitted to ENGINEER, review and return to supplier/manufacturer.
    - b. Material and equipment order, manufacturer, delivery, installation, and checkout.

- c. Performance tests and supervisory services activity.
- d. Piping installation
- e. Construction of various facilities.
- f. Concrete pour sequence.
- g. Precast concrete erection.
- h. Backfilling, grading, seeding, sodding, landscaping, fence construction, and paving.
- i. Subcontractor's items of work.
- j. Final cleanup.
- k. Allowance for inclement weather.
- l. Demolition.
- m. Miscellaneous concrete placement.

3. Show projected percentage of completion for each item as of first day of each month.

#### 1.04 SCHEDULE REVISIONS:

- A. Every 14 days CONTRACTOR shall revise construction schedule to reflect changes in progress of work. Contractor shall present revised schedule at each progress meeting.
- B. Indicate progress of each activity at date of submittal.
- C. Show changes occurring since previous submittal of schedule.
  - 1. Major changes in scope.
  - 2. Activities modified since previous submittal.
  - 3. Revised projections of progress and completion.
  - 4. Other identifiable changes.
- D. Provide a narrative report as needed to define:
  - 1. Problem areas, anticipated delays, and impact on schedule.
  - 2. Corrective action recommended and its effect.
  - 3. Effect of changes on schedules of other CONTRACTORS.

1.05 SUBMITTAL REQUIREMENTS:

- A. For initial submittal of construction schedule and subsequent revisions thereof, furnish four copies of schedule to ENGINEER.

END OF SECTION

SECTION 01380  
CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide construction photographs pertinent to the Contract work during the Contract period as specified and as directed by the Engineer.
  - 1. Section includes administrative and procedural requirements for the following:
    - a. Preconstruction photographs.
    - b. Periodic construction photographs.
    - c. Final completion construction photographs.

1.02 SUBMITTALS:

- A. Submit in accordance with Section 01300.
- B. Digital Photographs: Submit electronic image files within seven (7) **calendar** days of taking photographs.
  - 1. Digital Camera: Minimum sensor resolution of 8 megapixels.
  - 2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
  - 3. Digital Photographs of all areas requiring excavation, erosion and sediment control, wetland restoration, pavement cuts, and pavement repair.
  - 4. Identification: Provide the following information with each image description in file metadata tag:
    - a. Name of Project and Owner's project number.
    - b. Name and contact information for photographer.
    - c. Name of Contractor.
    - d. Date photograph was taken.



- e. Description of vantage point, indicating location, direction (by compass point), plan and profile sheet number, pipe length identification number from plan and profile sheet.
- f. Unique sequential identifier keyed to accompanying key plan.

### C. CONSTRUCTION PHOTOGRAPHS

1. Submit digital format photos in a digital format acceptable to Engineer.
2. Identification: Label each photograph with an identifier as specified herein or directed by the Engineer.
3. Identification: Provide the following information with each submitted flash drive:
  - a. Name of Project and Engineer's and Owner's project number.
  - b. Name and contact information for photographer.
  - c. Name of Engineer.
  - d. Name of Contractor.
  - e. Date photographs were taken and/or date range
  - f. Description of vantage point, indicating location, direction (by compass point), plan and profile sheet number, pipe length identification number from plan and profile sheet.
  - g. Unique sequential identifier keyed to accompanying key plan.

#### 1.03 QUALITY ASSURANCE:

- A. Photographer proposed to be approved by Engineer.
- B. Photographer to use techniques, material and equipment capable of producing photographs of high quality and resolution.
- C. Dates for photography at site to be coordinated with Engineer and Engineer to be present during photographic periods at site unless approved otherwise by Engineer.
- D. Photographer to make and retain detailed records of all photographs by photographer under this Contract:

1. The records to be in sufficient detail to support any attestation that may be required of photographer.
2. Photographer to retain such records for a period not less than two years from the final acceptance of entire work under this Contract.

1.04 USAGE RIGHTS:

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

1.05 DELIVERY STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01610.

PART 2 – PRODUCTS

2.01 PHOTOGRAPHIC MEDIA:

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS:

- A. The Contractor shall notify the Engineer 5 days in advance of any photographic sessions.
- B. All views to contain a relative dimension reference that is easily recognizable. In views where dimensions are critical use a recognizable measuring devices such as folding ruler, measuring tape in a manner the markings are clear and sharp in the photograph and the device located in close relationship with subject of photograph.

3.02 CONSTRUCTION PHOTOGRAPHS:

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
  1. Maintain key plan with each set of construction photographs that identifies each photographic location.

- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - 1. Date and Time: Include date and time in file name for each image.
  - 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Engineer.
  
- D. Preconstruction Photographs: Before the start of any construction work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Engineer.
  - 1. Flag construction limits for approval by the Engineer before taking construction photographs.
  - 2. Take as many photographs as required to accurately record physical conditions at start of construction on either side of the pipeline and roadway.
  - 3. Take additional photographs as required to record settlement or cracking of pavement and final conditions of all areas of excavation and wetlands.
  - 4. Set up timelapse photography prior to start of construction.
  
- E. Periodic Construction Photographs: Take photographs regularly as specified herein. Select vantage points to show status of construction and progress since last photographs were taken. Regularly submit bi-weekly for the duration of the project. (NTS: Retain "(Engineer) (Construction Manager)-Directed Construction Photographs" Paragraph below only if the cost of photographer's work is covered by an allowance or by a unit-price commitment and Engineer or Construction Manager is responsible for determining photographic vantage points.)
  
- F. In addition to the professional photographs provided as specified in this Section, the General Contractor shall also take daily photographs documenting the progress of the work. Digital copies of the General Contractor's image files shall be provided as part of project closeout in a format acceptable to the Engineer and Owner.

### 3.03 SITE PHOTOGRAPHY REQUIRED:

- A. Provide photographs at following stages of construction:
  - 1. Site before commencement of any construction.
  - 2. Site upon completion of site clearing.
  - 3. At completion of each structural excavation.

4. At completion of each structural foundation.
5. At completion of framing or forming for structures.
6. At completion of enclosures of structures.
7. At 1-month intervals, progress photography during construction of facilities. Photos of any month need show only new work performed during month.
8. Such special photographs required by Engineer.
9. Upon completion of all Contract work over-all site photography.

B. Views:

1. Coordinate with Engineer on views to be taken. In general views from locations to adequately illustrate state of project and condition of construction.
2. At least 3 different views of photographic subject except over-all site photography to have at least 4 different views unless otherwise approved by Engineer.
3. Succeeding photography of same photographic subject to be taken, insofar as practical, from the same view points as preceding photographic sessions. Variations in this procedure to be approved by Engineer.

3.04 COUNTRACT CLOSEOUT:

- A. Complete in accordance with Section 01700.

END OF SECTION

SECTION 01400  
QUALITY ASSURANCE

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This section covers Quality Assurance and Control requirements for this contract.
- B. The Contractor is responsible for controlling the quality of work, including work of its subcontractors, and suppliers and for assuring the quality specified in the Technical Specifications is achieved.
- C. Refer to the Article IV – General Performance Obligations of the Contractor.

1.02 CONTRACTOR FURNISHED TESTING LABORATORY SERVICES:

- A. An independent commercial testing laboratory acceptable to the Engineer shall perform all tests that require the services of a laboratory to determine compliance with the Contract Documents. The laboratory shall be staffed with experienced technicians, properly equipped, and fully qualified to perform the tests in accordance with the specified standards.
- B. Preliminary Testing Services: The Contractor shall be responsible for all testing laboratory services in connection with concrete materials and mix designs, the design of asphalt mixtures, gradation tests for structural and embankment fills, backfill materials, and all other tests and engineering data required for the Engineer's review of materials and equipment proposed to be used in the Work. The Contractor shall obtain the Engineer's acceptance of the testing laboratory before having services performed, and shall pay all costs for services.
- C. The Contractor shall not retain any testing laboratory against which the Owner or the Engineer have reasonable objection, and if at any time during the construction process the services become unacceptable to the Owner, or the Engineer, either the Owner or the Engineer may direct in writing that such services be terminated. The request must be supported with evidence of improper testing or unreasonable delay. If the Engineer determines that sufficient cause exists, the Contractor shall terminate the services and engage a different testing laboratory.
- D. Transmittal of Test Reports: Written reports of testing and engineering data furnished by the Contractor for the Engineer's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.
- E. The Contractor's testing laboratory shall furnish four copies of a written report of each test performed by laboratory personnel within three days after each test is completed. Distribution shall be two copies of each test report to the Engineer's Representative, one copy to the Owner, and one copy for the Contractor.

### 1.03 QUALITY ASSURANCE:

- A. Codes and Standards: Refer to Article II – Execution of the Contract, Scope of Work, Interpretation of Contract Documents in Part III of the General Conditions of the Contract.
- B. Copies of applicable referenced standards are not included in the Contract Documents. Where copies of standards are needed by the Contractor for superintendence and quality control of the work, the Contractor shall obtain a copy or copies directly from the publication source and maintain at the jobsite, available to the Contractor's personnel, subcontractors, and Engineer
- C. Quality of Materials: Unless otherwise specified, all materials and equipment furnished for permanent installation in the Work shall conform to applicable standards and specifications and shall be new, unused, and free from defects and imperfections, when installed or otherwise incorporated in the Work. The Contractor shall not use material and equipment for any purpose other than that intended or specified unless the Engineer authorizes such use.
- D. Where so specified, products or workmanship shall also conform to the additional performance requirements included within the Contract Documents to establish a higher or more stringent standard or quality than that required by the referenced standard.

### 1.04 OFFSITE INSPECTION:

- A. When the specifications require inspection of materials or equipment during the production, manufacturing, or fabricating process, or before shipment, such services shall be performed by the Owner's independent testing laboratory, or inspection organization acceptable to Engineer in conjunction with or by the Engineer.
- B. The Contractor shall give appropriate written notice to the Engineer not less than 30 days before offsite inspection services are required, and shall provide for the producer, manufacturer, or fabricator to furnish safe access and proper facilities and to cooperate with inspecting personnel in the performance of their duties.

### 1.05 MATERIALS AND EQUIPMENT:

- A. The Contractor shall maintain control over procurement sources to ensure that materials and equipment conform to specified requirements in the Contract Documents.
- B. The Contractor shall comply with manufacturer's printed instructions regarding all facets of materials and/or equipment movement, storage, installation, testing, startup, and operation. Should circumstances occur where the contract documents are more stringent than the manufacturer's printed instructions, the Contractor shall comply with the specifications. In cases where the manufacturer's printed instructions are more stringent than the contract documents, the Contractor shall advise the Engineer of the disparity and conform to the manufacturer's printed instructions. In either case, the Contractor is to apply the more stringent specification or recommendation, unless approved otherwise by the Engineer.

1.06 SHOP AND FIELD TESTING:

- A. The Contractor is responsible for providing advance notice of and access for the shop and field testing specified in the technical specification sections.
- B. The Contractor and its Subcontractor shall permit inspections, tests, and other services as required by the Contract Documents.
- C. Contractor shall provide twenty one days written notice to the Engineer so that the Engineer may schedule and witness off site and on site tests. The Engineer's witnessing of tests does not relieve the Contractor and/or Subcontractors of their obligation to comply with the requirements of the Contract Documents.

1.07 MANUFACTURER'S FIELD SERVICES:

- A. When specified in the technical specifications sections, the Contractor shall arrange for and provide technical representation from manufacturer's of respective equipment, items or components. The manufacturer's representative shall be a factory trained service engineer/technician with the type and length of experience specified in the technical specifications.
- B. Services Furnished Under This Contract: An experienced, competent, and authorized factory trained service engineer/technician representative of the manufacturer of each item of equipment for which field services are indicated in the specifications shall visit the site of the Work and inspect, operate, test, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's service representative shall be present when the equipment is placed in operation. The manufacturer's service representative shall revisit the jobsite as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory to the Engineer.

1.08 CERTIFICATION FORMS AND CERTIFICATES:

- A. The Contractor shall be responsible for submitting the certification forms and certificates in conformance with the requirements specified in Section 01300 - Submittals.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 QUALITY CONTROL:

- A. Quality control is the responsibility of the Contractor, and the Contractor shall maintain control over construction and installation processes to assure compliance with specified requirements.
- B. Certifications for personnel, procedures, and equipment associated with special processes (e.g., welding, cable splicing, instrument calibration, surveying) shall be maintained in the

Contractor's field office, available for inspection by the Engineer. Copies shall be made available to the Engineer upon request.

- C. Means and methods of construction and installation processes are the responsibility of the Contractor, and at no time is it the intent of the Engineer to supersede or void that responsibility.

END OF SECTION



SECTION 01500  
TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The Contractor shall provide all temporary facilities for the proper completion of the work, as required and as specified.

1.02 SANITARY REGULATIONS:

- A. The Contractor shall provide adequate sanitary facilities for the use of those employed on the Work. Such facilities shall be made available when the first employees arrive on the site of the Work, shall be properly secluded from public observation, and shall be constructed and maintained during the progress of the Work in suitable numbers and at such points and in such manner as may be required.
- B. The Contractor shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the Owner, or on adjacent property.

1.03 WATER SUPPLY:

- A. The Contractor shall make arrangements and pay for all water necessary for completion of construction operations under this contract.
- B. Contractor shall note that there are no available potable water supplies near the Lowes Pond Dam area.

1.04 TEMPORARY HEAT:

- A. If temporary heat is required for the protection of the Work, the Contractor shall provide and install suitable heating apparatus, shall provide adequate and proper fuel, and shall maintain heat as required.
- B. Temporary heating apparatus shall be installed and operated in such manner that finished work will not be damaged thereby. After the permanent heating system has been installed, tested, and made ready for operation, the Contractor may, at his own risk and expense, use it for providing heat for protection of the Work. The contractor shall provide and pay for all fuel and care necessary, and, when the Work is ready for acceptance, he shall, at his own expense, put the system into first-class condition, even to the extent of replacing worn or damaged parts as directed.

1.05 ELECTRICAL ENERGY:

- A. The Contractor shall make all necessary applications and arrangements and pay all fees and charges for electrical energy for power and light necessary for the proper completion of the Work and during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.
- B. The Contractor shall provide sufficient electric lighting so that all work may be done in a workmanlike manner when there is not sufficient daylight.
- C. Contractor shall note that there is no available electrical service near the Lowes Pond Dam area.
- D. Contractor shall provide a portable generator for providing power to the Engineer's Office (Item 1.08) to power lights, fan, and unit heater.

1.06 PRECAUTIONS DURING ADVERSE WEATHER:

- A. During adverse weather and against the possibility thereof, the Contractor shall take all necessary precautions so that the Work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building-paper shelters, or other suitable means.
- B. During cold weather, materials shall be preheated, if required, and the materials and adjacent structure into which they are to be incorporated shall be made and kept sufficiently warm so that a proper bond will take place and a proper curing, aging, or drying will result. Protected spaces shall be artificially heated by suitable means which will result in a moist or a dry atmosphere according to the particular requirements of the work being protected. Ingredients for concrete and mortar shall be sufficiently heated so that the mixture will be warm throughout when used.

1.07 CONTRACTOR'S FIELD OFFICE:

- A. The Contractor shall maintain a temporary field office near the work for his own use during the period of construction at which readily accessible copies of all contract documents shall be kept. The office shall be located where it will not interfere with the progress of the work. In charge of this office there shall be a competent superintendent of the Contractor as specified under "Supervision of Work" in the AGREEMENT.

1.08 OFFICE FOR ENGINEER:

- A. The Contractor shall provide a suitable office for exclusive use of the Engineer and equip it with, at minimum, amenities that are equal to the Contractor's amenities for the temporary field office.
- B. The Contractor shall furnish insurance coverage of adequate amount to replace not only the Contractor's equipment, but all property belonging to the Engineer and the Engineer's staff, at replacement cost.

- C. The Office shall be of suitable height and of ample size to accommodate the furniture and equipment listed below, without crowding (at least 200 sq. ft. of floor area). It shall be weathertight and acceptably insulated and suitably ventilated; the floor shall be tight and of sufficient construction to withstand the loads imposed upon it. The office shall have two exterior doors, with cylinder locks and keys and a minimum of two screened windows which can be both opened and locked shut. The exterior doors shall also be provided with a hasp, for which the Engineer will furnish his own locks.
- D. The Contractor shall furnish a parking area large enough to accommodate a minimum of two cars adjacent to the office, for the exclusive use of the Engineer.
- E. The Contractor shall furnish the following furniture, equipment, supplies, and services:
1. One plan table or sloping plan shelf, about 3 ft. by 6 ft., with a reasonably smooth top, and one suitable swivel stool.
  2. Eight additional folding chairs.
  3. Electric lights, desk lamps and outlets as directed. The Contractor shall pay for installation and all charges for the energy used.
  4. Broom and dustpan.
  5. One desk for general office use about 3 ft. by 5 ft., all with a desk chair of the armchair swivel type.
  6. Two four-drawer, legal size, metal filing cabinets each with locks.
  7. Class ABC type fire extinguisher of at least 4-lb capacity.
  8. Insulated waterproof chest for storage and moist curing of concrete cylinders; size and construction as directed with capability of maintaining required curing temp.
  9. A waste basket for appropriately sized plastic trash bags.
  10. Outdoor minimum-maximum thermometer with range of -40 deg. F to +120 deg. F and reset provisions.
  11. Power, lighting, heat, and air conditioning at least equal to that provided for the Contractors temporary field office.
  12. High speed internet access. The Contractor shall be responsible for connection and paying all fees associated with providing this service for the duration of the contract.
  13. Copy machine with color scanning capabilities.
- F. The Contractor shall provide office space and facilities until the office, furnishings, and equipment described above are ready for use, but by so doing he shall not be relieved of his obligation to provide and equip the specified Engineer's office as promptly as possible.

- G. Unless otherwise directed by the Engineer, after the date of completion of the Work as stated in the final estimate, the Contractor shall remove the office and all such temporary facilities from the site, the same to become his property, and leave the premises in a condition acceptable to the Engineer.

1.09 TEMPORARY FENCING:

- A. Provide commercial grade chain link fence to prevent trespass by workmen and suppliers onto private property and the public from construction site.
- B. Provide 6 foot high fence around staging area and as necessary to prevent unapproved access to the work area. Equip fence with vehicular and pedestrian gates with locks.
- C. Coordinate location of temporary fencing with Owner (Engineer).

1.10 HOISTING, SCAFFOLDING, STAGING AND PLANKING:

- A. Except as otherwise specified in the various sections of the specifications, the Contractor shall provide, set up, and maintain all derricks, hoisting machinery, and shall do all hoisting required for the project.
- B. Except as otherwise specified in the various sections of the specifications, the Contractor shall furnish, install, and maintain in safe condition, scaffolding, staging, and planking and all supports therefore, for the use of all trades requiring same, and shall bear all costs there from. The Contractor shall confer with the various trades to ascertain where and when such scaffolding, staging, and planking will be required.
- C. Scaffolds shall have solid backs and floors to prevent dropping materials there from to the floors or ground.

END OF SECTION

## SECTION 01568

### EROSION CONTROL, SEDIMENTATION AND CONTAINMENT OF CONSTRUCTION MATERIALS

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION:

- A. Provide all work and take all measures necessary to control soil erosion resulting from construction operations, prevent flow of sediment from construction site, and contain construction materials (including excavation and backfill) within protected working area as to prevent damage to any stream or wetlands.

##### 1.02 SUBMITTALS:

- A. Two weeks prior to the start of the work, submit to Engineer, for review, a plan with detailed sketches showing the proposed methods to be used for controlling erosion during construction.

##### 1.03 QUALITY ASSURANCE:

- A. Use acceptable procedures, including use of water diversion structures, diversion ditches, settling basins, and sediment traps.
- B. Operations restricted to areas of work indicated on drawings and area which must be entered for construction of temporary or permanent facilities.
- C. If construction materials are washed away during construction, remove materials from fouled areas.
- D. Engineer has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations and to direct immediate permanent or temporary pollution control measures to prevent contamination of any stream or wetlands, including construction of temporary berms, dikes, dams, sediment basins, sediment traps, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.
- E. The erosion control barrier shall be doubly staked with the ends butted on against another to prevent siltation from passing through in the location shown on the plans. Hay is not to be used as a barrier as it contains numerous invasive seeds and may result in additional long term impact to resource areas through the introduction of invasive plants. Alternatives include mulch, filter fences, straw, in bundle, bags, or sleeves.
- F. All stockpiled materials shall be located in designated upland portions of the site and shall not impact waterbodies and wetlands in the vicinity of the project.

G. Stabilize diversion outlets by means acceptable to Engineer.

PART 2 – PRODUCTS

2.01 FILTERING DEVICES

A. Filtrexx® Siltsoxx, or equivalent as approved by the Engineer, shall meet the following minimum specifications:

<u>Physical Property</u>	<u>Requirements</u>
Total Suspended Solids Removal	78%
Tensile Strength	26 lbs/square inch
Flow Rate	11.3 gallons per minute per foot
Density	32 lbs/ft
Motor Oil Removal	99%
Diesel Fuel Removal*	99%
Gasoline Removal*	54%

\*Removal Rate achieved by addition of Hydrocarbon agent.

B. Compost media inside Filtrexx® Siltsoxx or equivalent shall not contain noxious non-native weed seeds.

C. Media inside Siltsoxx or equivalent shall include a hydrocarbon removal additive, PetroLoxx or equivalent, designed to remove oil, diesel and gasoline from runoff.

2.02 WOOD STAKES:

A. 2 in. by 2 in. by 3 ft.

2.03 SYNTHETIC FILTER FABRIC:

A. Synthetic filter fabric to be a pervious sheet of propylene, nylon, polyester or ethylene filaments and shall be certified by the manufacturer or supplier as conforming to the following requirements:

<u>Physical Property</u>	<u>Requirements</u>
Filtering Efficiency	75% (min.)

Tensile Strength at	Extra Strength –
20% (max.) Elongation	50 lbs./lin. in. (min.)
	Standard Strength –
	30 lbs./lin. in. (min.)
Flow Rate	0.3 gal./sq. ft./min. (min.)

- B. Burlap to be 10 ounce per square yard fabric.
- C. Posts or stakes for filter fences either 2 x 3 or 2 x 4 inch studs or 0.5 pounds (minimum) per linear foot

#### 2.04 EROSION CONTROL BLANKETS

- A. Erosion control blankets shall be used to cover exposed soil surfaces and slopes with potential to erode.
- B. Erosion Control Blankets shall consist of a biodegradable blanket recommended for use on slopes of at least 1:1 and longevity of up to 24 months such as North American Green’s BioNet C125BN.

### PART 3 – EXECUTION

#### 3.01 GENERAL:

- A. Do not discharge chemicals, fuels, lubricants, bitumen, raw sewage, or other harmful waste into or alongside any body of water or into natural or man-made channels.
- B. Activities where there is any potential for runoff of any pollutant into wetlands and waterbodies should be subject to this section. If there is any uncertainty whether an activity is subject to this section, then precaution should be exercised.
- C. Soil and sedimentation control measures consisting of Filtrexx® Siltsoxx or equivalent approved by the Engineer shall be placed in areas as depicted on Drawings and where potential for dust or petroleum entering a waterbody exists. Modifications to the location of perimeter filtering devices shall be approved by the Engineer. Filtering devices shall be installed prior to the start of work. Sediment controls are to be placed surrounding at the base of all stored and demolished materials that contain liquids or sediment.

#### 3.02 INSTALLATION:

- A. Filtrexx® Siltsoxx compost filter sock or equivalent
  - 1. Filtrexx® Siltsoxx or equivalent shall be installed as per manufacturer’s recommendations.

2. Any gaps between bottom of Filtrexx® Siltsoxx and top of ground surface shall be filled with compost filter media or additional Siltsoxx material such that there is good contact between the bottom of the Filtrexx® Siltsoxx and the ground surface.
3. In impervious areas, concrete blocks, sand bags or other means of weighted barrier shall be used in lieu of stakes to secure filter device in place.

B. Additional Requirements:

1. Do not place debris adjacent to watercourse in manner that will cause it to wash away by high water, runoff, or by wind.
2. Do not dump spoiled material into any streams, wetlands, surface waters, or unspecified locations.
3. Prevent indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface waters.
4. Do not pump silt-laden water from construction into surface waters, wetlands, or natural or man-made channels leading thereto.
5. Prevent damage to vegetation adjacent to or outside of construction area limits.
6. Do not dispose of debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete, or any other pollutant in wetlands, surface waters, or natural or man-made channels leading thereto, or unspecified locations.
7. No herbicides or pesticides shall be used.

3.03 MAINTENANCE:

- A. Inspect erosion and sedimentation control system immediately after each rainfall and at least daily during prolonged rainfall. Perform any required repairs immediately.
- B. Should the fabric decompose or become ineffective prior to the end of the expected usable life and the barrier still be necessary, replace fabric promptly.
- C. Remove sediment deposits when they reach approximately one-half the height of the barrier.
- D. Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform to the existing grade, prepared, and seeded.

3.04 ADDITIONAL REQUIREMENTS:



- A. Use Filtrexx® Siltsoxx compost filter sock or equivalent and silt fence or construct earth berms or diversions to intercept and divert runoff water from critical areas.
- B. Discharge silt-laden water from excavation and wet excavated materials onto filter fabric mat and/or filtering sediment traps to ensure that only sediment-free water is returned to watercourses.
- C. Do not place excavated soil material adjacent to watercourse in manner that will cause it to wash away by high water or runoff.
- D. Prevent damage to vegetation by excessive watering or silt accumulation in the discharge areas.
- E. Do not dump spoiled material into any streams, wetlands, surface waters, or unspecified locations.
- F. Prevent indiscriminate, arbitrary, or capricious operation of equipment in streams, wetlands, or surface waters.
- G. Do not pump silt-laden water from trenches or excavations into surface waters, streams, wetlands, or natural or man-made channels leading thereto.
- H. Prevent damage to vegetation adjacent to or outside of construction area limits.
- I. Do not dispose of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in streams, wetlands, surface waters, or natural or man-made channels leading thereto, or unspecified locations.
- J. Do not alter flow line or any stream (perennial or intermittent) unless indicated or specified.
- K. No herbicides or pesticides shall be used.
- L. Erosion control blankets shall be used to prevent erosion of exposed slopes prior to permanent stabilization measures.

END OF SECTION

SECTION 01600  
CONTROL OF MATERIALS

PART 1 - GENERAL

1.01 APPROVAL OF MATERIALS:

- A. Unless otherwise specified, only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the Contractor shall be subject to the inspection and approval of the Engineer. No material shall be delivered to the work without prior approval of the Engineer.
- B. As specified in Section 01300, the Contractor shall submit to the Engineer, data relating to materials and equipment he proposes to furnish for the work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications.
- C. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, the Contractor shall submit additional samples or materials for such special tests as may be necessary to demonstrate that they conform to the specifications. Such samples shall be furnished, stored, packed, and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for the tests.
- D. Any delay of approval resulting from the Contractor's failure to submit samples or data promptly shall not be used as a basis of a claim against the Owner or the Engineer.
- E. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes, and surfaces, the Contractor shall provide such samples of workmanship or finish as may be required.
- F. The materials and equipment used on the work shall correspond to the approved samples or other data.

END OF SECTION

SECTION 01610  
DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 GENERAL:

- A. This Section specifies the general requirements for the delivery handling, storage and protection for all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

1.02 TRANSPORTATION AND DELIVERY:

- A. Transport and handle items in accordance with manufacturer's printed instructions.
- B. Schedule delivery to reduce long term on-site storage prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer.
- C. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.
- D. Deliver products to the site in manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.
- E. All items delivered to the site shall be unloaded and placed in a manner which will not hamper the Contractor's normal construction operation or those of subcontractors and other contractors and will not interfere with the flow of necessary traffic.
- F. Provide equipment and personnel to unload all items delivered to the site.
- G. Promptly inspect shipment to assure that products comply with requirements, quantities are correct, and items are undamaged. For items furnished by others (i.e. Owner, other Contractors), perform inspection in the presence of the Engineer. Notify Engineer verbally, and in writing, of any problems.

1.03 STORAGE AND PROTECTION:

- A. Store and protect products and equipment in accordance with the manufacturer's instructions, with seals and labels intact and legible. Storage instruction shall be studied by the Contractor and reviewed with the Engineer. Instructions shall be carefully followed and a written record of this kept by the Contractor for each product and pieces of equipment.

- B. Arrange storage of products and equipment to permit access for inspection. Periodically inspect to make sure products and equipment are undamaged and are maintained under specified conditions.
- C. Provide protective maintenance during storage consisting of manually exercising equipment, inspecting mechanical surfaces for signs or corrosion or other damage, lubricating, applying any coatings as recommended by the equipment manufacturer necessary for its protection and all other precautions to assure proper protection of all equipment stored and for compliance with manufacturers' requirements related to warranties.
- D. Store loose granular materials on solid flat surface in a well-drained area. Prevent mixing with foreign matter.
- E. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous and reinforcing steel shall be stored off the ground or otherwise to prevent accumulation of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in manner to reduce breakage, cracking and spalling to a minimum.

END OF SECTION

SECTION 01700  
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
  - 1. Closeout procedures.
  - 2. Final cleaning.
  - 3. Adjusting.

1.02 RELATED WORK:

- A. Warranties and Bonds are included in Section 01740.

1.03 CLOSEOUT PROCEDURES:

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection.
- B. Provide submittals to Engineer that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payment, and sum remaining due.

1.04 FINAL CLEANING:

- A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
  - 1. Remove labels that are not permanent labels.
  - 2. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean.
  - 3. The installing Subcontractor shall wipe surface of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
  - 4. 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 a smooth even-textured surface.

1.05 ADJUSTING:

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

END OF SECTION

## SECTION 01710

### CLEANING UP

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION OF WORK:

- A. During its progress, the work and the adjacent areas affected thereby shall be cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.
- B. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.
- C. On or before the completion of the work, the Contractor shall, unless otherwise especially 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, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.
- D. Upon completion of the work, the Contractor shall remove from the sites of the subsurface explorations all of his plant, machinery, tools, equipment, temporary work, and surplus materials; shall, unless otherwise directed or permitted in writing, remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.
- E. The Contractor shall thoroughly clean all materials and equipment installed by him and his sub-contractors, and on completion of the work shall deliver it undamaged and in fresh and new-appearing condition. All mechanical equipment shall be left fully charged with lubricant and ready for operation.

- F. The Contractor shall restore or replace, when and as directed, any public or private 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. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.

END OF SECTION



## SECTION 01732

### SELECTIVE DEMOLITION

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION:

- A. The work of this Section includes the removal, disposal and the replacement of selected portions of piping and valves.

##### 1.02 RELATED DOCUMENTS:

- A. Section 01070: Abbreviations
- B. Section 01090: Reference Standards
- C. Section 01300: Submittals
- D. Section 01400: Quality Assurance
- E. Section 01600: Material and Equipment
- F. Section 01700: Contract Closeout
- G. Section 02615: Ductile Iron Pipe and Fittings

##### 1.03 DEFINITIONS:

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- C. Existing; Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

##### 1.04 SUBMITTALS:

- A. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Authority's on-site operations are uninterrupted.

2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Authority's continuing occupancy of portions of existing buildings.
5. Means of protection for items to remain and items in path of waste removal from buildings.

#### 1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Predemolition Conference: Conduct conference at Project site to comply with requirements in Section 01200 – Project Meetings. Review methods and procedures related to selective demolition including, but not limited to, the following:
  1. Inspect and discuss condition of construction to be selectively demolished.
  2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  4. Review areas where existing construction is to remain and requires protection.

#### 1.06 PROJECT CONDITIONS:

- A. Authority will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Authority's operations will not be disrupted.
  1. Comply with requirements specified in Section 01011 – Summary of Work.
- B. Notify Authority of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

- C. Storage or sale of removed items or materials on-site is not permitted.
- D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.07 CORRECTION OF DEFECTIVE WORK:

- A. Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 EXAMINATION:

- A. Verify that process pipe systems and utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. When unanticipated mechanical process, plumbing, HVAC, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Authority.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS:

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
  - 1. Comply with requirements for existing services/systems interruptions specified in Section 01011 – Summary of Work.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Contractor will arrange with the Authority to shut off indicated services/systems when requested by Electrical Subcontractor.
  - 2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

### 3.03 PREPARATION:

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with the Island's roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  1. Comply with requirements for access and protection specified in Section 01500 - Construction Facilities and Temporary Services and as follows:
    - a. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
    - b. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

### 3.04 SELECTIVE DEMOLITION, GENERAL:

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  1. Proceed with selective demolition systematically.
  2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  5. Dispose of demolished items and materials promptly.
- B. Removed and Reinstalled Items:
  1. Clean and repair items to functional condition adequate for intended reuse.

2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Authority, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.
- 3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS:
- A. Piping and Valves: Remove and dispose the piping and valves to the limits indicated.
  - B. Refer to Contract Drawings and Division 16 – Electrical for additional requirements with regard to selective demolition.
- 3.06 DISPOSAL OF DEMOLISHED MATERIALS:
- A. General: Except for items or materials indicated to be reinstalled, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
    1. Do not allow demolished materials to accumulate on-site.
    2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
    3. Comply with the applicable requirements specified in Division 1.
  - B. Burning: Do not burn demolished materials.
  - C. Disposal: Transport demolished materials off Authority's property and legally dispose of them.
- 3.07 CLEANING:
- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

## SECTION 01740

### WARRANTIES AND BONDS

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK:

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

##### 1.02 RELATED WORK:

- A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.
- B. General closeout requirements are included in Section 01700 Project Closeout.
- C. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in the individual Sections of Division 2 through 16.
- D. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

##### 1.03 SUBMITTALS:

- A. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner.
- B. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner within fifteen days of completion of that designated portion of the Work.
- C. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Engineer for approval prior to final execution.
- D. Refer to individual Sections of Divisions 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.
- E. At Final Completion, compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer.

Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

- F. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-in. by 11-in. paper.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification Section in which specified, and the name of the product or work item.
- H. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer, supplier, and manufacturer.
- I. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name, address, and telephone numbers of the Contractor and equipment supplier.
- J. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.
- K. Schedule of Special Warranties

None

#### 1.04 WARRANTY REQUIREMENT:

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise

available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights or remedies.

- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- G. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.05 DEFINITION:

- A. Standard Product Warranties are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION



## SECTION 01900

### SEISMIC AND WIND REQUIREMENTS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. This section establishes the minimum seismic and wind loading design requirements for architectural, mechanical, electrical and non-structural components.
- B. The Contractor shall be responsible for compliance with the seismic and wind requirements specified including conformance by all Subcontractors, manufacturers and Suppliers.

##### 1.02 REFERENCES:

- A. American Society of Civil Engineers (ASCE):
  - 1. ASCE/SEI 7: Minimum Design Loads for Buildings and Other Structures
- B. American Society of Mechanical Engineers (ASME):
  - 1. [B31](#): Code for Pressure Piping
- C. International Code Council (ICC):
  - 1. International Building Code
- D. Manufacturers Standardization Society of the Valve and Fitting Industry:
  - 1. [SP-58](#): Pipe Hangers and Supports - Materials, Design and Manufacture
- E. National Fire Protection Association (NFPA):
  - 1. Standard for the Installation of Sprinkler Systems

##### 1.03 DEFINITIONS:

- A. Components are defined as systems, equipment, parts, or other elements, including supporting structures and attachments.
- B. The reference Building Code is the building code cited on the structural drawings or specified herein for the design of the basic structure.
- C. The specified seismic criteria is defined as the seismic criteria cited on the structural drawings or specified herein for the design of the basic structure.

- D. The specified wind criteria is defined as the wind criteria cited on the structural drawings or specified herein for the design of the basic structure.

#### 1.04 SEISMIC AND WIND DESIGN REQUIREMENTS:

- A. Refer to structural drawings for project specific seismic and wind requirements and also conform to the requirements specified herein.
- B. Seismic and wind design shall conform to the International Building Code and ASCE/SEI 7.
- C. Architectural, mechanical, electrical and non-structural components shall be designed and constructed to resist the seismic and wind forces and displacements based upon ASCE/SEI 7, the reference building code, and the specified seismic and wind criteria. In the case of conflict the more stringent requirements shall govern.
- D. The interrelationship of components and their effect on each other shall be such that the failure of one component shall not cause the failure of any other component.
- E. Components shall be anchored to the building structure to transfer seismic and wind forces. Connections shall be bolted, welded or otherwise positively anchored to the structure. Anchorage shall not rely on friction for force transfer.
- F. Post-installed anchors in concrete shall be prequalified for seismic applications in accordance with ACI 355.2, ICC-ES AC-193, or ICC-ES AC-308. Drop-in anchors are prohibited for concrete anchorage.
- G. Post-installed anchors in masonry shall be prequalified for seismic applications in accordance with ICC-ES AC-01, or ICC-ES AC-58. Drop-in anchors are prohibited for masonry anchorage.
- H. Exceptions: Exemption from the requirements for seismic and wind analysis and design are permitted only to the extent permitted by applicable codes and standards.

#### 1.05 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01300.
- B. Where specified in the technical specifications, provide and complete the Certificate of Unit Responsibility form in Section 01300 and submit to Engineer prior to manufacture of components.
- C. In addition, submit the following support data along with Certificate of Unit Responsibility:
  - 1. Certification, signed and sealed by a Professional Structural Engineer registered in the jurisdiction in which the project is located stating that all systems, equipment,

and other elements, including supporting structures, attachments and connections are designed to withstand the required seismic and wind forces and displacements.

2. Codes and specifications to which structural design conforms.

#### 1.06 SPECIFIC COMPONENTS:

- A. Compound Equipment: Connecting elements for equipment combinations such as pumps and motors, valves and operators, engines and generators, etc. which are not capable of transferring seismic and/or wind loads or accommodating seismic and wind displacements shall be protected by appropriate design.
- B. Storage Tanks: Tanks, supporting structures and anchorages shall be designed for the weight of the tank, appurtenances and the tank contents at the maximum capacity. Tank contents shall not be considered in resistance to seismic and wind loads.
- C. Ductwork: Equipment installed within ductwork shall be independently supported and braced. Support and bracing of heating and cooling coils shall account for the weight of the contents.
- D. Piping Systems: Support and bracing of piping systems shall account for the weight and hydrodynamic effects of the contents.
- E. Pressure Piping: Pressure piping support and bracing shall conform to ASME B 31 in addition to the force and displacement requirements of the reference code.
- F. Sprinkler Systems: Sprinkler system support and bracing shall conform to NFPA 13 in addition to the force and displacement requirements of the reference code.
- G. General Supports: Pipe, duct, raceways and cable tray supports and bracing shall conform to the AISC Manual of Steel Construction and MSS SP-58 in addition to the force and displacement requirements of the reference code.

#### PART 2 - PRODUCTS

(Not Used)

#### PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 02100  
SITE PREPARATION

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide labor, material, tools and equipment to prepare site as indicated and specified.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading

PART 2 - PRODUCTS

2.01 WOOD CHIPS:

- A. Chip from cleared wood.
- B. Provide additional wood chips as directed by Engineer.
- C. DO NOT PERMIT use of elm wood and elm bark as wood chips.

PART 3 - EXECUTION

3.01 EXISTING TREES AND VEGETATION:

- A. Avoid cutting or injuring trees and vegetation outside easement line and outside areas to be cleared as indicated, without Engineer's permission.
- B. Accept responsibility for damages outside these lines.
- C. Remove and dispose of trees and stumps within 20 feet of the dam embankments and core wall. Remove and dispose of trees and stumps in the staging area, in the location of the new access road and that otherwise interfere with the performance of the work as indicated on the drawings or as directed by Engineer.

3.02 EXISTING STRUCTURES AND PROPERTY:

- A. Remove existing signs, posts, catchbasin frames and grates, manhole frames and covers, and granite curbing within construction path unless directed otherwise.
- B. Store at a site designated by Owner, items in reusable condition as determined by Engineer.
- C. For work in loamed areas, strip loam to one side to avoid mixing with excavation materials. Do not take loam from site.

### 3.03 CLEARING:

- A. Cut or remove trees, brush, and other vegetable matter such as snags, bark and refuse, from areas to be cleared. Clear ground to width of permanent easement unless otherwise directed.
- B. Cut trees, stumps, and stubs to be cleared, except where clearing done by machinery, as close to ground surface as practicable, but no more than 6 in. above ground surface for small trees and 12 in. for larger trees.
- C. Bury elm bark, at least 1 ft. deep, or burn in incinerators off site with antipollution controls and fire prevention controls, to prevent spread of Dutch Elm disease as required by applicable laws.

### 3.04 CLEARING IN WOODED AREAS:

- A. Remove and dispose of cleared trees offsite. In doing so, observe all applicable laws, ordinances, rules and regulations.

### 3.05 GRUBBING, STRIPPING, DISPOSAL:

- A. Remove stumps and roots larger than 3 in. in diameter to a depth of 12 in., and roots larger than 1/2 in. in diameter to a depth of 6 in. Measure depths to cut from existing ground surface or proposed finished grade, whichever is lower.
- B. Strip stumps, roots, foreign matter, topsoil, loam and unsuitable earth from ground surface. Utilize topsoil and loam insofar as possible for finished surfacing. Do not take loam from site.
- C. Promptly dispose off site material from clearing and grubbing not reused or stockpiled. In doing so, observe all applicable laws, ordinances, rules and regulations. Do not consider work completed until final cleaning, unless otherwise directed.

### 3.06 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 02140

### DEWATERING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Design, furnish, operate, maintain, and remove temporary dewatering systems to control groundwater and surface water to permit work to be performed under dry and stable conditions. Work to be done as part of dewatering includes, but is not limited to:
  - 1. Lower the groundwater level.
  - 2. Lower hydrostatic pressure.
  - 3. Prevent surface water from entering the excavation during construction.
  - 4. Implement erosion control measures for disposing of discharge water.
- B. Common dewatering methods include, but are not limited to, sump pumping, deep wells, well points, vacuum well points or any combinations thereof.
- C. The Contractor shall obtain the required permits for discharge from the Contractor's dewatering systems in accordance with 40 CFR Part 122 and 61 FR 19284. The discharge location shall be in accordance with permit requirements.
- D. For work related to drawdown and maintenance of the Lowes Pond Dam water level refer to Section 01063 Miscellaneous Requirements.

##### 1.02 RELATED WORK:

- A. Section 01063: Miscellaneous Requirements.
- B. Section 01568: Erosion Control Sedimentation and Containment of Construction Materials.
- C. Section 02210: Earth Excavation, Backfill, Fill, and Grading
- D. Section 02222: Fine Aggregate
- E. Section 02223: Impervious Fill
- F. Section 02271: Riprap
- G. Section 02273: Geotextile Fabric
- H. Section 02435: Crushed Stone

### 1.03 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
  - 1. Submit a dewatering plan at least two weeks prior to start of any dewatering operation. The review will be for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:
    - a. A list of equipment including, but not limited to, pumps, prime movers, and standby equipment.
    - b. Detailed description of dewatering, maintenance, and system removal procedures.
    - c. Erosion/sedimentation control measures, and methods of disposal of pumped water.
    - d. List of all applicable laws, regulations, rules, and codes to which dewatering design conforms.

### 1.04 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. If subgrade soils are disturbed or become unstable due to dewatering operation or an inadequate dewatering system, notify the Engineer, stabilize the subgrade, and modify system to perform as specified at no additional cost to the Owner.
- C. Notify the Engineer immediately if any settlement or movement is detected on structures. If the settlement or movement is deemed by the Engineer to be related to the dewatering, take actions to protect the adjacent structures and submit a modified dewatering plan to the Engineer within 24 hours. Implement the modified plan and repair any damage incurred to the adjacent structures at no additional cost to the Owner.
- D. If oil and/or other hazardous materials are encountered after dewatering begins, immediately notify the Engineer.

### 1.05 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Section 01610 and as specified.

### 1.06 PROJECT/SITE CONDITIONS:

- A. Subsurface Conditions: Refer to Appendix A.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

- A. Provide casings, well screens, piping, fittings, pumps, power and other items required for dewatering system.
- B. Provide and store auxiliary dewatering equipment, consisting of pumps and hoses on the site in the event of breakdown, at least one (1) pump for every five (5) used.
- C. Provide and maintain erosion/sedimentation control devices as indicated or specified and in accordance with the dewatering plan.
- D. Provide temporary pipes, hoses, flumes, or channels for the transport of discharge water to the discharge location.

## PART 3 - EXECUTION

### 3.01 EXECUTION:

- A. Execution of any earth excavation, installing earth retention systems, and dewatering shall not commence until the related submittals have been reviewed by the Engineer with all Engineer's comments satisfactorily addressed and the geotechnical instrumentation has been installed.
- B. Furnish, install and maintain dewatering system in accordance with the dewatering plan.
- C. Carry out dewatering program in such a manner as to prevent undermining or disturbing foundations of existing structures or of work ongoing or previously completed.
- D. Do not excavate until the dewatering system is operational and has successfully dewatered the soil to the required elevation.
- E. Unless otherwise specified, continue dewatering uninterrupted until all structures, pipes, and appurtenances below the original groundwater level have been completed and backfilled such that they will not be floated or otherwise damaged by an increase in groundwater elevation.
- F. Discontinue open pumping from sumps and ditches, if such pumping is resulting in boils, loss of fines, softening of the ground, or instability of the slopes. Modify dewatering plan and submit to the Engineer at no additional cost to the Owner.
- G. Where subgrade materials are disturbed or become unstable due to dewatering operations, remove and replace the materials in accordance with Section 02210 at no additional cost to the Owner.
- H. Dewatering Discharge:



1. Transport pumped or drained water to discharge location without interference to other work, damage to pavement, other surfaces, or property.
  2. Provide separately controllable pumping lines.
  3. The Engineer reserves the right to sample discharge water at any time.
  4. Immediately notify the Engineer if suspected contaminated groundwater is encountered. Do not pump water found to be contaminated with oil or other hazardous material to the discharge locations.
- I. Install and maintain erosion/sedimentation control devices at the point of discharge as indicated or specified and in accordance with the dewatering plan.
- J. Removal:
1. Do not remove dewatering system without written approval from the Engineer.
  2. Backfill and compact sumps or ditches with crushed stone wrapped with geotextile fabric in accordance with Section 02210.
  3. All dewatering wells shall be abandoned upon completion of the work, and completely backfilled with cement grout.
- 3.02 CONTRACT CLOSEOUT:
- A. Provide in accordance with section 01700.

END OF SECTION

## SECTION 02160

### TEMPORARY EXCAVATION SUPPORT SYSTEMS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Design, furnish and install temporary excavation support systems as required to maintain lateral support, prevent loss of ground, limit soil movements to acceptable limits and protect from damage existing and proposed improvements including, but not limited to, pipelines, utilities, structures, roadways, railroads, embankments, and other facilities.
- B. The requirement of sheeting left in place in areas indicated on the drawings does not relieve the Contractor from the responsibility of furnishing and installing proper temporary excavation support systems in other areas.
- C. Common types of excavation support system include, but are not limited to, singular or multiple stages comprised of cantilevered or internally braced soldier piles and lagging, steel sheetpile wall, timber sheetpile wall, drilled secant pile wall system, trench box, or combinations thereof. Trench box temporary excavation support system is only acceptable for pipe or utility trench excavations. Temporary unsupported open cut excavation with stable sloping sides is allowed where applicable.
- D. Wherever the word "sheeting" is used in this section or on the contract drawings, it shall be in reference to any type of excavation support system specified except trench box.
- E. Construction of the temporary excavation support systems shall not disturb the existing structures or the completed proposed structures. Damage to such structures shall be repaired by the Contractor at no additional cost to the Owner.
- F. Temporary excavation support shall not be allowed within the limits of the existing or proposed embankment dam.
- G. Adjacent structures are those that are bear upon soils above the proposed excavation depth and within a distance equal to twice the total depth of the excavation away from the closest edge of the excavation. Monitor and protect adjacent structures as specified and indicated.
- H. Vibration monitoring for excavation support systems will be performed by Contractor's vibration consultant and monitoring firm. Vibration due to Contractor's operations shall not exceed specified limits 1.05 E.

- I. Construction operations not to exceed specified noise limits in accordance with Section 01100.
- J. The Contractor shall bear the entire cost and responsibility of correcting any failure, damages, subsidence, upheaval or cave-ins as a result of improper installation, maintenance or design of the temporary excavation support systems. The Contractor shall pay for all claims, costs and damages that arise as a result of the work performed at no additional cost to the Owner.

1.02 RELATED WORK:

- A. Section 02140: Dewatering
- B. Section 02210: Earth Excavation, Backfill, Fill, and Grading
- C. Section 03300: Cast-in-Place Concrete
- D. Section 05119: Structural Steel

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM):
  - 1. A36: Standard Specification for Structural Steel
  - 2. A328: Standard Specification for Steel Sheet Piling
  - 3. A416: Standard Specification for Strand Steel, Uncoated Seven-Wire for Prestressed Concrete
  - 4. A722: Specification for Uncoated High-Strength Steel Bar for Prestressing Concrete
  - 5. A615: Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- B. American Wood-Preserves Association (AWPA) Standards.
- C. American Welding Society (AWS) Code: D1.1.
- D. Federal Standard, FS TT-W-571: Wood Preservation and Treating Practices.
- E. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29: Subpart P - Excavations, Trenching and Shoring.
- F. American Concrete Institute (ACI)

- G. ACI 304: Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:

1. Submit the following qualifications four (4) weeks prior to the construction:
  - a. Qualifications of independent vibration consulting and monitoring firm as specified in Paragraph 1.05 D.
  - b. Qualifications of Contractor's temporary excavation support system designer as specified in Paragraph 1.05 G.
  - c. Qualifications of Contractor's temporary excavation support system installer as specified in Paragraph 1.05 H.
  - d. Qualifications of Contractor's independent tieback testing laboratory as specified in Paragraph 1.05 I, if a tieback system is utilized.
  - e. Qualifications of Contractor's temporary excavation support system installation supervisor as specified in Paragraph 1.05 J.
  - f. Qualifications of vacuum excavation subcontractor as specified in Paragraph 1.05 F, if DMPs for utilities are utilized.
2. Submit a temporary excavation support plan stamped and signed by a Registered Professional Engineer at least two weeks prior to start of the construction. Do not submit design calculations. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:
  - a. Proposed temporary excavation support system(s), details, location, layout, depths, extent of different types of support relative to existing features and the permanent structures to be constructed, and methods and sequence of installation and removal.
  - b. Certificate of Design: Refer to Section 01300.
  - c. A list of all design assumptions, including safety factors used for the temporary excavation support system(s) and all lateral pressures used for each system.

- d. If utilizing a tieback system, include tieback installation procedures and criteria for acceptance of tiebacks for performance and proof tests. Submit the tieback testing results to the Engineer for information only.
  - e. Requirements of dewatering during the construction.
  - f. Minimum lateral distance from the edge of the excavation support system for use for vehicles, construction equipment, and stockpiled construction and excavated materials.
  - g. List of equipment used for installing the excavation support systems.
  - h. Monitoring schedule, installation procedures and location plans for vibration/noise monitoring, geotechnical instrumentation (deformation monitoring points, inclinometers, etc.) and observation wells/piezometers to monitor ground, excavation support system, adjacent structures and groundwater fluctuation during the entire construction period.
3. Submit a Construction Contingency Plan specifying the methods and procedures to maintain temporary excavation support system stability if the allowable movement of the adjacent ground and adjacent structures is exceeded.
  4. Monitoring data within one (1) day of data collection from vibration and noise recording equipment, observation wells, deformation monitoring points and offset lines. Data shall include:
    - a. Horizontal and vertical movements of geotechnical instruments and groundwater readings.
    - b. New movements since the initial readings of the geotechnical instruments.
    - c. Weekly summary in tabular and graphic form at the end of each week.
    - d. A schematic plan of excavation and/or relevant construction activities at the time of monitoring.
  5. For excavation support systems left in place, submit the following as-built information prior to backfilling and covering the excavation support systems:
    - a. Survey locations of the temporary excavation support systems, including coordinates of the ends and points of change in direction.
    - b. Type of the temporary excavation support system.

- c. Elevations of top and bottom of the excavation support systems left in place.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Conform to the requirements of the OSHA Standards and Interpretations: "Part 1926 Subpart P - Excavation, Trenching, and Shoring", and all other applicable laws, regulations, rules, and codes.
- C. Construction operations to conform to noise regulations provided in the Noise Control Plan and this Section.
- D. Retain the services of an independent vibration consulting firm with the following in-house personnel to conduct the following vibration monitoring requirements:
  - 1. Preparing, reviewing and signing of monitoring plans and daily reports, and overseeing of the monitoring and interpretation of the vibration data shall be performed by personnel with the following qualifications:
    - a. Be a Massachusetts Registered Professional Engineer.
    - b. Have a minimum of five (5) years experience in the vibration consulting field.
    - c. Have successfully completed at least five (5) projects with vibration-inducing construction operations, pile driving, and noise levels equal to or more severe than those to be encountered.
  - 2. Assist Contractor in selecting pile driving equipment which will generate the lowest vibration and noise levels.
  - 3. Installation, monitoring and interpretation of monitoring equipment shall be performed by personnel with the following qualifications:
    - a. Have at least three (3) years of experience in the operation of monitoring equipment proposed for use and interpretation of records produced by such equipment.
    - b. Have installed, operated, monitored and interpreted equipment and records on at least three (3) projects with vibration-inducing construction operations, pile driving, and noise levels equal to or more severe than those to be encountered.

- E. The peak particle velocity for pile driving, or other vibration-inducing operations, shall not exceed the following:

Type of Concrete	Age of Concrete, hrs	Peak Particle Velocity in/sec
Mass Concrete (footings, mats, Slab-on-grade, fill concrete, etc.)	0-11	1.0
	11 and over	2.0
Concrete Structures (walls, columns, elevated slabs, etc.)	0-11	0.5
	11-24	1.0
	24 and over	2.0
Existing Structures, residences or utilities	-	0.5

- F. If utilizing deformation monitoring points (DMPs) for utilities, vacuum excavation shall be performed by subcontractor having five (5) years of experience in non-destructive vacuum excavation methods for utilities.
- G. Prepare design, including calculations and drawings, under the direction of a Professional Engineer registered in the state where the project is located and having the following qualifications:
1. Not less than ten (10) years experience in the design of specific temporary excavation support systems to be used.
  2. Completed not less than five (5) successful temporary excavation support system projects of equal type, size, and complexity within the last five (5) years.
- H. Temporary Excavation Support System Installer's Qualifications:
1. Not less than three (3) year experience in the installation of similar types and equal complexity as the proposed system.
  2. Completed not less than three (3) successful excavation support systems of similar type and equal complexity as the proposed system.
- I. If utilizing a tieback system, employ an independent testing laboratory to test the tieback system with the following qualifications:
1. Be accredited by the American Association of State Highway and Transportation Officials (AASHTO) Accreditation Program.

2. Employ personnel conducting testing who are trained in the methods and procedures to test and monitor tieback systems of similar type and equal complexity, as the proposed system.
  3. Have not less than five (5) years experience in testing of tieback systems of similar type and equal complexity as the proposed system.
  4. Have successfully tested at least three (3) tieback systems of similar type and equal complexity as the proposed system.
- J. Install all temporary excavation support systems under the supervision of a supervisor having the following qualifications:
1. Not less than five (5) years experience in installation of systems of similar type and equal complexity as the proposed system.
  2. Completed at least five (5) successful temporary excavation support systems of similar type and equal complexity as the proposed system.
- K. All welding shall be performed in accordance with AWS D1.1.

#### 1.06 DESIGN CRITERIA:

- A. Design of temporary excavation support systems shall meet the following minimum requirements:
1. Support systems shall be designed for earth pressures, hydrostatic pressure, equipment, temporary stockpiles, construction loads, roadways, railroads, and other surcharge loads.
  2. Design a bracing system to provide sufficient reaction to maintain stability.
  3. Limit movement of ground adjacent to the excavation support system to be within the allowable ground deformation as specified.
  4. Design the embedment depth below bottom of excavation to minimize lateral and vertical earth movements and provide bottom stability. Toe of braced temporary excavation support systems shall not be less than 5 feet [1.5 m] below the bottom of the excavation.
  5. Design temporary excavation support systems to withstand an additional 2 feet [60 cm] of excavation below proposed bottom of excavation without redesign except for the addition of lagging and/or bracing.
  6. Maximum width of pipe trench excavation shall be as indicated on the drawings.



7. Do not cast permanent structure walls directly against excavation support walls.
8. The design location of the excavation support wall shall be determined such that the installed wall and bracing system components are all located outside the limits of the permanent structure. Construction tolerances (e.g. wall verticality) shall be considered in determining the plan location.

#### 1.07 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Sections 01610 and as specified.
- B. Store sheeting and bracing materials to prevent sagging which would produce permanent deformation. Keep concentrated loads which occur during stacking or lifting below the level which would produce permanent deformation of the material.

#### 1.08 PROJECT/SITE CONDITIONS:

- A. Subsurface Conditions: Refer to Section 00100.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS:

- A. Structural Steel: All soldier piles, wales, rakers, struts, wedges, plates, waterstop and accessory steel shapes shall conform to ASTM A36.
- B. Timber Lagging Left in Place: Pressured treated per appropriate AWWPA standards.
- C. Tieback Tendons: Tieback tendons shall be high strength steel wire strand cables conforming to ASTM A416, or bars conforming to ASTM A722. Splicing of individual cables shall not be permitted.
- D. Raker Ties: ASTM A615 Grade 60.
- E. Cement Grout Materials And Admixtures For Tieback Anchorages: Grout cube strength shall be a minimum 3500 psi at 7 days and 5000 psi at 28 days.
- F. Concrete: Section 03300.
- G. Tamping tools adapted for backfilling voids after removal of the excavation support system.
- H. Provide specific trench box sizes for each pipe and utility excavation with structural capacity of retaining soil types as described in OSHA's 29 CFR Part 1926 Subpart P.

## 2.02 EQUIPMENT:

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Installation of the temporary excavation support systems shall not commence until the related earth excavation and dewatering submittals have been reviewed by the Engineer with all Engineer's comments satisfactorily addressed.
- B. Install excavation support systems in accordance with the temporary excavation support plan.
- C. If utilizing a tieback system, all performance and proof tests shall be conducted in the presence of the Engineer. Testing performed without the Engineer present will not be accepted. Repeat testing in the Engineer's presence at no additional cost to the Owner.
- D. Do not drive sheeting within 100 feet [30 m] of concrete less than seven (7) days old.
- E. Carry out program of temporary excavation support in such a manner as to prevent undermining or disturbing foundations of existing structures of work ongoing or previously completed.
- F. Bottom of the trench box excavation support system shall be above the pipe invert prior to installing the pipe.
- G. Install and read geotechnical instrumentation in accordance with the temporary excavation support plan. Notify the Engineer immediately if any geotechnical instrumentation is damaged. Repair or replace damaged geotechnical instrumentation at the sole option of the Engineer and at no additional cost to the Owner.
- H. Continuously monitor movements of the ground adjacent to excavation support systems and adjacent structures. In events of the measured movements approaching or exceeding the allowable movements, take immediate steps to arrest further movement by revising procedures such as providing supplementary bracing, filling voids behind the trench box, supporting utilities or other measures (Construction Contingency Plan) as required.
- I. Notify utility owners if existing utilities interfere with the temporary excavation support system. Modify the existing utility with the utility owners permission or have the utility owner make the modifications at no additional cost to Owner.

#### 3.02 GROUND DEFORMATION ADJACENT TO EXCAVATION SUPPORT SYSTEMS:

- A. Allowable Vertical (heave/settlement) and Lateral Movements: 2 inches [5 cm] maximum for the trench box excavation support system, and 1 inch [2.5 cm] maximum for other types of excavation support systems at any location behind the excavation support system.
- B. Monitoring personnel shall use a procedure for reading and recording geotechnical instrumentation data which compares the current reading to the last reading during data collection to eliminate spurious readings.
- C. Plot the observed ground deformation readings versus time. Annotate the plots with construction loading and excavation events having an impact on the readings. Evaluate plots by means of secondary rate-of-change plots to provide early warning of accelerating ground movements.
- D. Notify the Engineer when the allowable ground deformation is exceeded.
- E. Implement Construction Contingency Plan under direction of the temporary excavation support system designer and the Engineer.

### 3.03 REMOVAL OF EARTH RETENTION SYSTEM:

- A. Sheet piling shall be left in place unless otherwise indicated or approved in writing by the Engineer.
- B. When indicated or approved by the Engineer, remove the temporary excavation support system without endangering the constructed or adjacent structures, utilities, or property. Immediately backfill all voids left or caused by withdrawal of temporary excavation support systems with bank-run gravel, screened gravel or select borrow by tamping with tools specifically adapted for that purpose.
- C. When tiebacks are used, release tension in tiebacks as the excavation is backfilled. Do not leave tensioned tieback in place at the completion of the work.
- D. The excavation support system left-in-place shall be cut-off a minimum of 2 feet [60 cm] below the bottom of the next higher foundation level or a minimum of 5 feet [152 cm] below finished grade.
- E. Conduct survey of the locations and final cut-off elevations of the excavation support systems left in place.

### 3.04 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 02165

### TEMPORARY COFFERDAM

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. The work of this section consists of designing, furnishing, installing, maintaining and removing a temporary cofferdam within the Lowe's Pond to enable the dewatering of the construction areas within the reservoir for excavation, backfill, formwork erection and concrete placement in the dry.
- B. Design and provide the temporary cofferdam and temporary pumping systems to lower and maintain reservoir to desired level and to maintain dewatered area free of water. Contractor shall assume temporary pumps will be required on the interior of the cofferdams.
- C. The temporary cofferdam shall consist of one or combination of the following systems: portable dam, rubber dam system, interlocking steel sheet pile and soldier pile with steel plate lagging or others approved by the Engineer.

##### 1.02 RELATED REQUIREMENTS

- A. Sediment control devices are shown on drawings and are specified in Section 01568.

##### 1.03 PROJECT CONDITIONS

- A. Refer to Appendix A for subsurface information. The Contractor may perform additional investigations for the temporary cofferdam design. The drilling cost shall be included in the submitted bid for the temporary Cofferdam.
- B. The cofferdam shall not extend outside the limits of temporary or permanent easements.

##### 1.04 SUBMITTALS:

- A. Shop Drawing: Submit the following in accordance with Section 01300 - SUBMITTALS:
  - 1. Submit the following qualifications two (2) weeks prior to the construction:
    - a. Qualifications of Contractor's temporary cofferdam system designer.
    - b. Qualifications of Contractor's temporary cofferdam system installer.

2. Manufacturer's material and installation information.
3. Dewatering Plan to include drawings with written descriptions of the proposed procedures for dewatering and disposal of the fluidized materials. The Dewatering Plan shall provide detailed information of the proposed temporary cofferdam system's materials, dimension, layout and pumping plan.
4. Submit a temporary cofferdam plan stamped and signed by a Massachusetts Registered Professional Engineer at least two (2) weeks prior to start of the construction. Do not submit design calculations. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:
  - a. Proposed temporary cofferdam system(s), details, location, layout, depths, extent of different types of support relative to existing features and methods and sequence of installation and removal.
  - b. Certificate of Design: Refer to Section 01300.
  - c. Requirements of dewatering during the construction.
  - d. List of equipment used for installing the temporary cofferdam systems.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Conform to the requirements of the OSHA Standards and Interpretations and all other applicable laws, regulations, rules, and codes.
- C. Prepare design, including calculations and drawings, under the direction of a Massachusetts Registered Professional Engineer and having the following qualifications:
  1. Not less than ten (10) years experience in the design of specific temporary cofferdam systems to be used.
  2. Completed not less than five (5) successful temporary excavation support system projects of equal type, size, and complexity within the last five (5) years.
- D. Temporary Cofferdam System or Installer's Qualifications:
  1. Not less than three (3) year experience in the installation of similar types and equal complexity as the proposed system.

2. Completed not less than three (3) successful cofferdam systems of similar type and equal complexity as the proposed system.
- E. Install temporary cofferdam systems under the supervision of a supervisor having the following qualifications:
1. Not less than five (5) years experience in installation of systems of similar type and equal complexity as the proposed system.
  2. Completed at least five (5) successful temporary cofferdam systems of similar type and equal complexity as the proposed system.

#### 1.06 DESIGN CRITERIA:

- A. Design of temporary cofferdam systems shall meet the following minimum requirements:
1. Support systems shall be designed for hydrostatic pressure, water current, wave forces, ice forces, and other applicable surcharge loads.

### PART 2 - PRODUCTS

#### 2.01 TEMPORARY COFFERDAM

- A. The Contractor shall have full responsibility for the structural and protective adequacy of the temporary cofferdam system installed. The following type may be used:
1. Portadam System as manufactured by Portdam, Inc., Dover-Foxcroft, ME, 044265; 207-564-7878; Fax 207-564-7877; [www.portadam.com](http://www.portadam.com).
  2. Rubber Dam System as manufactured by Dam-It Dams, Inc., Fenton, MI, 48430; 313-886-6761; Fax 313-886-6710; [www.damitdams.com](http://www.damitdams.com).
  3. Interlocking steel sheeting or soldier pile with steel plate lagging cofferdams.
  4. Or approved equal.

### PART 3 - EXECUTION

#### 3.01 GENERAL

- A. The Dewatering Plan shall be approved by the Engineer. All sediment and erosion control measures shall be in place prior to the commencement of the construction for the temporary cofferdam. The Contractor shall notify the Engineer 48 hours in advance of the delivery and onsite erection of the cofferdam system.

- B. The Contractor shall be responsible for maintaining a safe, clean and accessible construction site. The Contractor shall have full responsibility for the complete and proper diversion of water during all stages of the project and shall repair, at no additional expense to the Owner, any damage to any equipment, materials or work caused by floods, high water or failure of the diversion of protective works.
- C. The temporary cofferdam shall be constructed to provide adequate clearances in all directions are required for the execution of work to be performed in the dewatered area. This shall include room for the dewatering pumps and installation and removal operations.

### 3.02 SUBGRADE PREPARATION

- A. The portable dam shall be placed directly on the existing ground of the reservoir. If large obstructions are encountered, such as boulders, their removal is necessary. Softer ground areas may be traversed by using distribution pads under the steel framework or by driving steel poles down to suitable subsurface material. Either of these methods shall be performed in accordance with the manufacturer's recommendations.

### 3.03 FRAME INSTALLATION

- A. Assembly of the steel framework for the portable dam requires in-water labor to position frame toes properly and can be accomplished using floating, light-lift equipment or landside crane. Assemble the steel framework using bolted clamps and pinned connections. Place appropriate portable dam frames as per the manufacturer's recommendations.

### 3.04 MEMBRANE INSTALLATION

- A. Membrane for the portable dam shall be installed and sealed after the frames are installed in accordance with the manufacturer's recommendations. The fabric sections are connected on shore, rolled and floated into position on the assembled framework. After connection of the top of the fabric at the desired elevation, it is unrolled down the diagonal face of the framework and extended over the mudline to the required distance out from the toes. Sandbags may be used to anchor the ends of the membrane approximately one sandbag per linear foot.

### 3.06 DEWATERING

- A. After the cofferdam has been installed and adequately sealed, the Contractor shall pump out the water behind the membrane. Minor leaks shall be located and sealed. All water pumped after construction has started shall be pumped to a temporary dewatering sediment basin which shall filter the water prior to discharging into the downstream flow channel.

- B. Temporary sump holes may be installed within the area to be dewatered to create a more suitable pumping area. Pumps shall be kept in a workable condition and a spare pump shall be available for breakdowns or emergency conditions.
- C. A temporary dewatering sediment basin shall be sized, constructed, and located by the Contractor. The sides of the dewatering basin shall be constructed of substantial materials designed for the prevention of siltation. The siltation prevention screening shall extend two feet above normal high water.

### 3.07 REMOVAL

- A. The Contractor shall notify the Engineer 48 hours in advance prior to removing any portion of the temporary cofferdam system. Upon completion, cleanup, inspection, and acceptance of the internal dry work, the enclosed area shall be flooded to equalize the water pressure on both side of the cofferdam. For the portable dam option, the fabric is first removed and then the frames. Sandbags shall be removed and disposed of. The Contractor shall check the ground surface for any stray objects, and dispose all surplus and unsuitable material from the site in accordance with all local, state, and federal rules.

END OF SECTION



## SECTION 02210

### EARTH EXCAVATION, BACKFILL, FILL AND GRADING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Perform the following earth excavation, backfill, fill and grading as indicated or specified:
- B. Make excavations to accommodate piping, conduits, foundations and other structures.
- C. Provide materials for backfilling excavations and constructing embankments and fills as indicated and specified.
- D. Construct embankments of compacted materials.
- E. Grade surfaces to meet finished grades indicated.
- F. Immediately notify the Engineer if suspected hazardous materials are encountered and cease operations in that part of work.

##### 1.02 RELATED WORK:

- A. Section 01568: Erosion Control Sedimentation and Containment of Construction Materials.
  1. Section 02100: Site Preparation.
  2. Section 02140: Dewatering
  3. Section 02222: Impervious Fill
  4. Section 02271: Riprap
  5. Section 02273: Geotextile Fabric
  6. Section 02435: Crushed Stone
  7. Section 03300: Cast-in-Place Concrete

##### 1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:
  1. C33: Specification for Concrete Aggregates.

2. C136: Sieve Analysis of Fine and Coarse Aggregates.
3. D421: Practice for Dry Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants.
4. D6913: Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
5. D1140: Test Method for Amount of Material in Soils Finer than the No. 200 (75  $\mu\text{m}$ ) Sieve.
6. D1556: Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
7. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
8. D2167: Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
9. D4318: Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
10. D4718: Practice for Correction of Unit Weight and Water Content for Soils Containing Oversized Particles.
11. D4944: Test Method for Field Determination of Water (Moisture) Content of Soil by the Calcium Carbide Pressure Tester Method.
12. D4959: Test Method for Field Determination of Water (Moisture) Content of Soil by Direct Heating Method.
13. D5080: Test Method for Rapid Determination of Percent Compaction.
14. D6938: Standard Test method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
15. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29: Subpart P - Excavations, Trenching and Shoring.

#### 1.04 DEFINITIONS:

- A. Percentage of compaction is defined as the ratio of the field dry density, as determined by ASTM D1556 or ASTM D6938 to the maximum dry density determined by ASTM D1557 Procedure C, multiplied by 100.
- B. Proof Roll: Compaction with a minimum of 4 passes of a vibratory steel drum or rubber tire roller. Vibratory plate compactors shall be used in small areas where vibratory steel drum or rubber tire roller can not be used.

C. Acceptable Material: Material which does not contain organic silt or organic clay, peat, vegetation, wood or roots, stones or rock fragments over 6-inch in diameter, porous biodegradable matter, loose or soft fill, excavated pavement, construction debris, or refuse. Stones or rock fragments shall not exceed 40 percent by weight of the backfill material.

D. Unacceptable Materials:

1. Material which contain organic silt or organic clay, peat, vegetation, wood or roots, stones or rock fragments over 6-inch in diameter, porous biodegradable matter, loose or soft fill, excavated pavement, construction debris, or refuse. Stones or rock fragments shall not exceed 40 percent by weight of the backfill material. Materials that do not comply with the requirements for the acceptable material or
2. Materials that cannot be compacted to the specified or indicated density.

#### 1.05 SUBMITTALS:

A. Submit the following in accordance with Section 01300:

1. Qualifications of the Contractor's Independent Testing Laboratory as specified in Paragraph 1.06 G, four (4) weeks prior to the execution of any earth excavation, backfilling, filling, or compaction process.
2. Submit an excavation, backfilling, and filling plan at least two weeks prior to start of any earth moving activities. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include, but not be limited to the following items:
  - a. Detailed sequence of work.
  - b. General description of construction methods.
  - c. Numbers, types, and sizes of equipment proposed to perform excavation and compaction.
  - d. Details of dust control measures.
  - e. Proposed locations of stockpiled excavation and/or backfill materials.
  - f. Proposed surplus excavated material off-site disposal areas and required permits.



2. The Contractor's independent testing laboratory shall have the following qualifications:
3. Be accredited by the American Associates of State Highway and Transportation Officials (AASHTO) Accreditation Program or U.S. Army Corps Engineers (USACE).
4. Have three (3) years experience in sampling, testing and analysis of soil and aggregates, and monitoring field compaction operations.
5. Able to provide three (3) references from previous work.
6. Field Testing and Inspections:
7. By Contractor's independent testing laboratory, acceptable to the Engineer, at Contractor's expense as specified in Paragraph 1.06 J.
8. Location of tests mutually acceptable to testing laboratory and the Engineer or as directed by the Engineer.
9. In the event compacted material does not meet specified in-place density, recompact material and retest this area until specified results are obtained at no additional to the Owner.
10. Contractor's testing laboratory to perform inspection at least once daily to confirm lift thickness and compaction effort for entire fill area.
11. Methods of Field Testing:
12. In-Place Density: ASTM D1556, ASTM D2167, or ASTM D6938.
13. In-Place Moisture Content: ASTM D6938, ASTM D4944, or ASTM D4959.
14. Material Testing Frequency: The following testing frequencies are minimum required for all structural and non-structural fill, grading and embankment.
15. Field In-Place Density and Moisture Content - crushed stone shall be compacted as specified and indicated. For other backfill and fill materials, minimum test frequency shall be as follows, and no less than one test per:
  16. Trenches under structures, foundation preparation or roadways subbase: Every 1000 lin. ft. per lift.
  17. Trenches in areas without structures or roadways: Every 1000 lin. ft. per alternate lift.
  18. Under Structures: 1,000 sq. ft. per lift.
  19. Around Structures: 1,500 sq. ft. per lift.

20. Embankment Fills: 10,000 sq. ft. per lift.
21. Moisture Density - One per source, except for crushed stone. Repeat the moisture density test for every 5,000 cubic yard of material use, and whenever visual inspection indicates a change in material gradation as determined by the Engineer.
22. Gradation Analysis - A minimum of one per source and for each moisture density test and whenever visual inspection indicates a change in material gradation.
23. Liquid Limit, Plastic Limit and Plasticity Index - Minimum of one test per 5,000 cubic yard of soil for use as fill material and whenever classification of material is in doubt as determined by the Engineer.
24. Construction Tolerances:
25. Construct finished surfaces to plus or minus 1 inch of the elevations indicated.
26. Grade cut and fill areas to plus or minus 0.20 foot of the grades indicated.
27. Complete embankment edges to plus or minus 6 inches of the slope lines indicated.
28. Provide the Engineer with adequate survey information to verify compliance with above tolerances.
29. Pipes, drains, and other utilities may exist in certain locations not indicated on drawings. No attempt has been made to show all services. Completeness or accuracy of information given is not guaranteed.
30. Dig test pits considered as incidental to the normal excavation as indicated and specified in this Section, at no additional compensation. When the Engineer orders test pits beyond limits of excavation, payment for such test pits shall be as specified in Section 01151.
31. Carefully support and protect from damage, existing pipes, poles, wires, fences, curbs, property line markers, and other structures, which the Engineer determines must be preserved in place without being temporarily or permanently relocated. Should such items be damaged, restore without compensation therefore, to at least as good condition as that in which they were found immediately before the work was begun.
32. Whenever certain existing structures, as described below, are encountered, and the Engineer so directs, change the location, remove and later restore, or replace such structures, or assist the Owner in doing so. Such work to be paid for under applicable items of work, otherwise as Extra Work.

33. In removing existing pipes or other structures, include for payment only those new materials which are necessary to replace those unavoidably damaged as determined by the Engineer.
34. The preceding two paragraphs apply to pipes, wires, and other structures which meet the following: (a) are not indicated on the drawings or otherwise provided for, (b) encroach upon or are encountered near and substantially parallel to the edge of the excavation, and (c) in the opinion of the Engineer, will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.
35. Restore existing property or structures as promptly as practicable.
36. Do not remove excavation materials from the site of the work or dispose of except as directed or permitted by the Engineer.
37. Haul away and dispose of surplus excavated materials at locations approved by the Engineer at no additional cost to the Owner.
38. During progress of work, conduct earth moving operations and maintain work site so as to minimize the creation and dispersion of dust. Furnish and spread calcium chloride if the Engineer decides that it is necessary for more effective dust control.
39. Provide suitable and safe bridges and other crossings where required for accommodation of travel, and to provide access to private property during construction, and remove said structures thereafter.

#### 1.07 SITE CONDITIONS:

- A. Subsurface Conditions: Refer to Appendix A.

### PART 2 - PRODUCTS

#### 2.01 GENERAL:

- A. Use only acceptable materials from excavations or borrows.
- B. Provide fine aggregate, impervious fill, common fill material, and crushed stone.
- C. Provide erosion/sedimentation control devices as indicated, including geotextile fabric in accordance with Section 02273.

#### 2.02 EQUIPMENT:

- A. The compaction equipment shall be selected by the Contractor, and shall be capable of consistently achieving the specified compaction requirements. The selected compaction equipment shall meet the following minimum requirements:

1. Manually operated vibratory plate compactors weighing no less than 200 pounds with vibration frequency no less than 1600 cycles per minute.
2. Vibratory steel drum or rubber tire roller weighing at least 12,000 pounds.
3. Small vibratory drum rollers and equipment mounted vibratory plate.

### PART 3 - EXECUTION

#### 3.01 SITE MAINTENANCE:

- A. Roadway and Site Leveling: Grade roadway and site as to maintain them in a level unrutted condition and to eliminate puddling of surface and subsurface water.

#### 3.02 EXCAVATION:

- A. Execution of any earth excavation shall not commence until the related dewatering, excavation support systems, and backfill and fill materials submittals are reviewed by the Engineer and all Engineer's comments satisfactorily addressed.
- B. Carry out program of excavation, dewatering, and excavation support systems to eliminate possibility of undermining or disturbing foundations of existing structures or of work previously completed under this contract or adjacent preexisting embankment slopes.
- C. Excavate to widths that give suitable room for building structures or laying and jointing piping.
- D. Do not plow, scrape or dig by machinery near to finished subgrade in a manner that would result in disturbance of subgrade.
- E. Excavate to lines and grades indicated in an orderly and continuous program.
- F. Establish limits of excavation to allow adequate working space for installing forms and for safety of personnel.
- G. Excavate to elevations indicated, or deeper, as directed by the Engineer, to remove unacceptable bottom material.
- H. Exercise care to preserve material below and beyond the lines of excavations.
- I. Place excavated material at the approved stockpile locations and in no case closer than 3 feet from edge of excavations to prevent cave-ins of bank slides.
- J. Regard small, less than one cubic yard, boulders, rock fragments, and concrete encountered during excavation as a normal part of in-place soils and not included for payment as rock.

#### 3.03 SEPARATION OF EXCAVATED MATERIALS FOR REUSE:



- A. Remove only existing pavement that is necessary for prosecution of work.
- B. Carefully remove loam and topsoil from excavated areas. Store separately for further use or furnish equivalent loam and topsoil as directed.
- C. Carefully remove acceptable material from excavated areas and store separately for further use as backfill material.

#### 3.04 TRENCH EXCAVATION:

- A. When pipe is to be laid in gravel bedding or concrete cradle, excavate trench by machinery to, or just below designated subgrade. If material remaining at bottom of trench is disturbed, recompaction shall be required.
- B. When pipe is to be laid directly on bottom of trench, do not excavate lower part of trenches by machinery to subgrade. Remove remainder of material to be excavated just before placing of pipe by use of hand tools. Form a flat or shaped bottom, true to grade, so pipe will have a uniform and continuous bearing. Support on firm and undisturbed material between joints, except for limited areas where use of pipe slings have disturbed bottom.

#### 3.05 DEPTH OF TRENCH:

- A. Excavate trenches to depths so as to permit pipe to be laid at elevations, slopes, or depths of cover indicated on drawings, and at uniform slopes between indicated elevations.

#### 3.06 WIDTH OF TRENCH:

- A. Make pipe trenches as narrow as practicable and do not widen by scraping or loosening materials from the sides. Make every effort to maintain sides of trenches firm and undisturbed until backfilling has been placed and compacted.
- B. Excavate trenches with approximately vertical sides between springline of pipe and elevation 1 ft. above top of pipe.

#### 3.07 TRENCH EXCAVATION IN FILL:

- A. Place and compact material to top of fill or to a minimum height of 1 ft. above top of pipe, whichever is less, when pipe is to be laid in embankment or other recently filled material. Take particular care to ensure maximum consolidation of material under pipe location. Excavate pipe trench as though in undisturbed material.

#### 3.08 EXCAVATION NEAR EXISTING STRUCTURES:

- A. Discontinue digging by machinery when excavation approaches pipes, conduits, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation in work to be done when incidental to normal excavation and under items involving normal excavation.

- B. Excavate test pits when determination of exact location of pipe or other underground structure is necessary for doing work properly.

### 3.09 REMOVAL OF SUBSURFACE OBSTRUCTIONS:

- A. Remove indicated subsurface structures and related obstructions to extent shown.
- B. Promptly notify the Engineer when any unexpected subsurface facilities are encountered during excavation such as utility lines and appurtenances, walls and foundations.

### 3.10 UNAUTHORIZED EXCAVATION:

- A. When the bottom of any required excavation is taken out beyond limits indicated or specified, backfill, with the same original material as directed by the Engineer.

### 3.11 REUSE AND DISPOSAL OF SURPLUS EXCAVATED MATERIALS:

- A. Reuse surplus acceptable excavated materials for backfill; deposit neatly and grade so as to make or widen fills, flatten side slopes, or fill depressions; or legally dispose off-site; all as directed or permitted and without additional compensation.

### 3.12 SUBGRADE PREPARATION AND PROTECTION:

- A. Remove loam and topsoil, loose vegetable matter, stumps and large roots from areas upon which embankments will be built or material will be placed for grading. Shape subgrade as indicated on drawings, and prepare by forking, furrowing, or plowing so that the first layer of new material placed thereon will be well bonded to it.
- B. As directed by the Engineer, over excavate unacceptable materials below the foundation subgrade. Backfill the over excavation with approved material by the Engineer.
- C. Proof roll the foundation subgrade prior to backfilling and filling operation, or placing foundation concrete.
  - 1. Proof roll the pipe trench foundation subgrade prior to backfilling and filling operation, or placing soil-supported pipeline.
  - 2. Utilize excavating equipment equipped with a toothless or smooth edged, excavating bucket to expose the pipe trench foundation subgrade to avoid disturbance of the bearing surface. Tamp the exposed subgrade with the excavating bucket prior to backfilling and filling operation, or placing soil-supported pipeline.

### 3.13 CARE AND RESTORATION OF PROPERTY:

- A. Enclose uncut tree trunks adjacent to work in wooden boxes of such height as may be necessary for protection from injury from piled material, equipment, operations, or otherwise due to work. Operate excavating machinery and cranes of suitable type with

care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.

- B. Cut all branches, limbs, and roots smoothly and neatly without splitting or crushing. Neatly trim, cut the injured portions and cover with an application of grafting wax or tree healing paint as directed.
- C. Protect cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations by suitable means or dig up and temporarily replant and maintain. After construction operations have been substantially completed, replant in original positions and care for until growth is reestablished. If cultivated hedges, shrubs, and plants are injured to such a degree as to effect their growth or diminish in their beauty or usefulness, replace by items of equal kind and quality existing at the start of the work.
- D. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces when their treads or wheels of which are so shaped as to cut or otherwise damage such surfaces.
- E. Restore surfaces damaged by the Contractor's operations to a condition at least equal to that in which they were found immediately before work commenced. Use suitable materials and methods for such restoration.

#### 3.14 BACKFILLING - GENERAL:

- A. Do not place frozen materials in backfill or place backfill upon frozen material. Remove previously frozen material or treat before new backfill is placed.
- B. Do not place, spread, roll or compact fill material during unfavorable weather conditions. If interrupted by heavy rain or other unfavorable conditions, do not resume until ascertaining that the moisture content and density of the previously placed soil are as specified.
- C. Do not use puddling, ponding or flooding as a means of compaction.

#### 3.15 MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS:

- A. Common Fill for Access Road:
  - 1. Dump and spread in layers not to exceed 8-in. uncompacted thickness.
  - 2. Compact, fill and backfill as indicated but to not less than 95 percent.
  - 3. Crushed Stone:
  - 4. Dump and spread in layers not to exceed 8-in. uncompacted thickness.
  - 5. Compact using self propelled vibratory steel drum or rubber tire rollers with a minimum of 4 passes in directions perpendicular to one another in open areas. In

small areas, use manually operated vibratory plate compactors with a minimum of 4 passes.

6. Acceptable materials for use as non-structural fill:
7. Dump and spread in layers not to exceed 12-in. uncompacted thickness.
8. Compact to not less than 90 percent unless otherwise indicated.
9. Backfilling and filling operation shall be suspended in areas where tests are being made until tests are completed and the testing laboratory has advised the Engineer that adequate densities are obtained.

3.16 STRUCTURAL FILL AND BACKFILL UNDER STRUCTURES:

- A. Compact fill and backfill under structures and pavements with crushed stone as specified and indicated.

3.17 NON-STRUCTURAL BACKFILL AROUND STRUCTURES:

- A. Use acceptable materials for non-structural backfill around structures and compacted as specified and indicated.
  - 1. Deposit material evenly around structure to avoid unequal soil pressure.
  - 2. Do not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking, or other damage.

3.18 MATERIAL FOR FILLING AND EMBANKMENTS:

- A. Use acceptable materials for filling and constructing embankments unless otherwise indicated.

3.19 PLACING AND COMPACTING EMBANKMENT MATERIAL:

- A. Compact fill material as specified and indicated.
- B. Perform fill operation in an orderly and systematic manner using equipment in proper sequence to meet the specified compaction requirements.
- C. Place fill on surfaces which are free of unacceptable materials.
- D. Begin filling in lowest section of work area. Grade surface of fill approximately horizontal but provide with sufficient longitudinal and transverse slope to allow for runoff of surface water from every point.
- E. Conduct filling so that no obstruction to drainage from other sections of fill area is created at any time.
- F. Install temporary dewatering sumps in low areas during filling operation where excessive amounts of rain runoff collect.
- G. Reduce moisture content of fill material, if necessary, in source area by working it over under warm and dry atmospheric conditions. A large disc harrow with two to three foot diameter disks may be required for working soil in a drying operation.
- H. Compact uniformly throughout. Keep surfaces of fill reasonably smooth and free from humps and hollows which would prevent proper and uniform compaction. Do not permit hauling equipment to follow a single track on the same layer but direct equipment to

spread out to prevent over compaction in localized areas. Take care in obtaining thorough compaction at edges of fill.

- I. Slightly slope surface of fill to ensure drainage during periods of wet weather. Do not place fill while rain is falling or after a rain-storm until the Engineer considers conditions satisfactory. During such periods and upon suspension of filling operations for any period in excess of 12 hours, roll smooth the surface of fill using a smooth wheel static roller to prevent excessive absorption of rainfall and surface moisture. Prior to resuming compaction operations, remove muddy material off surface to expose firm, compacted material, as determined by the Engineer.
- J. When fill is placed against an earlier fill or against in-situ material under and around structures, including around piping beneath structures or embankments, slope junction between two sections of fill, 1 vertical to 1.5 horizontal. Bench edge of existing fill 24-in. to form a serrated edge of compact stable material against which to place the new fill. Ensure that rolling extends over junction between fills.
- K. When fill is placed directly upon another older fill, clean surface thoroughly of debris and remove any loose material. Then proof roll the entire old surface.
- L. After spreading each loose lift to the required thickness and adjusting its moisture content as necessary, roll with sufficient number of passes to obtain the required compaction. One pass is defined as the required number of successive trips which by means of sufficient overlap will insure complete coverage and uniform compaction of an entire lift. Do not make additional passes until previous pass has been completed.
- M. In case material of any fill sinks and weaves under roller or under hauling units and other equipment, required degree of compaction is not being obtained. Reduce the moisture content. If such sinking and weaving produces surface cracks, suspend operations on that part of the embankment until it becomes sufficiently stabilized. Ideal condition in fill is that attained when the entire fill below the surface being rolled is so firm and hard as to show only the slightest weaving and deflection as roller passes. Spread out rolling operations over the maximum practicable area to minimize condition of sinking and weaving.
- N. If because of defective workmanship, compaction obtained over any area is less than that required, remedy condition at no cost to Owner. If additional rolling or other means fail to produce satisfactory results, remove material in that area down to a level of satisfactory density. Perform removal, replacement, and rerolling without additional compensation.

### 3.20 COMPACTION CONTROL OF BACKFILL, FILL, AND EMBANKMENT:

- A. Compact to density specified and indicated for various types of material. Control moisture content of material being placed within  $\pm 2\%$  of optimum moisture content.
- B. The soil testing laboratory shall provide inspection during filling or backfilling operations to ensure compaction of crushed stone and record compaction equipment in use.

- C. Moisture control may be required either at the stockpile area, pits, or on embankment or backfill. Increase moisture content when material is too dry by sprinkling or other means of wetting uniformly. Reduce moisture content when material is too wet by exposing the greatest possible area to sun and air in conjunction with harrowing, plowing, spreading of material or any other effective methods.

3.21 ALLOWANCE FOR SHRINKAGE:

- A. Build embankments or backfill to a height above finished grade which will, in the opinion of the Engineer, allow for the shrinkage or consolidation of material. Initially, provide at all points, an excess of at least one percent of total height of backfill measured from stripped surface to top of finished surface.
- B. Supply specified materials and build up low places as directed, without additional cost if embankment or backfilling settles so as to be below the indicated level for proposed finished surface at any time before final acceptance of the work.

3.22 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02222  
IMPERVIOUS FILL

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. Provide and compact impervious fill for the dam embankment as specified. Impervious fill shall be used for all earthen embankment fill, or replacement as a result of embankment excavation unless indicated otherwise.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:

- 1. D1140: Test Method for Amount of Material in Soils Finer than the No. 200 (75  $\mu\text{m}$ ) Sieve.
- 2. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>).
- 3. D4318: Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- 4. D6913: Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

- B. American Association of State Highway and Transportation Officials (AASHTO) Publication:

- 1. M145: Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300 - Submittals:

- 1. Gradation and compaction test results from the soil testing laboratory, at least two (2) weeks prior to hauling material, for the Engineer's acceptance.
- 2. Submit a 20-lb. sample of the material when requested by the Engineer.



1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Qualifications of the independent soil testing laboratory as specified in Section 02210.
- C. Maximum particle size and gradation analyses shall be performed in accordance with ASTM D6913. Soil compaction test shall be performed in accordance with ASTM D1557 Procedure C.
- D. Material testing frequency and requirements as specified in Section 02210.

PART 2 – PRODUCTS

2.01 MATERIAL:

- A. Impervious fill shall be obtained from approved natural deposits and unprocessed except for the removal of deleterious materials and stones larger than the maximum size permitted.
- B. Impervious fill shall be unfrozen and substantially free from vegetation, roots, loam and other organic matter, snow, frozen particles and other fine or harmful substances.
- C. Impervious fill shall have the physical characteristics of A-4, A-5 and A-6 soils under AASHTO M145, which contain more than 36% by mass passing No. 200 sieve.

PART 3 – EXECUTION

3.01 PLACEMENT AND COMPACTION:

- A. Specified in Section 02210 and where indicated on the drawings.

3.02 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 02226

### FOUNDATION PREPARATION

#### PART 1 - GENERAL

##### 1.01 REFERENCES:

###### A. American Society for Testing and Materials (ASTM) Publications:

1. C387: Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar

##### 1.02 DEFINITIONS:

###### A. Foundations:

1. The rock foundation is comprised of the rock surfaces upon which concrete structures are placed.

###### B. Rock Joints:

1. Rock joints are all planar and/or curvilinear fractures, including cracks, crevices, and seams which separate a rock mass into individual rock blocks of various sizes. They may be open or closed and may be filled with material other than rock material.

##### 1.03 SUBMITTALS:

###### A. Submit the following in accordance with Section 01300:

1. Product Data
2. Equipment List

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS:

###### A. Dental Concrete:

1. Dental concrete shall conform to the requirements of ASTM C387, normal weight and strength.

## PART 3 - EXECUTION

### 3.01 EXAMINATION:

- A. The limits of the proposed foundations for the various parts of the work are approximately as indicated. The Owner reserves the right to change the depth to, or the width of, the foundations if, conditions exposed in the foundation excavations warrant such modifications.

### 3.02 PREPARATION:

#### A. Equipment:

- 1. Tools: Submit for approval tabular list of light power tools, to be used in lieu of hand tools, prior to their use on the job site. Hand tools, where required or permitted by these specifications include, but are not limited to shovels, bars, picks, wedges, and brooms. Light power tools may be used in lieu of hand tools only when such use is approved.

- B. Air/Water Jet: An air/water jet shall consist of a 1-1/2 inch nozzle with associated controls and supply hoses connected to suitable sources of compressed air and water. Compressed air shall have a pressure between 90 and 110 psi. Water shall be introduced into the airstream at the nozzle when needed, at a rate of up to 30 gpm. The air and water shall be separately controllable at the nozzle.

### 3.03 PRELIMINARY CLEANUP:

- A. When the excavation has reached the approximate limits shown or when the Engineer determines that a satisfactory foundation may have been reached, the Engineer may direct that a preliminary cleanup be performed on all or any part of the rock foundation surface. This cleanup shall consist of removing all debris, loose rock, sand, silt, and other objectionable material by hand tools followed by air/water jets or any combination of additional methods approved or directed. The Engineer may require that the excavation be continued and the preliminary cleanup procedure repeated until a satisfactory foundation surface is reached.

### 3.04 FINAL CLEANUP AND FOUNDATION PREPARATION:

- A. Unless otherwise directed, Final Cleanup and Foundation Preparation shall be performed. This work shall consist of removing loose and/or weather rock and pockets of fines, sand, rock rubble or gravel and other objectionable material from the in-place rock surface including areas of depression, large crevices, and open rock joints. Picking, barring, and hand excavation may be necessary to obtain a foundation surface free from loose, drummy, or shattered materials. Overhangs shall be excavated and backfilled with compacted granular materials. The final rock surface shall be thoroughly cleaned by use of air/water jets or other approved method and shall be maintained in a clean condition until the placement of concrete thereon.

### 3.05 DENTAL TREATMENT:

- A. Dental treatment shall consist of excavation, if necessary, of the material in joints, cavities, depressions, and overhangs and the placement of concrete such that the final surface is satisfactory for the subsequent placement of concrete.
- B. Joints and cavities shall be excavated to a depth 3 times the width (measured at the base of the excavation) of the joint or cavity.
  - 1. Dental Concrete: Concrete shall be used to fill joints, cavities, depressions, and overhangs except where the use of mortar is required or permitted. Prior to placement, the surfaces of the joint, cavity, depression, or overhang will be thoroughly cleaned using air/water jets. The concrete shall conform with paragraph MATERIALS.

### 3.06 PROTECTIVE TREATMENT:

- A. Protective Backfill: The final 2 feet of excavation, final cleanup and foundation preparation, inspection, and dental treatment shall all be accomplished within a period of 24 hours.

### 3.07 TESTS:

- A. General: Establish and maintain quality control for foundation preparation operations to assure compliance with contract specifications and maintain records of the quality control for all operations including but not limited to the following:
  - 1. Equipment: Quantity and type.
  - 2. Foundation Excavation: Strict adherence to foundation excavation limits and depths.
  - 3. Inspection, Mapping, and Cleanup: Orderly prosecution of inspections, mapping, and cleanup of foundation excavation areas.
  - 4. Specialized Operations: Protective treatment and Dental treatment.
- B. Reports: Submit three copies of these records of inspection as well as corrective action taken daily.

### 3.08 FOUNDATION INSPECTION AND GEOLOGIC MAPPING:

- A. Inspections to determine adequacy of the foundations will be performed by the Engineer in all foundation areas between completion of excavation and placement of concrete, or protective treatment. The Contractor will cooperate to the extent necessary to assist in inspection and mapping activities which may require additional survey control points and access. Coordinate the schedule for foundation excavation and preliminary cleanup with

the Engineer to ensure that the cleanup, inspection, and mapping proceed in an orderly manner.

END OF SECTION

## SECTION 02271

### RIPRAP

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Provide labor, materials, and equipment required to place stone riprap as indicated and specified.

##### 1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading

##### 1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:
  - 1. C535: Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - 2. C88: Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.

##### 1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300 and as specified herein.
  - 1. Quarry stone source information. Indicate type of stone and include current photographs representative of the intended stone for this project with adequate scale to show the stone sizes. Riprap stone supply shall be subject to inspection and approval by the Engineer as meeting specification prior to utilization.
  - 2. LA Abrasion Test (ASTM C535) test data.
  - 3. Sample of stone for review of color.

#### PART 2 - PRODUCT

##### 2.01 STONE:

- A. Color to match as close as possible stone color of existing rock toe stone.
- B. Specific gravity 2.5 min., a potential stone supply shall have stone with less than 30% loss in an LA Abrasion Test in accordance with ASTM C 535.
- C. Soundness 5 percent max. loss in accordance with ASTM C88.

D. Facing stone size and gradation smaller than as indicated and uniformly graded.

<u>Designation</u>	<u>Percent Passing</u>
24"	100%
18"	80%
12"	50%
4"	10%

E. Shape:

1. Suitable to form protective structure.
2. Provide quarried, rough, angular stones, no rounded cobbles or boulders allowed.
3. Flat or needle shapes NOT ACCEPTABLE, unless thickness greater than 1/3 length.

## 2.02 BEDDING STONE:

A. ASTM C33 #2 STONE

## PART 3 - EXECUTION

### 3.01 PLACEMENT:

- A. Trim and dress areas to conform to lines and grades indicated.
- B. Place spread, and compact bedding stone where indicated.
- C. Excavate footing trench along slope toe as indicated, and place larger rocks there.
- D. Placing rocks:
1. Machine place rocks with longitudinal axis normal to embankment face.
  2. Leave minimum voids so that rock above foundation course has 3-point bearing on underlying rocks. Bearing on smaller rocks used for chinking voids and dumping is NOT ACCEPTABLE.
- E. Placing rocks:
1. Provide minimum voids.
  2. Place larger rocks in foundation course and on outside of slope protection.
  3. Dumping and spreading by equipment is ACCEPTABLE.
- F. Dress up outer facing to render.
1. Smooth surface

- 2. Irregularities not more than 0.5 ft measured normal to the slope.
  - G. Chink voids in outer facing with smaller stones. Remove loose stones.
- 3.02 CONTRACT CLOSEOUT:
- A. Provide in accordance with Section 01700.

END OF SECTION



SECTION 02273  
GEOTEXTILE FABRIC

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide woven geotextile fabric for silt fence as indicated or specified.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading
- B. Section 02435: Crushed Stone

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:
  - 1. D4355: Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon ARC Type Apparatus.
  - 2. D4491: Test Methods for Water Permeability of Geotextile by Permittivity.
  - 3. D4533: Test Method for Trapezoid Tearing Strength of Geotextiles.
  - 4. D4632: Test Method for Grab Breaking Load and Elongation of Geotextiles.
  - 5. D4751: Test Method for Determining Apparent Opening Size of a Geotextile.
  - 6. D4833: Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
  - 1. At least two weeks prior to shipment, submit manufacturer's certificate of compliance and physical property data sheet indicating that requirements for materials and manufacture are in conformance as specified.
  - 2. For informational purposes only, submit manufacturer's printed installation instructions.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.

B. General:

1. Producer of geotextile fabric to maintain competent laboratory at point of manufacture to insure quality control in accordance with ASTM testing procedures. Laboratory to maintain records of quality control results.
2. Do not expose geotextile fabric, except the geotextile fabric for silt fence, to ultraviolet radiation (sunlight) for more than 14 days total in period of time following manufacture until geotextile fabric is installed and covered with fill or backfill material.
3. Take all precautions to protect geotextile fabric from damage resulting from any cause. Either repair or replace geotextile fabric to Engineer's satisfaction at no additional cost to the Owner.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Section 01610 and as specified.
- B. Provide geotextile fabric in rolls wrapped with protective covering to protect geotextile fabric from mud, dirt, dust, and debris. Label each roll of geotextile fabric with number or symbol to identify production run.
- C. Protect geotextile fabric from sunlight during transportation and storage. Do not leave geotextile fabric exposed to sunlight for more than two weeks during installation operations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Provide the following woven geotextile fabric except for silt fence:
  1. Geotex 200ST as manufactured by Propex.
  2. Mirafi 500X as manufactured by Tencate.
  3. Linq GTF 200 as manufactured by Thrace Linq.
  4. Or acceptable equivalent product.
- B. Provide the following woven geotextile fabric for silt fence:
  1. Geotex 2130 as manufactured by Propex.
  2. Mirafi 100X as manufactured by Tencate Geosynthetics.
  3. Beltech 1935 by Belton Industries Inc.

4. Or acceptable equivalent product.

2.02 MATERIAL:

A. Geotextile fabric shall conform to test requirements for minimum average roll value (weakest principle direction) for strength properties of any individual roll tested from manufacturing lot or lots of particular shipment in excess of minimum average roll value (weakest principle direction) as specified hereafter:

B. Woven geotextile fabric, except for silt fence, shall be:

Property	ASTM Test Method	Units	Value
1. Grab Strength	D4632	lbs	200 (min.)
2. Grab Elongation	D4632	%	15 (min.)
3. Trapezoidal Tear Strength	D4533	lbs	75 (min.)
4. Puncture Strength	D4833	lbs	80 (min.)
5. Permittivity	D4491	sec -1	0.02 (min.)
6. Apparent Opening Size	D4751	Sieve Number	30-70
7. Ultraviolet Stability	D4355	Percent	70 (min.)

C. Physical Properties of Minimum Average Roll of the woven geotextile fabric for silt fence shall be:

Property	ASTM Test Method	Units	Value
1. Grab Strength	D4632	lbs	100 (min.)
2. Permittivity	D4491	sec -1	0.10 (min.)
3. Apparent Opening Size	D4751	Sieve Number	20-30
4. Ultraviolet Stability	D4355	Percent	70 (min.)

PART 3 - EXECUTION:

3.01 INSTALLATION:

A. Install geotextile fabric in accordance with manufacturer's printed instructions.

- B. Place geotextile fabric on the foundation subgrade prior to placing the screened gravel or crushed stone.
- C. Overlap geotextile fabric 18 inches minimum for unsewn lap joint. Overlap fabric 6 inches at seam for sewn joint.
- D. Do not permit traffic or construction equipment to travel directly on geotextile fabric.
- E. Place geotextile fabric in relatively smooth condition to prevent tearing or puncturing. Lay geotextile fabric loosely but without wrinkles or creases so that placement of the backfill materials will not stretch or tear geotextile fabric. Leave sufficient slack in geotextile fabric around irregularities to allow for readjustments.
- F. Patch all tears in geotextile fabric by placing additional section of geotextile fabric over tear with a minimum of 3 feet overlay.
- G. Extend the geotextile fabric and wrap around the screened gravel or crushed stone along the perimeter of the foundation.
- H. Install silt fence in accordance with the manufacturer's printed instructions and as indicated.

### 3.02 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02435  
CRUSHED STONE

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide and compact crushed stone for drain material as indicated and specified.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:
  - 1. C33: Specification for Concrete Aggregates
  - 2. D6913: Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
  - 1. Gradation test result from the soil testing laboratory, at least two (2) weeks prior to hauling material, for the Engineer's acceptance.
  - 2. Submit a 20-lb. sample of the material when requested by the Engineer.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Qualifications of the independent soil testing laboratory as specified in Section 02210.
- C. Maximum particle size and gradation analyses shall be performed in accordance with ASTM D6913.
- D. Material testing frequency and requirements as specified in Section 02210.

PART 2 - PRODUCTS

2.01 MATERIAL:

- A. Crushed Stone: Gradation and physical property requirements of crushed stone shall conform to AASHTO No. 57 Coarse Aggregate Stone.

- B. Crushed stone shall be free from roots, leaves, and other organic materials, and free of ice, snow or frost and frozen soil particles.

PART 3 - EXECUTION

3.01 PLACEMENT AND COMPACTION:

- A. Specified in Section 02210 and as indicated on the drawings.

3.02 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 02615

### DUCTILE IRON PIPE AND FITTINGS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Provide and test ductile iron pipe, fittings and appurtenances as indicated and in compliance with Contract Documents.
- B. Provide restrained push-on or mechanical joint fittings with restraint system as indicated and specified herein.
- C. Cast iron pipe and fittings are not acceptable.

##### 1.02 REFERENCES:

- A. American Society of Mechanical Engineers (ASME):
  - 1. B16.1: Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
  - 2. B16.21: Nonmetallic Flat Gaskets for Pipe Flanges.
  - 3. B16.42: Ductile Iron Pipe Flanges and Flanged Fittings.
  - 4. B31.1: Power Piping.
- B. ASTM International (ASTM):
  - 1. A240: Specification for Heat Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.
  - 2. A307: Carbon Steel Bolts and Studs, 60,000 psi Tensile.
  - 3. A530: Specification for General Requirements for Specialized Carbon and Alloy Steel Pipe.
  - 4. A774: Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures.
  - 5. A778: Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products.
- C. American Water Works Association (AWWA):
  - 1. A21.4: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

2. A21.10: Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids.
3. A21.11: Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe Fittings.
4. A21.50: Thickness Design of Ductile-Iron Pipe.
5. A21.51: Ductile-Iron Pipe, Centrifugally Cast in Metal Molds, or Sand-Lined Molds, for Water or Other Liquids.

D. Fluid Sealing Association: Technical Handbook.

#### 1.03 SUBMITTALS:

A. Submit the following in accordance with Section 01300:

1. Pipe manufacturer's technical specification and product data.
2. Certified shop and erection drawings. Contractor shall submit electronic files of the piping layout including the following.
  - a. Pipe layouts in full detail.
  - b. Location of hangers and supports.
  - c. Location and type of anchors.
  - d. Location of couplings and expansion joints.
  - e. 1/2-inch = 1 foot-0 inch scale details of all wall penetrations and special fittings.
  - f. Schedules of pipe, fittings, special castings, couplings, expansion joints and other appurtenances.
3. Certificates: Sworn certificates in duplicate showing compliance with material used and shop tests performed.
4. Catalog cuts and technical data for expansion joints, couplings, gaskets, pipe supports and other accessories.
5. Brochures and technical data on coatings and linings and proposed method of application.
6. Manufacturer's descriptive literature and technical data on insulation and proposed method of installation.



- B. A copy of the contract mechanical process, civil, and structural drawings, with addenda that are applicable to the equipment specified in this section, marked to show all changes necessary for the equipment proposed for this specification section. If no changes are required, mark all drawings with “No changes required” or provide a statement that no changes are required.
  - 1. Failure to include all drawings or a statement applicable to the equipment specified in this section will result in submittal return without review until a complete package is submitted.
  - 2. A copy of this specification section with addenda and all referenced specification sections with addenda, with each paragraph check-marked to indicate specification compliance or marked and indexed to indicate requested deviations and clarifications from the specified requirements.
    - a. If deviations and clarifications from the specifications are indicated, therefore requested by the Contractor, provide a detailed written justification for each deviation and clarification.
    - b. Failure to include a copy of the marked-up specification sections and or the detailed justifications for any requested deviation or clarification will result in submittal return without review until marked up specifications and justifications are submitted in a complete package.

1.04 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Provide manufacturer's certification in writing, that materials meet or exceed minimum requirements as specified.
- C. Inspect and test at foundry according to applicable standard specifications.
- D. Owner reserves right to inspect and test by independent service at manufacturer’s plant or elsewhere at his own expense.
- E. Visually inspect before installation.
- F. Job Conditions:
  - 1. Coordinate dimensions and drillings of flanges with flanges for valves, pumps and equipment to be installed in the piping systems.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01610.

- B. During loading, transportation and unloading, prevent damage to pipes and fittings. Load and unload each pipe under control at all times. Under no circumstances will a dropped pipe be used unless inspected and accepted by Engineer. Place skids or blocks under each pipe in the shop and securely wedge pipe during transportation.

**PART 2 - PRODUCTS**

**2.01 PIPE:**

**A. Ductile Iron:**

- 1. Design conforming to AWWA A21.50.
- 2. Manufacture conforming to AWWA A21.15 or AWWA A21.51.
- 3. Thickness class, unless otherwise indicated or specified:
  - a. Minimum Thickness Class 52.
  - b. Minimum thickness Class 53 for use with threaded flanges.
  - c. Minimum thickness Class 53 for use with flanged pipe.
  - d. Minimum thickness for use with grooved couplings conforming to AWWA C606.

**2.02 WALL CASTINGS:**

**A. Provide size and type indicated and specified.**

- 1. Piping 24-inches and Smaller: Mechanical Joint with specified restraint or Restrained Push-On.
- 2. Piping 30-inches and Larger: Restrained Push-On.

**B. Wall Castings: Conform to requirements of AWWA A21.10 or fabricate of Class 53 ductile iron pipe with screwed on flanges and welded on waterstop. Screwed on mechanical or push-on joints are not acceptable.**

**C. Provide water stop centered in wall. Weld water stops on in factory under controlled conditions to ensure adequate strength to permit waterstop to absorb thrust up to the pressure rating of the pipe.**

<b>Wall Castings with annealed ductile iron water stops</b>	
<b>Pipe Size</b>	<b>Waterstop thickness, inches</b>
24 inch	0.75

<b>Wall Castings with fabricated steel water stops</b>	
<b>Pipe Size</b>	<b>Waterstop thickness, in</b>
24 inch	0.38

- D. On flanged wall castings, provide space between the wall and flange to permit mounting the nuts on the flange bolts.
- E. Flanged wall castings located with the flange flush with the wall are not acceptable.
- F. Locate push-on joint wall castings with space between the bell and the wall to insert the follower bolts.
- G. As an option, fabricated wall pipe of Schedule 40 Type 316L stainless steel may be substituted for wall castings specified above. Provide with waterstops of above dimensions and welded continuously on both sides of stop. Flanges of Type 316 stainless steel. Bolts for connection to buried pipe Type 316 stainless steel. Provide flange insulation gaskets, sleeves and washers for all flanges.
- H. Testing: Factory pressure test all wall castings to pipe and joint pressure rating for a minimum of 5 minutes. No visible leakage is acceptable.

2.03 ADAPTERS:

- A. Furnish and install for joining pipe of different types, unless solid sleeves indicated.
  - 1. Provide ends conforming to above specifications for the correct type of joint, to receive adjoining pipe.
  - 2. Joining two classes of pipe may be of lighter class provided annular space in bell-and-spigot type joints sufficient for jointing.

2.04 JOINTS:

- A. Provide push-on joint and mechanical joint pipe with necessary accessories, conforming to AWWA A21.11.
  - 1. Provide gasket composition designed for exposure to liquid within pipe.
- B. Provide restrained joint on pipe and fittings where indicated. Provide restrained joint which is:
  - 1. Boltless.
  - 2. Capable of being deflected after assembly.
  - 3. Designs using set screws or requiring field welding are not acceptable.
  - 4. Manufacturers:

- a. American Cast Iron Pipe Co. Flex-Ring.
- b. U.S. Pipe TR FLEX.
- c. Clow Super-Lock.

2.05 MECHANICAL JOINT FITTINGS – RESTRAINT SYSTEM:

- A. Provide restraint devices for pipe consisting of multiple gripping wedges incorporated into a follower gland meeting requirements of AWWA A21.10.
  1. Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, retaining full mechanical joint deflection during assembly and allowing joint deflection after assembly.
  2. Provide actuation of the gripping wedges ensured with torque limiting twist off nuts.
  3. Provide restraint devices Listed by Underwriters Laboratories (3 inch through 24 inch).
  4. Gland body, wedges and wedge actuating components must be domestic manufactured in the USA.
- B. Working Pressure Rating:
  1. 18-inch thru 48-inch: 250 psi.
  2. Minimum safety factor: 2 to 1.
- C. Materials:
  1. Gland body, wedges and wedge actuating components: Grade 65-45-12 ductile iron in accordance with ASTM A536.
  2. Ductile iron gripping wedges: Heat treated, 370 to 470 BHN.
  3. Provide three (3) test bars incrementally poured per production shift as per Underwriter's Laboratory (U.L.) specifications and ASTM A536. Testing for tensile, yield and elongation in accordance with ASTM E8.
  4. Provide chemical and nodularity tests performed as recommended by the Ductile Iron Society, on a per ladle basis.
  5. Provide an identification number consisting of year, day, plant and shift (YYDDD)(plant designation)(Shift number) cast into each gland body.

6. Record all physical and chemical test results such that they can be accessed via the identification number on the casting. Provide the Material Traceability Records (MTRs) available, in hard copy.
7. Provide coating for restraint devices consisting of the following:
  - a. Process all wedge assemblies and related parts through a phosphate wash, rinse and drying operation prior to coating application.
  - b. Coating: A minimum of two coats of liquid thermoset epoxy coating with heat cure to follow each coat.
  - c. Surface pretreat all casting bodies with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. Coating: Polyester based powder to provide corrosion, impact and UV resistance.
  - d. Coating system: MEGA-BOND by EBAA Iron, Inc.

D. Manufacturer:

1. EBAA Iron MEGALUG Series 1100

2.06 PIPE COATING:

- A. Outside surfaces of piping not encased in concrete: Two coats of high solids NSF 61 certified polyamidoamine epoxy, Themec Series N140 Pota-Pox Plus, or acceptable equivalent product.
- B. Outside surfaces of piping encased in concrete: No coating.
- C. Machined surfaces cleaned and coated with rust-preventative compound at shop.

2.07 CEMENT LINING:

- A. Inside of pipe and fittings: Provide double thickness cement lining and bituminous seal coat conforming to AWWA A21.4.

2.08 GASKETS, BOLTS, AND NUTS:

- A. Provide Type 316 stainless steel bolts, washers, and nuts for all services.

PART 3 - EXECUTION

3.01 HANDLING AND CUTTING:

- A. Mark pipe and fittings "Rejected" and remove from site when cracked or has received a severe blow.

- B. If permitted, cut on sound barrel at a point at least 12 inch from visible limit of crack, at Contractor's expense.
- C. Machine cut with milling type cutters, knives, or saws. Snap cutters, torch, or hammer and chisel NOT ALLOWED. Examine for possible cracks.
- D. Chamfer cut ends if used for push-on joints.

3.02 INSTALLATION:

- A. Visually inspect before installation.
- B. Pitch piping toward low points. Provide for draining low points.
- C. Before assembly, remove dirt and chips from inside pipe and fittings.
- D. Pipe and fittings:
  1. Remove and replace defective pieces.
  2. Clear of all debris and dirt before installing and keep clean until accepted.
  3. Lay accurately to lines and grades indicated or required. Provide accurate alignment, both horizontally and vertically.
  4. Provide firm bearing along entire length of buried pipelines.
  5. Do not allow deflection of alignment at joints to exceed permissible deflection as specified below:

**PIPE DEFLECTION ALLOWANCES**

<b>Maximum permissible deflection, inches*</b>		
Size of pipe, inches	Push-on joint	Mechanical joint
24	11	9
* Maximum permissible deflection for 20-foot lengths; for other lengths in proportion of such lengths to 20-feet.		

- a. For push-on joint or similar pipe, clean bell of excess tar or other obstruction and wipe out before inserting next pipe spigot. Shove new pipe into place until properly seated and hold securely until joint completed.
- b. Set castings to be encased in concrete accurately with bolt holes, if any, carefully aligned. Clean off rust and scale before setting.

- E. Temporary Plugs: When pipe laying not in progress, close open ends of pipe with temporary watertight plugs. If water in trench, do not remove plug until danger of water entering pipe passed.

3.03 JOINTS AND COUPLINGS:

A. Push-on Joints:

1. Insert gasket into groove bell. Apply thin film of nontoxic gasket lubricant over inner surface of gasket in contact with spigot end.
2. Insert chamfered end into gasket. Force pipe past it until it seats against socket bottom.

B. Bolted Joints:

1. Remove rust-preventive coatings from machined surfaces.
2. Clean pipe ends, sockets, sleeves, housings, and gaskets and smooth all burrs and other defects.
3. Use torque wrench to tighten to correct range of torque not to exceed values specified below:

<b>TORQUE RANGE VALUES</b>		
<b>Nominal pipe size, in</b>	<b>Bolt diameter, in</b>	<b>Range of torque, ft-lbs</b>
24	3/4	75-90

C. Mechanical Joints:

1. Wire brush surfaces in contact with gasket and clean gasket.
2. Lubricate gasket, bell, and spigot with soapy water.
3. Slip gland and gasket over spigot, and insert spigot into bell until seated.
4. Seat gasket and press gland firmly against gasket.
5. After bolts inserted and nuts made finger-tight, tighten diametrically opposite nuts progressively and uniformly around joint by torque wrench. Torque bolts to values specified above.

3.04 FIELD PAINTING:

- A. Contractor to touch-up damaged shop coating with identical product and dry film thickness.

3.05 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION



## SECTION 02701

### EXFILTRATING BIORETENTION AREAS

#### PART 1 - GENERAL

##### 1.01 SUMMARY:

###### A. Section Includes:

1. Geotextiles.
2. Aggregate Layers.
3. Drainage Overflow Structure.
4. Bioretention Soil Materials.
5. Planting and Seeding.

##### 1.02 STANDARDS:

Except as modified herein, comply with the current edition of the following standards:

###### A. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M105 - Gray Iron Castings.

###### B. ASTM International:

1. ASTM D75 - Standard Practice for Sampling Aggregates.
2. ASTM D1883 - Standard Test Method for California Bearing Ration (CBR) of Laboratory Compacted Soils.
3. ASTM D5856 - Standard Test Method for Measurement of Hydraulic Conductivity of Porous Material using a Rigid Wall Compaction Mold Permeameter.

###### C. American Standard for Nursery Stock

##### 1.03 SUBMITTALS:

###### A. Aggregates: Prior to delivery of aggregates, the supplier must provide the following certificates:

1. Location of material source.
2. That stone is double washed.

3. Test results for gradation, smoothness, and percentage of wear.
- B. Aggregate Samples: Prior to delivery of aggregates, take at least one initial sample in accordance with ASTM D 75. Collect each sample by taking three incremental samples at random locations from source material to make a composite sample. Repeat sampling procedure when source of material is changed or when deficiencies or variations from specified grading of materials are found in testing.
  - C. Stone aggregates: Coarse aggregate used in the construction of the storage reservoir of bioretention systems shall be clean, double washed stone, defined as maximum wash loss of 0.5% when tested with AASHTO T-11. At least 14 working days before construction, the Contractor shall submit to Engineer for approval the product certificate including the AASHTO T-11 test results and gradation for the stone. AASHTO #5, and AASHTO #57 stone are acceptable gradations for the crushed stone reservoir.
  - D. Pea gravel: Pea gravel shall be used as indicated. No geotextile fabric shall be used as horizontal separation at any level within bioretention systems. The pea gravel used in the construction of the storage reservoir of bioretention systems shall be clean, double washed stone, defined as maximum wash loss of 0.5% when tested with AASHTO T-11. At least 14 working days before construction, the Contractor shall submit to Engineer for approval the product certificate including the AASHTO T-11 test results and gradation for the stone. AASHTO #8 stone is the acceptable gradation.
  - E. Soil Samples: Submit, in air-tight containers, 5 lb. sample of each type of Bioretention Soil to testing laboratory.
  - F. Materials Source: Submit name of imported materials source.
  - G. Topsoil: Prior to delivery of topsoil, the supplier must provide the location where topsoil was originally harvested along with results of topsoil analysis and written recommendations by an independent laboratory or university laboratory recognized by the State Department of Agriculture with the experience and testing capability to conduct the topsoil testing indicated below.
  - H. Topsoil samples analyzed must be obtained for analysis from source location no earlier than 90 days prior to the beginning of construction. Testing methods and written recommendations shall comply with USDA's Handbook No. 60 and shall include the following:
    1. Percentages of organic matter as conducted in conformance with ASTM D2974 (loss on ignition test).
    2. USDA gradation of sand, silt and clay content.
    3. Cation exchange capacity (CEC).

4. Nutrient levels by parts per million including phosphorous, potassium, magnesium, manganese, iron, zinc, and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil for optimum growth of the plants specified.
  5. Deleterious material.
  6. Soluble Salt Content.
  7. pH, buffer pH, and recommendations to obtain optimal pH factor.
- I. Compost: At least 14 working days in advance of construction and before delivery of compost, Contractor must submit the following to the Engineer for approval:
1. Sample: A 1-gallon sample of compost that represents compost to be used on actual project in a sealed plastic bag.
  2. Technical data sheet showing the following:
    - a. Feedstock percentage in the final compost product.
    - b. A statement that the compost meets federal and state health and safety regulations.
    - c. A compost technical data sheet from the vendor of the compost. The analysis and report must be consistent with the sampling and reporting requirements of the US Composting Council Seal of Testing Assurance (STA) program as described herein and must demonstrate that the compost meets the physical requirements specified in Table 6 of this specification. The date of analysis shall be no more than 90 calendar days prior to the date of submittal.
- J. Engineered Bioretention Soil: Prior to delivery of the engineered bioretention soil mixture, the supplier must provide the following documentation to the Engineer for approval:
1. Results of the analysis on final engineered bioretention soil mixture, and written report by a qualified soil testing laboratory with the experience and testing capability to conduct the bioretention soil testing indicated below.
  2. Particle gradation analysis as conducted in conformance with ASTM C117/C136 (AASHTO T11/T27). The gradation of the mixture shall meet the following gradation criteria using sieve sizes listed in the table below:

**Table 1: Gradation Criteria**

Sieve Size	Percent Passing
1 inch	100
#4	75-100
#10	40-100
#40	15-50
#100	5-25
#200	3-6

3. Percentages of organic matter as conducted in conformance with ASTM D 2974 (loss on ignition test), pH, and buffer pH.

K. Drainage and Erosion Control Geotextiles: Product certificates and manufacturer's information.

L. Plants and Seeds

1. Certify, invoice, and order plants for each shipment grown locally in a nursery free of disease and insect pests. Submit certificates to Engineer.
2. For seed mixtures, certificates from the seed vendor(s) shall be submitted to the Engineer for approval at least two weeks prior to application. The certificates shall state the botanical name, common name, number of seeds per unit of weight, germination percentage, the amount of undesirable plant seeds present in the mixtures, date of production and of packaging, and name and address of supplier(s).
3. Submit list of plant material to be used and source at least two weeks prior to planting.

#### 1.04 QUALITY ASSURANCE:

- A. All work shall be performed in accordance with all applicable Federal, State, and Local regulations and permits associated with the project.
- B. Furnish each Bioretention material from single source throughout the Work.
- C. Maintain one copy of certificates and documents on-site.

### PART 2 – PRODUCTS

#### 2.01 AGGREGATE LAYERS:

- A. Sand: Clean Natural Sand in accordance with the Aggregates section of the current MassDOT Standard Specifications for Construction.

B. Coarse aggregate shall consist of clean, tough, durable fragments of crushed stone, or crushed gravel, conforming to the gradations in the following tables and shall also meeting the following:

1. Be double washed, sufficient to remove dust and other coatings, and defined as meeting <0.5 % wash loss when tested with AASHTO T-11.
2. Be free from clay balls, organic matter, and other deleterious substances.

**Table 2: Gradation for Base Courses**

Pea Gravel	Bioretention Storage/Drainage Layer
AASHTO No. 8	AASHTO No. 5 or No. 57

**Table 3: Crushed Stone Gradation Requirements for AASHTO #57**

U.S. Standard Sieve Size	Percent Passing
1 ½" (37.5 mm)	100
1" (25 mm)	95-100
½" (12.5 mm)	25-60
No. 4 (4.75 mm)	0-10
No. 8 (2.36 mm)	0-5

**Table 4: Gradation requirements for AASHTO #5**

U.S. Standard Sieve Size	Percent Passing
1 ½" (37.5 mm)	100
1" (25 mm)	90-100
¾" (19 mm)	20-55
½" (12.5 mm)	0-10

3. Pea Gravel shall be a clean, double washed pea gravel following AASHTO No. 8 gradation.

**Table 5: Gradation requirements for AASHTO #8**

U.S. Standard Sieve Size	Percent Passing
½" (12.5 mm)	100
⅜" (9.5 mm)	85-100
No. 4 (4.75 mm)	10-30
No. 8 (2.36 mm)	0-10
No. 16 (1.16 mm)	0-5

## 2.02 ENGINEERED BIORETENTION SOIL:

- A. The engineered bioretention soil shall consist of a mixture containing the soil components and amendments listed below. The engineered bioretention soil shall be thoroughly mixed off site at a clean location. The material shall be well mixed, homogenous, loose friable, have no visible free water, and be free of wood pieces, plastic and other foreign matter. The soil mixture shall be protected from all sources of contamination, including weed seeds, while at the supplier, in conveyance and at the project site.
- B. The soil mixture shall, with the addition of approved amendments, meet the following criteria:
  - 1. Final organic matter content between 10 and 20 percent.
  - 2. pH of 5.5 to 7.0.
  - 3. Consist of a blend of the following components by volume, for the bottom 18 inches of the bioretention filter layer:
    - a. 60% Sand.
    - b. 30% Topsoil / Loam.
    - c. 10% Shredded Wood.

For the top 6 inch layer of the bioretention filter layer, a 10% compost shall be added to the mix listed above.

- C. Sand: Clean Natural Sand in accordance with the Aggregates section of the current MassDOT Standard Specifications for Construction.
- D. Topsoil/Loam:
  - 1. Shall be free of subsoil, stones 1 inch or larger in any dimension, dense material, hardpan, slag, clay, cinders, sod, roots, sticks, poison ivy, crabgrass, cough grass, noxious weeds, and foreign matter including but not limited to glass, metal, asbestos, toxins, hazardous wastes, petroleum product contamination, lead and chemicals (such as atrazine and muriatic acid) that may be injurious to humans, animals and plant material.
  - 2. Topsoil / Loam shall have a pH of 5.5 to 7.0, soluble salt content not to exceed 500 parts per million, and shall be composed of approximately 10% sand, 40% silt, 40% clay, with not more than 10% organic matter.
- E. Compost:

1. Compost must be mature/stabilized, humus like material aged 12 months and shall be the result of biological degradation and transformation under conditions designed to promote aerobic decomposition. The compost must have a dark brown or black color, be capable of supporting plant growth with ongoing addition of fertilizers or other soil amendments, must not have an objectionable odor and be stable with regard to oxygen consumption and carbon dioxide generation.
2. Compost feedstock may include, but is not limited to: agricultural, food, or industrial residuals, class A biosolids, as defined in the EPA CFR, Title 40, Part 503; yard trimmings, source separated municipal solid waste, or other material designated compostable as defined 1994 PA 451, Part 115 and must be in compliance with all federal and state laws.
3. Compost must be free of plastic, glass, metal and other physical contaminants, substances toxic to plants, over 5% sand, silt, clay, or rock, material by dry weight, as well as viable weed seeds and plant parts capable of reproducing (except airborne weed species).
4. The product must meet all applicable US EPA CFR Title 40, Part 503 Standards for Class A biosolids. The compost moisture content must be such that no visible free water or dust is produced when handling it. The preferred range of moisture content for finished compost is 40-50 percent.

**Table 6: Compost Requirements**

Parameters	Reported as (units of measure)(a)	Range (b)
pH	pH units (TMECC 04.11-A)	6.0 - 8.5
Soluble Salt Concentration ( <i>electrical conductivity</i> )	dS/m (mmhos/cm) (TMECC 04.10-A)	maximum 5
Moisture Content	%, wet weight basis (TMECC 03.09-A)	30 – 60
Organic Matter Content	%, dry weight basis (TMECC 05.07-A)	30 – 65
<b>Medium Grade</b> Particle Size ( <i>aggregate size</i> )	% passing a selected mesh size, dry weight basis (TMECC1 02.02-B)	2-inch 100% 1-inch 90% minimum ¾-inch 65% minimum ¼-inch 50% maximum
<b>Fine Grade</b> Particle Size ( <i>aggregate size</i> )	% passing a selected mesh size, dry weight basis (TMECC1 02.02-B)	¾-inch or smaller 98% minimum
Stability Carbon Dioxide Evolution Rate	mg CO <sub>2</sub> -C per g OM per day (TMECC 05.08-B)	< 8
Maturity Seed Germination	%, compared to control (TMECC 05.05-A)	≥ 80%
Trace Elements/Heavy Metals	ppm (mg/kg) on dry weight basis (TMECC 04.06):	Meets or exceeds US EPA Part 503 EQ Concentration Limits

Arsenic	ppm (mg/kg) on dry weight basis (TMECC 04.06):	< 41
Cadmium	ppm (mg/kg) on dry weight basis (TMECC 04.06):	< 39
Copper	ppm (mg/kg) on dry weight basis (TMECC 04.06):	< 1,500
Lead	ppm (mg/kg) on dry weight basis (TMECC 04.06):	< 300
Mercury	ppm (mg/kg) on dry weight basis (TMECC 04.06):	< 17
Molybdenum	ppm (mg/kg) on dry weight basis (TMECC 04.06):	< 75
Nickel	ppm (mg/kg) on dry weight basis (TMECC 04.06):	< 420
Selenium	ppm (mg/kg) on dry weight basis (TMECC 04.06):	< 100
Zinc	ppm (mg/kg) on dry weight basis (TMECC 04.06):	< 2,800
Pathogens	MPN/4 grams or MPN/gram of total solids (TMECC 07.01-B)	Salmonella < 3 MPN/4 grams of total solids or Fecal Coliform < 1000 MPN/gram of total solids
Inert contamination (man-made)	%, dry weight (TMECC 03.08-A)	< 1.0% (no visible plastic, glass or metal allowed)

- a. Based on Test Methods for the Examination of Composting and Compost (TMECC) standard listed.
- b. In the event that the requirements of any of the referenced standards and specifications conflict with each other, the more stringent requirement shall prevail.

## 2.03 GEOTEXTILES

A. Drainage Geotextile: For use as a soil separator where indicated on the Drawings. Woven needle punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent meeting the requirements below:

1. Apparent opening size: No. 70 to 100 sieve, maximum ASTM D 4751.
2. Minimum Grab Tensile Strength: 200 lb.; ASTM D4632. Minimum Weight: 6 oz./sq. yd.

## 2.04 PLANTING AND SEEDING:

A. Seed the Exfiltrating Bioretention Areas with a wetland seed mix, such as New England Wetland Plants ([www.newp.com](http://www.newp.com), 413-548-800) New England Wetmix, or approved equal. Sow at one pound/2,500 square feet (eighteen pounds (185) lbs. per acre. Seed composition shall be comprised of the following, or approved equal: fox sedge (*Carex vulpinoidea*), blunt broom sedge (*C. scoparia*), lurid sedge (*C. lurida*), hop sedge (*C. lupulina*), fowl bluegrass (*Poa palustris*), beggar ticks (*Bidens frondosa*), green bulrush (*Scirpus atrovirens*), swamp milkweed (*Asclepias*



*incarnata*), fringed sedge (*Carex crinita*), New York ironweed (*Vernonia noveboracensis*), soft rush (*Juncus effusus*), starved/calico aster (*Aster lateriflorus/Symphyotrichum lateriflorum*), blue flag (*Iris versicolor*), American mannagrass (*Glyceria grandis*), square stemmed monkey flower (*Mimulus ringens*), and spotted Joe Pye weed (*Eupatorium maculatum/Eutrochium maculatum*)

Install perennials and grasses as indicated on the Drawings

#### 2.05 TEMPORARY EROSION CONTROL SEED:

- A. Definition: A nurse or cover crop seed used to stabilize the soil surface to help mitigate erosion. Temporary erosion control seed should only be installed when finish grading occurs outside of the allowable planting/seeding period. Temporary erosion control seed may also be incorporated into the permanent seed mix if indicated on Drawings.

### PART 3 – EXECUTION

#### 3.01 OBSERVATION OF THE WORK:

- A. The Engineer shall be informed of the progress of the work so that the work may be observed at key critical stages of construction including completion of excavation and subgrade work, completion of installation of geotextile and double washed stone aggregate (crushed stone and pea gravel) and installation of planting soil. The Engineer shall be afforded a minimum of three (3) working days' notice to schedule visits to the site. Failure of the Engineer to make field observations shall not relieve the Contractor from meeting all the requirements of this specification.

#### 3.02 SUBGRADE SOIL COMPACTION

- A. It is very important to minimize compaction of both the base of the bioretention area and of the side-slopes of the excavation. Operate equipment adjacent to, and not within the footprint of the bioretention areas whenever possible. Equipment operation within the facility should be avoided to prevent soil compaction. If machinery must operate in the facility, use lightweight, low ground contact pressure equipment (no more than 4 psi) and ensure that existing ground infiltration rate has not been reduced as a result.
- B. Use of equipment with narrow tracks or narrow tires, rubber tires with large lugs, or high-pressure tires will cause excessive compaction resulting in reduced infiltration rates and is not acceptable. Improper compaction will significantly contribute to design failure.
- C. No storage of equipment, materials, debris, or any other items shall be allowed in the areas designated as bioretention areas on the Drawings for any length of time.
- D. Excavation or placement of material will not be allowed if any portion of the bioretention area is wet or saturated or has been subjected to more than ½ inch of precipitation within

48 hours prior to the proposed construction activities. The Engineer shall have final authority to determine if wet or saturated conditions exist.

### 3.03 EXCAVATION:

#### A. Excavation:

1. Excavate bottom of bioretention areas to the depth shown on the Drawings. Do not use heavy equipment within any area designated as a bioretention area shown on the Drawings. The existing native subgrade material under all bed areas shall NOT be compacted or subject to excessive construction equipment traffic prior to stone bed placement.
2. Rototill or scarify surface of subgrade to a depth of 6 inches with the teeth of the backhoe or loader bucket, or other suitable device. Bring subgrade to line, grade, and elevations indicated. Fill and lightly regrade any areas damaged by erosion, ponding, or traffic compaction before the placing of the geotextile fabric.

### 3.04 OVERFLOW STRUCTURES:

#### A. Provide storm inlet for Exfiltrating Bioretention Area No.2 as indicated on the Drawings.

#### B. Provide overflow spillway with riprap apron for Exfiltrating Bioretention Area No.1 as indicated on the Drawings.

1. Spillway elevation shall be set as specified on the Drawings.
2. The spillway shall be 3' in length, and 1' in breadth.
3. The spillway shall be lined with a woven geotextile fabric layer and stone riprap to avoid erosion of the spillway. The nonwoven geotextile fabric shall comply with Section 2.03.
4. The spillway shall be followed by a riprap apron at the outlet side. The upstream end of the apron, adjacent to the spillway outlet, shall have a width two (2) times the diameter of the spillway length.

### 3.05 AGGREGATE LAYERS:

#### A. Inspection: The contractor shall notify the engineer a minimum of 7 days prior to aggregate placement work to inspect the preparation of subgrade. The Engineer shall examine the site conditions and provide written approval that design conditions and elevations have been met.

#### B. Prior to aggregate installation the Contractor shall do the following:

1. Verify subgrade preparation, elevations, steepness of side slopes, basin dimensions and placement, overflow structure rim and invert elevations.
  2. Do not install aggregates in overly wet conditions or when wet weather is anticipated within 2 days.
  3. Clean all construction debris and sediment within the placement area.
- C. Immediately after approval of the subgrade, place geotextile along the sides of the excavation. Any accumulation of debris or sediment which has taken place after approval of subgrade shall be removed prior to installation of geotextile or aggregate at no extra cost to the Owner.
- D. Install coarse aggregate (crushed stone and pea gravel) in lifts no greater than 8-inches. Lightly compact each lift with equipment, keeping equipment movement over storage bed subgrades to a minimum. Install aggregate to grades indicated on the Drawings.
- E. Following placement of bed aggregate, the geotextile along the sides of the excavation shall be folded back along all bed edges to protect from sediment washout along bed edges. At least a four-foot edge strip shall be used to protect the filter bed from adjacent bare soil. This edge strip shall remain in place until all bare soils contiguous to beds are stabilized and vegetated. In addition, take any other necessary steps to prevent sediment from washing into beds during site construction.
- F. Make adjustments in placing procedures or equipment to obtain true grades, minimize segregation and degradation to reduce or increase water content, and ensure a satisfactory aggregate base course.

### 3.06 PROTECTION:

- A. Runoff Control: Construction site runoff from disturbed areas shall not be allowed to enter the bioretention basins during construction. Contractor shall use sediment control measures and flow diversions as necessary to prevent construction site runoff from entering the bioretention basins during any of the construction phases until the bioretention system is finalized and stabilized.
- B. Contractor shall not construct bioretention basins until all contributing drainage areas are stabilized to the satisfaction of the Engineer. Do not use the bioretention basins as temporary sediment control facilities during construction. Any sediment that enters the bioretention basins during construction shall be removed by the Contractor at no cost to the Owner. The double washed aggregate used within the bioretention system shall remain free of sediment.

### 3.07 BACKFILLING:

- A. Bioretention Soil: Place Engineered Bioretention Soil in 8" lifts over all areas designated as bioretention areas. Compact soil to a maximum of 75- 85% Proctor density according to ASTM D698. Compaction can be obtained by lightly tamping with bucket as necessary. Test planting soil compaction after placing each lift and at completion using a densitometer or soil- compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D698.
- B. Soil media will be considered defective if it does not pass tests and inspections and should be replaced or restored as directed by Engineer. Place soil with equipment located outside the bioretention excavation. No equipment shall be allowed to drive across installed locations. Any soil observed being driven on may be subject to removal and reinstallation at Contractor's own expense. Contractor shall gain approval from Engineer of installation method prior to beginning installation. Contractor shall provide three (3) working days' notice to Engineer prior to beginning installation.
- C. Final Grading: Grade bioretention soil media to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Stabilize in accordance with applicable local regulatory requirements. Avoid erosion of bioretention areas from overwatering, foot traffic, or machine compaction. Repair any damaged areas and areas that have the potential to cause erosion or have caused erosion at no cost to the Owner.
- D. Topsoil: Install topsoil per seeding specification on side slopes. Do not place topsoil over the bioretention soil.
- E. Temporary Erosion Control Seeding: If final grading occurs outside of the recommended planting period, seed entire bioretention basin with temporary erosion control seed mixture as per seeding specification. Irrigate daily until vegetation germinates.
- F. Erosion Control Geotextile: Install erosion control geotextile on all regraded side slopes surrounding all bioretention areas. Install geotextile immediately after finish grading is complete. Install geotextile per manufacturer's instructions.

### 3.08 PLANTING AND SEEDING:

- A. Seed as per Drawings between April 15 and October 15. Seed mix may be applied by hydroseeding or by hand.
- B. Install plants per numbers and species indicated on Drawings between June 1 and September 15. Protect all slopes and bottom surfaces of bioretention areas from erosion and rutting until planting can be completed.
- C. To install plants, excavate with vertical sides and in accordance with following requirements:

- D. Plant herbaceous plant stock in pits greater in width than diameter of root ball and as necessary to properly set plant at finished grade.
- E. Set plants in center of pits, plumb and straight and at level that top of root ball is 1 inch lower than surrounding finished grade after settlement.
- F. Compact topsoil mixture thoroughly around base of root ball to fill all voids, when plant material is set. Add slow-release fertilizer in accordance with manufacturer's recommendations and backfill tree and shrub/herb pits halfway with planting soil mixture and thoroughly puddle before backfilling tree or shrub/herb pit to remove any air pockets.
- G. Immediately after plant pit is backfilled, form a shallow saucer slightly larger than pit with ridge of soil to facilitate and contain watering.
- H. Seeding and planting shall not occur when the ground is frozen, snow covered, inundated, or otherwise unsuitable. All seeds shall be watered within the same working day on which they are sown. Seeded areas and installed plants shall be watered at a minimum of twice per week for three weeks immediately following sowing/planting, adjusted as local rainfall conditions allow, to allow vegetation to successfully establish, unless otherwise directed by the Engineer.
- I. Install a 1" shredded wood mulch in between the plant plugs. Woodchips should be shredded wood, free of chemicals and dies.
- J. Seed and plants shall be protected from herbivores and other vectors which threaten the establishment of the vegetation

### 3.09 TOLERANCES

- A. Comply with Quality Requirements.
- B. Finish Grades: plus or minus 1/2-inch.
- C. Overflow Riser Elevation: plus or minus 1/2-inch.

### 3.11 PROTECTION OF INSTALLED WORK

- A. Prohibit construction traffic over topsoil.

END OF SECTION

## SECTION 02820

### CHAIN LINK FENCES AND GATES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

###### A. Section includes:

1. Chain link fence framework, fabric, and accessories.
2. Excavation for post bases.
3. Manual gates and related hardware.

###### B. Design Criteria:

1. 6 ft. high fence as indicated with top rail, and bottom tension wire.

##### 1.02 REFERENCES:

###### A. American Association of State Highway and Transportation Officials (AASHTO):

1. M181: Standard Specification for Chain-Link Fence.

###### B. ASTM International (ASTM):

1. A53/A53M: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. A392: Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
3. F567: Standard Practice for Installation of Chain-Link Fence.
4. F654: Standard Specification for Residential Chain Link Fence Gates.
5. F900: Standard Specification for Industrial and Commercial Swing Gates.
6. F1184: Standard Specification for Industrial and Commercial Horizontal Slide Gates.

###### C. Chain Link Fence Manufacturers Institute (CLFMI):

1. PM 2445: Chain Link Fence Manufacturers Institute Product Manual.

1.03 SUBMITTALS:

- A. Submit the following in accordance with Section 01300.
  - 1. Submit Manufacturer's specifications, drawings, details and fence layout with appurtenances.
  - 2. Submit two samples of fencing materials. Mark or tag each sample and submit 30 days prior to erection of fence.
  - 3. Submit certified test reports with results of tests for fence finish.
  - 4. Submit shop drawings, samples and certificates simultaneously as one complete package.

1.04 SPARE PARTS:

- A. Comply with the requirements specified in Section 01600.

1.05 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01400.
- B. Sustainability Standards Certifications.

1.06 DELIVERY STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01610.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION:

- A. General. Entire chain link fence and gate system shall be:
  - 1. Vinyl coated galvanized steel. The color of the vinyl coating shall be black as selected from manufacturer's samples by the Engineer. Entire chain link fence (pipe/tube and fittings) and gate system shall be fuse bonded heavy mil vinyl coated galvanized steel.
- B. Conform to CLFMI PM 2445 for the specified use.
- C. Provide chain link fence in accordance with AASHTO M181; ASTM F-668, M-181 Class 2B.
- D. Provide framework, fabric, accessories and gates in accordance with ASTM F567.
- E. Fence heights as indicated with top rail, and bottom tension wire
- F. Steel pipe dimensions and weights: SS-40. Dimensions specified are nominal pipe sizes.

- G. Dimensions and weight tolerances: Plus or minus 5%.
- H. Gates:
  - 1. Industrial:
    - a. Provide swing gates in accordance with ASTM F900.
    - b. Provide horizontal slide gates in accordance with ASTM F1184.
- 2.02 FENCE FABRIC:
  - A. Colored PVC-coated steel fabric with galvanized and factory-painted steel posts, hardware, and fittings.
  - B. Fabric woven in 2-inch mesh from PVC coated wire in 6 feet height. PVC coating thermally fused and bonded over galvanized plastic primed commercial quality steel wire with minimum coating thickness of 7 mils. Coated wire 9-gage with minimum breaking strength of 1,200 lbs. Color to be selected to match total fence system (0.40 oz. of zinc per sq. ft. of surface).
- 2.03 TENSION WIRE:
  - A. Color matched PVC coated No. 6 gage outside diameter, zinc coated coil spring steel wire having 0.40 oz of zinc coating per sq. ft. of wire surface.
- 2.04 TIE WIRES:
  - A. Tie wires, for fastening fence fabric to line posts and rails, not less than 9 gage (outside diameter) color matched PVC coated galvanized steel wire.
- 2.05 LINE POSTS:
  - A. 2-3/8 inches outside diameter steel pipe weighing not less than 3.65 lb/ft, or 1-7/8 inch high carbon steel H-beams weighing not less than 2.70 lb/ft.
- 2.06 END, CORNER, AND PULL POSTS:
  - A. 2-7/8 inch outside diameter steel pipe weighing not less than 5.79 lb/ft , or 2-1/2 inch square steel tube weighing not less than 5.14 lb/ft, or 3-1/2 inch by 3-1/2 inch roll-formed, steel corner section weighing not less than 5.14 lb/ft .
- 2.07 GATE POSTS:
  - A. 2-7/8 inches outside diameter steel pipe and gate posts, for gate leaves up to and including 6 feet wide, weighing not less than 5.79 lb. per ft., or 2-1/2 inch square steel tube weighing not less than 5.14 lb. per ft., or 3-1/2 inch by 3-1/2 inch roll-formed, steel corner section weighing not less than 5.14 lb/ft.



- B. 4 inch outside diameter steel pipe, gate posts for gate leaves over 6 feet wide and up to and including 13 feet wide and weighing not less than 9.10 lb/ft.
  - C. 6-5/8 inch outside diameter steel pipe, gate posts for gate leaves over 13 feet wide and up to and including 18 feet wide and weighing not less than 18.97 lb/ft.
- 2.08 RAILINGS:
- A. 1-5/8 inch outside diameter steel pipe with minimum weight of 2.27 lb/ft or 1-5/8 inch by 1-1/4 inch, 14-gage roll-form section, for top railing and railings for top middle and bottom braces between terminal posts and adjacent line posts.
- 2.09 TRUSS:
- A. 3/8 inch diameter steel rod diagonal truss braces between terminal and adjacent line posts and for gate framework.
- 2.10 FITTINGS:
- A. Heavy-duty malleable iron or pressed steel fittings of suitable size to produce strong construction.
- 2.11 STRETCHER BARS:
- A. Flat bars with minimum cross section dimensions of 1/4-inch by 3/4 inch, full height of fabric, secured with bar bands of minimum 11-gage sheet steel, spaced approximately 15 inches on centers and bolted with 3/8-inch diameter bolts, for attaching fabric to terminal posts.
- 2.12 GATE LEAF FRAMEWORK:
- A. 1-7/8 inch outside diameter steel pipe weighing 2.72 lb/ft, minimum.
- 2.13 GATE HINGES:
- A. Heavy pattern of adequate strength for gate size, with large bearing surfaces for clamping or bolting in position.
- 2.14 LATCH:
- A. Gates with suitable latch, accessible from both sides and with provision for padlocking.
- 2.15 GATE PADLOCKS:
- A. Manufacturers:
    1. Eaton Corp. Lock & Hardware Div., Yale Marketing Dept., Charlotte, NC.
    2. P&F Corbin, Div. of Emhart Corp., Berlin, CT.

3. Best Universal Lock Co., Inc., Indianapolis, IN. Solid brass cases hardened steel shackles, removable core cylinders, and galvanized steel chains attached to shackle by a clevis.

2.16 CONCRETE FOOTINGS:

- A. Section 03300 Cast-In-Place Concrete, Class A concrete.

2.17 GROUT:

- A. One part Portland cement and three parts of clean, sharp, well-graded sand with minimum water for proper workability for posts set in solid rock.

2.18 ACCESSORIES:

- A. Steel pipe dimensions and weights: ASTM A53/A53M, Schedule 40. Dimensions specified are nominal pipe sizes.
- B. Dimensions and weight tolerances: Plus or minus 5 percent.
- C. Zinc Coating: Minimum 2.0 ounces per square foot.
- D. Provide posts with tops of same material, and designed to fit securely over post and carry top rail. Carry apron around outside of post at base of top fitting.
- E. Ferrous metal fittings, posts, fence, gate framework, and accessories galvanized with heavy coating of 2.0 oz/ft<sup>2</sup> pure zinc spelter per square foot or surface area to be coated. Use hot-dip process. Thinner zinc coatings, electro-galvanizing, zinc paint or cold galvanizing compounds not used as substitute for hot-dipped galvanized finish not acceptable.
- F. Fabricate and weld before hot-dip galvanizing. Weld conforming to American Welding Society standards.
- G. Hot-dip galvanized gate frame, after welding, if bolted or riveted corner fittings not used.
- H. Galvanize fittings, posts, fence and gate framework, and accessories, then epoxy phenolic primed and top coated with matching PVC, using thermal bond process.
- I. Single and double leaf swing gates with center bolt, center stop, and automatic backstops.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Examine conditions under which fence and gates are to be installed. Notify Engineer, in writing, of improper conditions of work.

- B. Do not proceed with work until unsatisfactory conditions have been corrected.
- C. Verify measurements at site.
- D. Check location of underground work to make sure fence footings clear utilities and drainage work.
- E. Do not install fence until final grading is complete and finish elevations are established.
- F. Do not drive equipment on areas to be landscaped, except as accepted by Engineer. Areas not accessible from roads shall be protected with heavy wood planking. Remove barricades and protection at completion of project. Repair damaged landscape surfaces.

### 3.02 INSTALLATION:

#### A. Footings:

1. Vertical sides to minimize up-lift. Dispose of excavated material in accordance with Section 01710 Cleaning Up.
2. Rod and compact concrete around posts. Slope top of footings above level of adjacent grade, and trowel finish.
3. Size:
  - a. 6 inches minimum diameter, plus outside dimension of post.
  - b. Set corner, end, pull, and gate posts 42 inches into concrete.
  - c. Set line posts set 36 inches into concrete.
  - d. Total depth of concrete 6 inches greater than required for post embedment.
4. Time of Set: 48 hours before rails are erected or before fabric is applied or stretched.

#### B. Framing:

1. Install line posts not more than 10 feet apart.
2. Install pull posts not more than 600 feet apart where a straight run of fence exceeds 600 feet and where fence line changes direction by more than 15 degrees but less than 30 degrees.
3. Install corner posts where the fence line changes direction by more than 30 degrees.
4. Set posts in concrete footings, plumb and true to line.
5. Brace and truss end, pull, corner, and gate posts to adjacent line posts. Provide brace to match top rail spaced midway between top rail and tension wire and extending to

adjacent line posts. Provide brace to match top rail spaced midway between top rail and tension wire and extending to adjacent line post. Truss diagonally with 5/16-inch diameter tension rod with turnbuckle.

6. Fasten top rail to end, pull, gate and corner posts. Pass top rail through fittings of line posts.
7. Provide expansion and contraction joints in top rail for each 100 linear feet of fence.
8. Fasten bottom tension wire to end, pull, gate, corner, and line posts.
9. Maximum area of unbraced fence shall not exceed 1,500 square feet.
10. Use galvanized sleeve and grout posts or install with suitable galvanized flange casings and galvanized anchor bolts as accepted by Engineer.
11. When rock is encountered, set posts into rock a minimum depth of 12 inches for line posts and 18 inches for terminal posts. If solid ledge is encountered without overburden of soil. Provide post holes at least 1 inch greater in diameter than post, fill post holes with concrete work post into hole taking care not to cause voids, remove excess concrete and crown remainder at top to shed water. Where solid rock is covered by overburden, do not exceed total setting depth required for setting in earth, grout posts into rock as described.

C. Fabric:

1. Place fabric on outside of posts and stretch to avoid bulging or buckling.
2. Fasten at line posts, top rail, and bottom tension wire with aluminum or zinc PVC coated ties. Space ties not more than 15 inches apart on line posts and not more than 24 inches apart on rail and tension wire.
3. Fasten at terminal posts at intervals not exceeding 15 inches using flat or beveled galvanized steel bands with 5/16-inch x 1-1/4 inch galvanized carriage bolts and nuts.
4. Make tie connections on interior side of fence.
5. Provide steel angle metal closures where finished ground surface is more than two inches below bottom tension wire. Bolt steel angle to fence posts, and install reinforcing rods and bracing members as accepted. Install rods of accepted length vertically. Where drainage ditches cross fence line, provide concrete ditch lining and steel reinforcing bar grill.
6. Install gates plumb, level, and secure for full width of opening and hardware adjusted for smooth operation.

7. Electrical Ground where a power line carrying more than 600 volts passes over fence, install ground rod at nearest point directly below each point of crossing.

3.03 REPAIR:

- A. Remove and replace fencing which is improperly located or is not true to line, grade and plumb within tolerances as indicated.
- B. Repair damaged vinyl-coated components as recommended by manufacturer.

3.04 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02850

PRE-FABRICATED BRIDGE

PART 1 - GENERAL

1.01 GENERAL:

- A. Design, furnish and install the preengineered, prefinished, clear span bridge of welded construction on concrete foundations as indicated and as specified.
- B. Bridge Configuration:

Type	Aluminum Truss
Span*	60 ft
Width	6'-2"
Height	4'-6"

\* Contractor to coordinate bridge span with actual foundation as constructed.

- C. The preengineered bridge components shall be provided by and be the product of a single manufacturer.
- D. Contractor shall make modifications to the foundations as may be required for the specific bridge provided. All modifications are subject to the approval of the Engineer.

1.02 REFERENCES:

- A. American Aluminum Association "Aluminum Construction Manual".
- B. Aluminum Association Standard Anodic Finishes (AASAF).
- C. American Welding Society AWS:
  - 1. AWS D1.1: Structural Welding Code – Aluminum
  - 2. Code for Welding in Bridge Construction
- D. ASTM International (ASTM):
  - 1. B 26: Specification for Aluminum-Alloy Sand Castings.
  - 2. B 209: Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 3. B 211: Specification for Aluminum-Alloy Bars, Rods, Profiles and Tubes.

4. B 221: Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
  5. B241: Specification for Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
  6. B 247: Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings and Rolled Ring Forgings.
  7. B308: Specification for Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.
  8. B 429: Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
- E. International Code Council (ICC):
1. International Building Code
- F. Metal Bridge Manufacturers' Association:
1. Recommended Design Practices Manual
- G. Occupational Safety and Health Administration (OSHA)
1. Safety and Health Standards for the Construction Industry, 29 CFR 1926 Subpart R Safety Standards for Steel Erection.
- 1.03 SUBMITTALS:
- A. Shop Drawings: Submit the following in conformance with Section 01300:
1. Shop and erection drawings for all structural aluminum to be approved by Engineer prior to fabrication.
  2. Complete and checked shop and erection drawings for all aluminum components. Show materials, anchor rods, member and connection details, piece marks, appurtenances, shop and field bolting and welding in conformance with Aluminum Construction Manual, and AWS Structural Welding Code.
  3. Submit the welding procedure for each type of weld prior to welding.
  4. Qualification test reports bearing witness certification by an independent testing laboratory for each welder, welding operator and tacker to be employed in the work.
- B. Drawings shall bear the seal and signature of a structural engineer licensed in the state where the bridge is to be installed.

- C. Drawings shall include as minimum information:
1. Span, depth, camber, weight and spacing of bridge elements.
  2. Bridge component interface connection bolts and welds.
  3. Gravity, wind and seismic design loadings, including concentrated loads and their points of application.
  4. Vertical and horizontal support reactions under the various design loading combinations.
  5. Member material specifications, sizes and gauges.
  6. Bridging member sizes, connections and locations.
- D. A certificate of design shall be submitted to the Engineer prior to the production of the pre-engineered bridge. The certificate of design shall be signed and sealed by a Professional Structural Engineer employed by the bridge manufacturer and holding current registration in the state where the bridge is to be installed.

#### 1.04 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. The bridge manufacturer shall have been in the business of design and fabrication of bridges for a minimum of five years and provide a list of ten successful bridge projects, of similar construction, each of which has been in service at least three years. Provide the location, bridge size, owner, and a contact for reference for each project.
- C. The manufacturer shall provide a warranty against defects in material, workmanship and finish for a period of ten years.
- D. Design Responsibility:
1. Submit the Certificate of Design to Engineer prior to manufacture of bridge components.
  2. Provide the following support data along with Certificate of Design:
    - a. Codes and specifications to which structural design conforms.
    - b. Certification, signed and sealed by a Professional Structural Engineer employed by the bridge manufacturer and holding current registration in the state where the bridge is to be installed stating that all members, elements and connections are designed to withstand the required loads and forces.



- E. Welding Qualification and Certification:
  - 1. Furnish written welding procedure for all welds in conformance with the AWS D 1.1.
  - 2. Each welder, welding operator and tack welder shall be certified by test to perform type of work required in conformance with AWS D 1.1.
  - 3. If a welder or welding operator has not been engaged in a specific welding process for a period of six months or more, that individual shall be deemed unqualified and shall not perform work on the project until the individual has been qualified again by testing in conformance with AWS D 1.1.
  
- F. Bridge shall be inspected by a Certified Weld Inspector that is qualified under the AWS QC-1 program in accordance with the special inspections requirements defined in Section 01065 – Special Tests and Inspections. This inspection shall include as a minimum requirement the following: review of shop drawings, weld procedures, welder qualifications and weld testing reports, visual inspection of welds and verification of overall dimensions and geometry of the bridge. A report shall be produced indicating the above items were reviewed. The report shall be signed by the CWI, signifying compliance with AWS D1.1 codes.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Provide in conformance with Section 01610, “Delivery, Storage, and Handling” and as specified.
- B. Transport, handle and store materials to protect from weather, rusting, corrosion or other damage.
- C. Store bridge components off the ground on supports.
- D. Cover and protect from snow, rain and ground splatter.
- E. Use nylon slings or padded cables for handling material. Do not drop or drag material.

PART 2 – PRODUCTS

2.01 DESIGN REQUIREMENTS:

- A. The design of the bridge shall be in accordance with the “Aluminum Construction Manual”; latest edition.

- B. Loading requirements shall be in accordance with International Building Code (IBC), the Ninth Edition Massachusetts Amendments to the 2015 International Building Code. and as indicated on the drawings and in these specifications.
- C. Design Criteria: In addition to bridge dead load, the bridge shall be designed for the following:
  - 1. Uniform Live Load: 90 pounds per square foot of deck area.
  - 2. Moving Concentrated Live Load: 2,000 pounds per foot of bridge width.
  - 3. Wind Load: Bridge shall be designed for a minimum ultimate design wind speed of 136 mph in accordance with the 780 CMR, Ninth Edition Massachusetts Amendments to the 2015 International Building Code. The wind shall be calculated on the entire vertical surface of the bridge as if fully enclosed.
  - 4. Seismic: Bridge shall be designed for seismic loads developed using the seismic parameters indicated on Sheet 00 S-001.
  - 5. Temperature: Bridge shall be designed to accommodate a temperature differential of 120 degrees Fahrenheit. Slip pads of UHMW polyethylene shall be placed between the smooth surface of this setting plate and the smooth bearing plate of the bridge. At least 1" clearance shall be provided between the bridge and concrete abutments.
  - 6. Camber: Bridge shall have vertical camber dimension at midspan equal to the full dead load deflection.
  - 7. Deflection: The vertical deflection of the bridge due to pedestrian live load shall not exceed 1/360 of the span length. The horizontal deflection due to lateral wind load shall not exceed 1/500 of the span length.

## 2.02 ALUMINUM:

- A. Plates, rolled or extruded shapes, sheets or castings conforming (unless otherwise permitted or indicated) to the following Aluminum Association alloy and temper designations:
  - 1. Rolled structural sheets and plates: ASTM B209-6061-T6
  - 2. Rolled Structural Shapes: ASTM B308 -6061
  - 3. Extruded structural shapes, bars and tubes: ASTM B221 Alloy 6061-T6
  - 4. Extruded structural tube or pipe: ASTM B429 Alloy 6061 T-6

5. Gratings (bearing bars): ASTM B211-6061-T6 (crimp bars): ASTM B211-6061-T5.
6. Castings: ASTM B26-214
7. Sheets: ASTM B209-Alclad 3003-H14 and 3003
8. Bolts and nuts: Type 316 stainless steel
9. Pipe railings: ASTM B241-6061-T6
10. Handrail posts: ASTM B241-6061-T6
11. Die and hand forgings: ASTM B247 Alloy 6061-T6

#### 2.03 WELDING:

- A. Class 5356 electrodes.
- B. Welding filler rods: ASTM B241-6061-T6.
- C. Provide equipment for welding, electrodes, welding wire and fluxes capable of producing indicated welds when used by certified welders under AWS welding procedures. Provide welding materials that comply with requirements of AWS Structural Welding Code.

#### 2.04 FASTENERS:

- A. Provide Type 316 stainless steel stud bolts and nuts with heavy aluminum washer for fastening of aluminum material.
- B. Draw up bolts or nuts tight, and deform threads where possible. Use bolts of lengths required so that bolts do not project more than 1/4-inch beyond face of nut. Do not use washers unless specified. Provide hexagonal head bolts with hexagonal nuts.
- C. Provide holes required for the connection of adjacent or adjoining work wherever noted on drawings. Locate holes for bolting equipment to supports to a tolerance of + 1/16-inch of exact dimensions indicated.

#### 2.05 FRAMING:

- A. Structural members shall have a minimum thickness of material of at least 3/16".
- B. Welding materials shall be in strict accordance with the American Welding Society (AWS). Structural welding code, D1.1.
- C. Structural elements used in the bridge shall be identified by heat number of the member used. Specific mill test reports and individual welder certificates shall

be tracked and kept on file to be provided at the request of the Owner or Engineer.

- D. Welding shall utilize 5356 series electrodes.
  - E. The connection of bridge end post to top chord shall be a mitered welded joint with the exposed welds ground smooth.
- 2.06 RAILINGS & ACCESSORIES:
- A. Railings shall have a smooth inside surface with no protrusions or depressions. All ends of angles and tubes shall be closed and ground smooth.
  - B. Safety Rails: Continuous rails shall be located on the inside of the trusses. The rails shall be horizontal safety rails with a top rail locate 42” from the floor deck and the mid-height rail 21” from the deck.
  - C. Toe Plate: A 4" high toe plate shall be located at the floor deck.

### PART 3 - EXECUTION

#### 3.01 DELIVERY AND ERECTION:

- A. Bridge shall be delivered by truck to a location nearest to the site accessible by roads. Hauling permits and freight charges are the responsibility of the manufacturer.
- B. The manufacturer will notify the Contractor in advance of the expected arrival at the site.
- C. The manufacturer will advise the Contractor of the actual lifting weights, attachment points and all other information necessary to install the bridge.
- D. The Contractor shall install the anchor bolts in accordance with the bridge manufacturer's approved shop drawing layout. Provide anchor bolts and anchors with templates for correct placement into concrete or other supporting materials.
- E. The bridge shall be erected on the prepared concrete foundation as indicated.
- F. The bridge shall be erected complete with all components and accessories in strict accordance with the bridge manufacturer's printed instructions and approved shop drawings.
- G. Align and adjust members forming parts of a complete assembly before permanent fastening.

- H. Report errors in shop fabrication or deformation resulting from handling or transportation immediately to Engineer. Replace and remove from job site incorrectly fabricated or deformed material at no additional cost to the Owner.
  - I. Do not enlarge holes or damage metal in the vicinity of holes with drift pins during assembly.
  - J. Enlarge holes to admit bolts for connections only if approved in writing by Engineer. Make enlargements only by drilling.
- 3.02 WELDING:
- A. Workmanship and techniques for welded construction to conform to requirements of AWS Structural Welding Code and as indicated or specified.
  - B. No field welding permitted unless indicated on Engineer approved fabrication shop drawings.
- 3.03 CONTRACT CLOSEOUT:
- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 02900

### PLANTING AND SEEDING

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION

A. The Work of this Section includes but is not limited to:

1. Fine grading of all planted and seeded areas,
2. Installing deciduous and evergreen trees and shrubs as shown on the contract drawings
3. Topsoil Re-handled and Spread is the Work of SECTION 02701 – EXFILTRATING BIORETENTION AREAS. Requirements for materials, testing, amendments, mixing and use of acceptable Planting Soil is described in this Section.
4. Amending stockpiled or imported loam with soil additives to be spread as planting soil,
5. Drainage test pits for all tree plantings,
6. Fertilizing and pruning trees and shrubs,
7. Mulching planting beds and tree saucers,
8. Maintaining all plantings through 2-year guarantee period,
9. Fine grading and installing tested and approved planting soil in seeded and planted areas to required depths,
10. Seeding including seeding of all disturbed areas at Owner's direction,
11. Maintenance, reseeding, guarantee, and protection of seeded areas,
12. Locating and pre-tagging plant materials specified at nurseries at least two months before construction. Contractor shall also provide full compensation (including time and expenses) for Owner to tag trees at nurseries outside of Massachusetts and for tagging visits to Massachusetts's nurseries where plant material does not meet specifications as determined by Owner.

##### 1.02 RELATED WORK

- A. Section 02210 – Earth Excavation, Backfill, Fill and Grading
- B. Section 02910 – Planting Soils

C. Section 02920 – Site Improvements

1.03 REFERENCES and STANDARDS

A. Comply with applicable requirements of:

1. Commonwealth of Massachusetts, Standard Specifications for Highways and Bridges, Department of Public Works, latest edition, Boston, Massachusetts.
2. ASTM: American Society of Testing Materials.
3. AAN: American Association of Nurserymen.
4. ISA: International Society of Arboriculture.
5. ANSI: American National Standards Institute.
6. AOAC: Association of Official Agricultural Chemists.
7. USDA: United States Department of Agriculture.
8. MA Mass DOT (Massachusetts Department of Transportation) formerly Massachusetts Highway Department (MHD) Standard Specifications (for Highways and Bridges), 1988 edition, including all addenda.
9. UMTC: University of Massachusetts Transportation Center, "Manufactured Loam using Compost Material - Phase 1: Feasibility", October 1966 or latest update.
10. MassDEP: Department of Environmental Protection, Commonwealth of Massachusetts.
11. USEPA: United States Environmental Protection Agency

1.04 DEFINITIONS

- A. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.
- B. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.
- C. Finish Grade: Elevation of finished surface of planting soil.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

## 1.05 SUBMITTALS

- A. Do not order or deliver materials until required samples, certifications, manufacturers' literature, and test results have been reviewed by the Owner. Delivered materials shall closely match the samples, as judged by the Owner. If any deviations from specified materials are proposed, submit written request explaining differences and reasons for request. Submit three (3) copies of each document required, or as directed by the Owner.
- B. Soil Additives and amendments: Product or testing certificates signed by manufacturers certifying that their products comply with specified requirements:
  - 1. Manufacturers' certified analysis for all products specified.
  - 2. Analysis for other amendments, such as organic compost, by the University of Massachusetts Agricultural Extension Service or other approved testing laboratory, made according to methods established by the AOAC, where applicable, and as required in this Specification.
  - 3. Sieve and salt analysis of sand proposed as a planting soil amendment or component.
- C. Chemicals and Pesticides: Manufacturers' literature.
- D. Plant Materials: Labels and nursery certificates substantiating that plants, trees and shrubs materials comply with specified requirements set by AAN and others and were grown within USDA hardiness zones specified.
- E. Tagging and planting schedule: Proposed dates for tagging plants at nurseries, and for planting each type of planting, with consideration for fall-hazard species, work coordination, etc.
- F. Seed Mix: Manufacturer's Certificate of Compliance with the specifications for type of seed required. These certificates shall include the guaranteed percentage of purity, weed content and germination of the seed, and the net weight and date of shipment and pounds per acre sowing rate. No seed may be sown until the Contractor has submitted the certificates.
- G. Organic Material: If organic matter is proposed as a soil amendment and is manufactured from biosolids, a letter certifying source and composition of organic material proposed for use as a soil amendment indicating compliance with UMTC "Article 5.4 Standard Compost Specifications for Massachusetts" and that the compost is mature, and if manufactured from biosolids and wood bulking agents, has been aged a minimum of one (1) year, is required for review by Owner. Refer also to requirements included in Article 2.3 Soil Additives for Planting Soil. Letter shall also give description of product and recommendations for use as a planting soil component or amendment.
- H. Samples: Submit samples of:



1. Fertilizer: one (1) sample packet of planting fertilizer; one-pound sample of slow-release pelletized fertilizer; certificate showing composition and analysis; purchasing receipt showing the total quantity purchased for the Project.
2. Organic Material: Two-pound sample and source for review.
3. Bark Mulch: Two-pound sample and source for review.
4. Fertilizer: Submit certificates of analysis for lawn fertilizer.
5. Chemicals (lawn and tree herbicides, fungicides, and pesticides): Manufacturer's literature and analysis.
6. Maintenance: Provide watering and fertilizing schedule to the Client for approval.
7. Maintenance Instructions: Submit recommended procedures for routine year-round maintenance of plantings. Instructions shall be submitted as a condition of Substantial Completion of the Project.

#### 1.06 EXAMINATION OF EXISTING CONDITIONS

- A. Inspect all areas to be planted before starting Work and report any defect, such as incorrect grading, incorrect subgrade elevations, or drainage problems, etc., to the Owner and Engineer prior to beginning Work. Commencement of Work shall indicate acceptance of filled subgrade areas to be planted, and Contractor shall assume responsibility for Work. Inspect areas to be fine graded and seeded before starting work.
- B. The Contractor shall be solely responsible for judging the full extent of Work requirements involved, including but not limited to the potential need for storing and maintaining plants temporarily and re-handling plants prior to final installation.
- C. Determine location of above-grade and underground utilities and perform Work in a manner, which will avoid damage. Review the locations of utilities with the Owner before proceeding. Contact all relevant utility companies, public or private, prior to beginning work; contact DIG SAFE 1-888-344-7233 (serves five N. E. states). Report any conflicts to the Owner and the Client in writing before excavating. Hand-excavate as required. Maintain grade stakes until removal is approved by the Owner.
- D. Coordinate installation of planting materials to assure installation during normal planting seasons for each type of plant material required and as specified in planting schedule. Species designated as "Fall Hazard" by Nursery shall be planted in the Spring, indeterminate of other site and project schedules.
- E. Coordinate planting Work with other Work of this contract being performed on site, or work being performed by others.
- F. Coordinate maintenance of landscape areas installed at different times. Protect completed Work as sequence of planting proceeds.

## 1.07 PLANT LIST

1. Within 30 days of receipt of Contract, submit plant list for review by Owner which includes:
  - a. plant materials proposed for project and corresponding nursery source where plants are to be selected.
  - b. written documentation indicating nursery(s) have available the plants in the species, quantity and size(s) shown on Drawings.
  - c. for plants indicating names of plants in accordance with American Joint Committee on Horticultural Nomenclature.
2. Schedule for review at nursery source by Owner with Contractor present.
3. Substitutions: plant list shall indicate unavailable materials and document a thorough search for materials. For unavailable materials list sources contacted with telephone number, date, and person's name at source.

## 1.08 SCHEDULE

1. Submit planting schedule for approval.

## 1.09 QUALITY ASSURANCE

- A. Contractor shall have at least five (5) years of experience in Landscape Work similar in materials, design, and extent to that indicated for this project and with a record of successful landscape establishment. Installer shall maintain an experienced supervisor on the project site during all times that landscape construction is in progress. Provide written qualification data for firms and persons to be responsible for Work, to demonstrate their capabilities and experience. Include lists of completed projects, with project names, addresses, phone numbers, and names and address of designers and clients.
- B. Contractor shall conduct pre-landscape construction conference at Project site as directed by the Owner, to review landscape construction procedures, site conditions, and submittal requirements required in the Work of this Section, especially the requirements for Planting Soil, before any products are submitted for review and approval, or landscape construction commences.
- C. To extent possible, provide each plant material species or variety from single source.
- D. If required, only herbicides, pre-emergents, fertilizers, fungicides, and pesticides reviewed and approved by the Owner and permitted for use shall be used and applied by appropriately licensed personnel according to manufacturer's recommendations.

- E. Select compatible products where options are provided, provide each material from a single source and only with review and approval of college and Owner.

#### 1.10 SELECTION AND INSPECTION OF PLANTS

- A. Plants shall be selected by Owner at place of growth for conformity to specification requirements as to quality, size, and variety. Such approval shall not impair right of inspection and rejection upon delivery at site or during progress of work. Cost of replacement shall be borne by Contractor.
- B. Notify Owner in writing upon selection of planting subcontractor. State name, address, telephone number and supervisor for planting subcontractor.
- C. Schedule selection and tagging of nursery stock so Owner can tag trees and representative shrubs for project at place of growth. Advise Owner of schedule a minimum of one month (30-day minimum) in advance of selection/tagging dates so Owner can make proper travel arrangements. If Owner must make additional trips to select/tag plants if inadequate, insufficient, or unacceptable plant material was available at the inspection location, then additional travel expenses to be back charged to Contractor.
- D. Notify Owner a minimum of five business days prior to each shipment of proposed arrival of plant material on site.
- E. Layout tree locations, bed outlines and individual planting on site for inspection by Owner prior to planting. Arrange for adequate manpower and equipment on site at time of plant material inspection and installation to provide complete staked layout and to unload, open and handle plant material during inspection.
- F. Plants selected and affixed with an identification number tag by the Owner must arrive on site with the same tag attached for confirmation. Plants without the identification number tag will not be accepted for planting.

#### 1.11 DELIVERY, STORAGE AND HANDLING OF FERTILIZER AND MULCH

- A. Packing and Shipping: deliver materials in unopened containers bearing manufacturer's name and guaranteed statement of analysis. Transport materials without damage. Protect finishes from abrasion, dirt, oils, grease, and chemicals. Pack materials to protect from weather.
- B. Acceptance at Site: verify in writing that delivered materials conform to specifications and approved submittals.
- C. Storage and Protection:
  - 1. Materials shall be uniform in composition, dry and free flowing. Store materials in dry place, on pallets, off ground; protect from sun. Store materials in a manner, which does not diminish their usability and effectiveness.

2. Protect materials from theft, damage, weather, dirt, oils, grease, and construction.

#### 1.12 DELIVERY, STORAGE AND HANDLING OF PLANTS

- A. Plants during shipping and delivery and plants requiring storage on site shall be properly wrapped and covered to prevent wind drying and desiccation of branches, leaves, or buds. Plant balls shall be firmly bound, unbroken, and reasonably moist to indicate watering prior to delivery and during storage. Trees shall be free from fresh scars and damage in handling. Root masses of container grown plants shall be kept moist and containers screened from direct sun.
- B. Wrap tree trunks at nursery prior to shipping then unwrap for inspection by Owner \ prior to installation. Report damaged plants to Owner.
- C. Apply antidessicant to plants before digging at nursery and/or as directed by Owner once plants are delivered to site.

#### 1.13 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: do not deliver or handle soils when dry, wet, or frozen.
  1. Field Test
    - a. Form soil in palm of hand, if soil retains shape and crumbles upon touching, the soil may be worked.
    - b. If the soil will not retain shape it is too dry and should not be worked.
    - c. If the soil retains shape and will not crumble, it is too wet and should not be worked.
  - B. Planting Season: planting seasons shall be those indicated below. Plants planted out-of-season shall receive special attention as directed. Out-of-season planting and or transplanting shall be at Contractor's risk and expense. No planting shall be done in frozen or muddy ground or when snow covers ground, or soil is otherwise in an unsatisfactory condition for planting.

#### 1.14 SEQUENCING AND SCHEDULING

- A. Plant after acceptance of fine grading.
- B. Trees to be installed first.

#### 1.15 SUBSTANTIAL COMPLETION

A. See Section 02930 - Landscape Maintenance.

#### 1.16 MAINTENANCE

A. See Section 02930 - Landscape Maintenance.

#### 1.17 ACCEPTANCE

A. See Section 02930 - Landscape Maintenance.

#### 1.18 GUARANTY

A. Start of Guaranty Period: when Owner issues Letter of Preliminary Acceptance.

B. Term: one year for trees

one year for shrubs.

C. Requirements: plant material to be alive and in healthy, vigorous condition.

1. Quarterly reviews will be made with Contractor and Owner during guaranty period. Reviews will assess condition of installed plant materials.

2. Replace plants that are dead or, as determined by Owner, are in an unhealthy or unsightly condition, and have lost their natural shape due to dead branches, or other causes.

D. End of Guaranty Period: when Owner issues letter of Final Acceptance, one year from date of substantial completion; two years from date of substantial completion for trees.

#### 1.19 FINAL ACCEPTANCE

A. Owner reviews work and finds it complete and in accordance with Drawings and Specifications.

B. Owner will issue a letter of Final Acceptance, at which time project becomes responsibility of Owner.

### PART 2 – PRODUCTS

#### 2.01 SOIL MATERIALS

A. Refer to Section 02910 for Planting Soils.

#### 2.02 SOIL ADDITIVES FOR PLANTING SOIL

A. Aluminum sulphate for adjustment of planting soil pH shall be commercial sulfur, unadulterated, delivered in containers with the name of the manufacturer, material analysis and net weight appearing on each container.

- B. Ground limestone for adjustment of planting soil pH shall be agricultural grade ground dolomite limestone containing at least 85% calcium carbonate equivalent, with 50% passing the 100 mesh and 95% passing the 20-mesh sieve.
- C. Organic Compost:
1. Organic compost shall be natural or manufactured mature, composted organic material, and, if biosolid based, aged a minimum of one (1) year. Organic material shall be as specified by UMTC 'Article 5.4 - Standard Compost Specifications for Massachusetts'. Only compost meeting Class A (E.P.A. Federal) or Type I (Massachusetts) compost products shall be acceptable.
  2. Organic compost shall be produced by a DEP-approved composting vendor of material originating from mature leaf compost, mature composted animal manure, other aged, composted vegetable materials such as brewer's waste, or chemically tested toxin-free processed sludge products (biosolids), composted with wood products, safe for plants, humans, and soil organisms (Class A or Type I). Raw (uncomposted or unprocessed) or incompletely composted organic matter shall be rejected. Organic matter manufactured from sludge and other biowaste materials or manure, shall be aged for at least one (1) year without exception, and shall have no objectionable biowaste odor.
  3. Organic compost shall contain no uncomposted bulking agents, such as uncomposted wood chips, and shall be free from hard lumps and free water when handled (at least 60% dry solids). It may be shredded or granular in form. No plastic shall be present. It shall be free from excessive amounts of zinc or unpleasant odor. 100% of material shall pass a 1/2" sieve.
  4. Each and every source of organic material proposed for use as a soil amendment or component of planting soil must be tested on the criteria specified in this Article and results submitted for review and approval by the Owner before construction. Each delivery of organic material must match samples tested by Contractor and approved by the Owner or delivered material will be rejected. Each delivery of compost shall require testing and approval, per specifications, to ensure compliance with previously approved test submittals. Contractor shall provide sufficient quantities of composted organic material to meet requirements of the planting soil specified and detailed in the Drawings after mixing, spreading, and compaction, and may obtain this material from various sources, if material and test results have been reviewed and approved by the Owner.
  5. Other requirements and test results for specific characteristics of the organic matter and results issued for the following criteria shall be:
    - a. According to the methods of testing of AOAC, latest edition, the acidity range shall be approximately 5.5 pH minimum to 8.0 pH maximum.
    - b. The organic matter shall not be less than 40% as determined by loss on ignition for bio-solid compost and may be higher for other compost types. The density shall be 1150 kilos/cubic meter (850 lbs/CY).

- c. The water absorbing ability shall be 200% minimum by weight on an oven dry basis for organic compost other than peat moss.
- d. The Carbon/nitrogen ratio shall be between 10/1 to maximum 25/1 without the addition of nitrogen.
- e. The degree of maturity should be between Grades IV and V, 'curing compost' and 'very stable compost' as measured in a colorimetric-based maturity test. The stability shall be, on the O<sub>2</sub>-evolution test, < 7 mg CO<sub>2</sub> - C/g BVS day or deWar self-heating test < 15 degrees C above room temperature.
- f. There should be no unpleasant or detectable odor of ammonia or hydrogen sulfide, which would indicate immature compost. Color of bio-solid compost shall be dark brown.
- g. Total salinity should be less than 4.0 mmhos/cm (Ds/m) or less than 2560 PPM salt (NaCl)
- h. The material shall contain some nitrogen, phosphorus, copper, boron, manganese, and molybdenum in horticulturally and agriculturally appropriate proportions to prevent ion antagonisms.
- i. Concentrations of arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, and selenium must be below EPA (EPA CFR Part 503 Regulations, Table 3, p. 93392, Vol. 58 No.32, 1993) and Commonwealth standards for application to soils with human activity. No pesticide residues or chlorinated hydrocarbons of any kind should be present.
- j. Maturity and age of composted organic material intended for use on this project shall be verified in writing by supplier as part of test results.

D. Sand for use as PLANTING SOIL additive or component:

- 1. Sand for use as ingredient or amendment in planting soil shall be medium sand with angular (not round) sand particles (beach sand not acceptable). Sand that meets MassDOT Standard Specifications M4.101.0: Sand Borrow Type a, may be used if material is not self-compacting or overly gravelly, according to the Owner.
- 2. Sand sources and requirements of sand as a planting soil component or amendment may require adjustment at the request of the Owner, depending on the characteristics and proportions of the other planting soil components (stripped topsoil, borrow, organic component) used to mix the approved planting soil. The intent of the installed planting soil is to provide a consistent, stable, well-draining, aerated, nutrient rich, and friable planting soil that will support mature trees and lawns in an irrigated environment.

2.03 SEED MIX

- A. Contractor shall furnish the Owner with the dealer's certificate of the mixture composition for review and approval before seeding operations begin. Seed mixture shall be fresh, clean, new crop seed of the previous year's crop, mixed off site by the seed dealer. Weed seed content shall not exceed 1% by weight. The seed shall be furnished and delivered in the proportion specified below in new, clean, sealed and properly labeled containers. All seed shall comply with State and Federal seed laws; seed that has become wet, moldy, or otherwise damaged will be rejected.
- B. CONSERVATION/WILDLIFE MIX (available from New England Wetland Plants, [www.newp.com](http://www.newp.com), 413-548-800 or approved equal) : Sow at thirty five (35) lbs. per acre and shall be comprised of the following:

<u>Botanical Name/Proportion Common Name</u>	<u>by Weight Minimum</u>	<u>Purity Minimum</u>
Andropogon gerardii Big Bluestem	15%	90%
Asclepias syrica Common Milkweed	3%	90%
Aster novae-angliae New England Aster	1%	90%
Chamaecrista fasciculata Partridge Pea	6%	90%
Desmodium canadense Showy Tick Trefoil	4%	90%
Elymus virginicus Virginia Wild Rye	20%	90%
Eupatorium perfoliatum Boneset	1%	90%
Festuca rubra Red Fescue	13%	90%
Helenium autumnale Common Sneezeweed	1%	90%
Panicum virgatum Switch Grass	6%	90%
Rudbeckia hirta Black Eyed Susan	2%	90%



Schizachyrium scoparium Little Bluestem	17%	90%
Solidago juncea Early Goldenrod	1%	90%
Sorghastrum nutans Indian Grass	10%	90%

- C. EMBANKMENT/ EROSION CONTROL SEED MIX (available as Erosion Control/Restoration Mix for Dry Sites from New England Wetland Plants, [www.newp.com](http://www.newp.com), 413-548-800 or approved equal), : Sow at five (5) lbs. per 1,000 square feet and shall be comprised of the following:

Agrostis perennans Upland Bentgrass	1%	90%
Elymus canadensis Canada Wild Rye	27%	90%
Festuca rubra Red Fescue	22%	90%
Juncus tenuis Path Rush	1%	90%
Lolium multiflorum Annual Ryegrass	15%	90%
Lolium perenne Perennial Ryegrass	13%	90%
Panicum virgatum Switch Grass	7%	90%
Schizachyrium scoparium Little Bluestem	7%	90%
Sorghastrum nutans Indian Grass	7%	90%

- D. Note: If these specific named varieties and/or cultivars of species listed above are not available at the time of construction, the Contractor may substitute cultivars that display similar proven growth, color, habit, drought tolerance, and disease and insect resistance as patented and named cultivars specified, but only with review and approval of the Owner and only if Contractor demonstrates that these cultivars are equal in

performance and appearance. Species and proportions of species in mix may not be changed.

## 2.04 PLANT MATERIALS

- A. Plant Identification and Standards: Nomenclature conforms to current edition of Standardized Plant Names, published by American Joint Committee on Horticultural Nomenclature. Plants conform to varieties and sizes specified in plant list, and to code of standards set forth by American Association of Nurserymen, Inc. in American Standard for Nursery Stock, ANSI Z60.1 - latest edition. Substitutions shall not be permitted without consent of Owner. Plants shall be properly identified with plant labels securely attached to plants, in order to identify plants on site. Information regarding sources of plant material shall be furnished to Owner.
- B. The Owner, accompanied by the Contractor, will tag plants at their place of growth, after pre-tagging by Contractor. At least one (1) month prior to the expected planting date, request in writing that the Owner schedule tagging trip(s). No plant material tagged by the Owner shall be delivered to the site of Work without these tags.
- C. The Owner's selection shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the Work. Contractor shall pay cost of replacement of materials rejected by the Owner at the site.
- D. Each tree shall be labeled with securely attached, waterproof tag bearing legible designation of botanical and common name according to AJCHN.
- E. Only plant stock obtained from and grown between latitudes 40-49 degrees north and USDA hardiness Zones 1 through 5, will be accepted. All plants shall be nursery grown, not collected from natural vegetated areas.
- F. Trunks shall be free from sunscald, frost cracks, or wounds resulting from abrasions, fire, or other causes. No tree shall have evidence of ever having had basal suckers. The plants must be in a moist vigorous condition, free from dead wood, bruises or other root, bark, or branch injuries.
- G. Trees shall not be pruned in preparation for transplanting. No wounds from previous pruning shall be present having a diameter exceeding two (2) inches; such wounds shall show vigorous scar tissue on all edges.
- H. Plant List: If there are discrepancies between the quantities shown on plant schedule and work shown on Drawings, Contractor shall supply plants necessary to complete work as shown on Drawings. Where size of plant on the plant list is a variation between a minimum and maximum dimension, the sizes of plants furnished shall be equal to average of two dimensions. Where a single dimension is given, dimension represents the minimum size of plants to be furnished.

- I. General Plants: Unless specified otherwise, plants shall be nursery grown under climatic conditions similar to those in locality of project and shall have been previously transplanted or root pruned at least once in last three years. Plants shall possess a normal balance between height and spread. Plants shall be typical of their species and variety with a normal habit of growth, densely foliated when in leaf, and a well-developed branch structure with a fibrous, healthy root system with no girdling roots. Plants shall be sound and healthy, free from dead wood, defects, disfiguring knots, sun scald, injuries or abrasions of roots or bark. Plants shall be freshly dug. No heeled-in plants or plants from cold storage shall be used. Parts of plant shall be moist and show active green cambium when cut. Plants shall be free of plant diseases, insects, pests, eggs, larvae, and forms of infestations.
- J. Balled and Burlapped Plants: Plants designated on plant list as "B&B" shall be dug with root systems as solid units. Diameter and depth of balls of soil must be sufficient to encompass fibrous and feeding root system necessary for healthy development of plants. Balls shall be wrapped firmly with biodegradable material and bound carefully with twine or cord. Tree balls may also be placed in a wire basket of diameter suitable for the size of the root ball. No plant shall be accepted when ball of earth surrounding roots has been badly cracked or broken, either before or during process of planting, or after burlap, ropes, etc., required for transplanting have been unfastened. Plants and root balls shall remain intact as a unit during operations. Plants that cannot be planted at once must be protected and watered.
- K. Measure trees according to AAN with branches and trunks or canes in their normal position. Take caliper measurements six (6) inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes.
- L. Container-Grown Plants: Container plants shall have been acclimatized for one growing season in container. Container plants shall be well established in container and shall have sufficient roots to hold earth intact after removal, without being in a rootbound condition. Plants shall remain in container until planted.
- M. Trees: Trees to be hand dug and balled and burlapped rootballs. Root balls shall be custom dug to special widths and depths to accommodate shallow soil conditions of this Project. Trees, except when a clump form is designated, shall be straight and symmetrical with a crown having a persistent single, main leader, and growing from a single, unmutilated crown of roots. No part of trunk shall be conspicuously crooked as compared with normal trees of same variety. Trunk shall be free from sunscald, frost cracks, or wounds resulting from abrasions, fire, or other causes. No pruning wounds shall be present having diameter of more than two inches (2") and wounds must show vigorous bark on edges. Pruning wounds over 3/4 inch in diameter must be completely calloused over. Evergreen trees shall be branched to within one foot of ground. Height of trees, measured from crown of roots to top of top branch, and caliper, measured as specified herein, shall not be less than minimum size designated in plant list. Take caliper measurements 6 in. above ground on trees up to and including 4 in. caliper, and at 12 in. above ground for larger sizes.

- N. Shrubs and Small Plants: Shrubs and small plants, unless otherwise designated, shall be well-formed and bushy with well-spaced side branches, and shall have a crown and stem(s) typical of species and variety. Plants shall be well-branched to ground. Plants shall meet requirements for spread and/or height stated in Plant List. Measurements for height are to be taken from ground level to average height of top of shrub and not to longest branch. Thickness of each shrub shall correspond to trade classification "No. 1". Single stemmed or thin plants will not be accepted.
- P. Plants larger than those specified in the Plant List may be used if approved by Owner but use of such plants shall not increase the Contract Price. If use of larger plants is approved, spread of roots or ball of earth shall be increased in proportion to size of plant.
- Q. Trees delivered by truck and plants requiring storage on site shall be properly wrapped and covered during delivery to prevent drying of branches, leaves, or buds. Plant root balls shall be firmly bound, unbroken, and reasonably moist to indicate watering prior to delivery and during storage, and tree trunks shall be free from fresh scars and damage in handling.

2.05 BARK MULCH

- A. Bark mulch: shredded granular outer bark of evergreen trees and minimum of hardwood bark and shall be aged for period of at least 6 months and not longer than two years. Bark mulch shall not have been subjected to anaerobic conditions and must be partially decomposed and dark brown in color, Bark chunks shall average 1/2 inch to 2 inches in length and no chunks three inches or more in size and thicker than 1/4 inch shall be left on site. Moisture content shall be 40 percent or more, retained with normal watering and/or rainfall. Mulch shall be free of dirt, leaves, twigs, and other materials deleterious to plant life. Mulch shall not contain chipped construction materials.

2.06 FERTILIZERS

- A. FERTILIZER FOR TREES AND SHRUBS installed by the Contractor shall be provided with through the use of slow-release fertilizer packets, which are designed and certified by the manufacturer to provide controlled release of nutrients over a minimum three-year period. Packets shall remain sealed at delivery to site and until installation. Each packet shall consist of four (4) ounces of water-soluble fertilizer with a minimum guaranteed analysis of available elements by weight as follows:

<u>Nitrogen</u>	<u>Phosphorus</u>	<u>Potash</u>
16%	8%	16%

Note: Fertilizer packets shall not be used for trees located within the 100-foot wetland buffer zone.

- B. FERTILIZER FOR SEEDED AREAS 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. At least 50% by weight of the nitrogen content shall be derived from organic materials. Fertilizer shall contain not less than the percentages of weight of ingredients as follows or as recommended by the soil analysis:

<u>Nitrogen</u>	<u>Phosphorus</u>	<u>Potash</u>
10%	6%	4%

## 2.07 POST PLANTING FERTILIZER

### A. Post Planting Fertilizer:

1. Complete, fertilizer made from all-natural ingredients complying with State and Federal fertilizer laws. Fertilizer shall contain the following available plant food by weight, unless soils test indicates a need for different composition:
  - Pro Start 5-3-4 manufactured by North Country Organics, Bradford, Vermont 05033, ph# 802.222.4277.
2. Fertilizer to be delivered in original unopened standard size bags showing weigh, analysis ingredients and manufacturer's name.

## 2.08 WATER

- ### A. Contractor shall provide all labor and materials required to furnish water to plantings and seeded or sodded lawns, until Final Acceptance at his/her expense. Contractor shall supply temporary soaker hoses, hose connections, and any other appurtenances necessary to connect and draw from existing water lines or water trucks. Contractor shall not cause damage to any vegetation during the watering operation. Water shall potable, free of salt and other impurities injurious to vegetation.

## 2.09 TREE WRAP

- ### A. Tree wrap may be used to protect tree trunks from damage during digging at the nursery, transport to the site or during planting operations, but the use of tree wrap of any type shall not be allowed on tree trunks and branches after trees are planted.

## 2.10 ANTIDESSICANT

- ### A. Antidessicants: emulsions or materials which provide a protective film over plant surfaces permeable enough to permit transpiration and specifically manufactured for that purpose. Antidessicant shall be delivered in manufacturer's containers and used according to manufacturer's instructions.

## 2.11 CHEMICALS, HERBICIDES, FUNGICIDES, AND INSECTICIDES

- A. Provide chemicals, herbicides, fungicides, and insecticides as needed for fungus or pest control. Chemicals and insecticides shall be approved by Massachusetts Department of Environmental Protection for intended use and application rates. No pesticides shall be used on site without knowledge and approval of Owner. Pesticides shall be handled by State licensed operators only.

#### 2.12 PLANT LABELS

- A. Plant labels shall be provided by Contractor and shall be durable, legible labels, stating correct plant name and size, in weather-resistant ink or embossed process lettering, and are easily removable.

#### 2.13 TREE PAINT/TREE WOUND DRESSING

- A. Tree paint or tree wound dressing of any type shall not be used on tree wounds. Allow wound to heal and weather naturally, after trace cutting ragged or loose damaged bark back to live cambium.

### PART 3 – EXECUTION

#### 3.01 SITE PREPARATION PRIOR TO COMMENCING PLANTING AND SEEDING

- A. Refer to Section 02210: Earthwork for rough grading which shall be performed before planting commences.
- B. Refer to Section 02910 for Planting Soils.
- C. Before starting work, locate existing underground utilities in areas of Work, call DIG SAFE and other sources of information as necessary. Should uncharted, or incorrectly charted, piping, or other utilities be encountered during excavation, notify the Owner. Cooperate with the Engineer and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of the utility companies and the Client. Do not interrupt existing utilities serving facilities occupied or used by others, during occupied hours, except when permitted in writing by the Client and then only after acceptable temporary utility services have been provided. Provide minimum of 48-hour notice to the Client and obtain written notice to proceed before interrupting any utility.
- D. Protect all existing structures, existing subgrades to remain, utilities, pavements, lawns, planting, and other site improvements from damage due to grading Work.
- E. Submit to Owner any requests for adjustments in grades and alignments found necessary to avoid interference with special conditions encountered.
- F. Stockpile usable excavated materials inside Limit of Work. Place, grade, and shape stockpiles for proper drainage. Locate and retain soil materials away from edge of excavations. Dispose of waste materials legally.

- G. Backfill excavations as promptly as Work permits, but not until completion of inspection, testing, approval and recording locations of underdrainage and irrigation.
- H. Uniformly grade subgrade to pitch a minimum of 1-2% including adjacent transition areas, providing minimum gradients for temporary drainage to catch basins and swales, streets, curbs, and away from plantings and structures.
- I. Protect subgrade areas scheduled for planting from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- J. The top four (4) inches of subgrade of all areas to be planted and seeded shall be raked of all rubbish, sticks, roots, existing vegetative material and roots, and debris and stones larger than 1/2-inch and shall be removed off site. Subgrade surfaces shall be harrowed, raked, or otherwise loosened to a depth of 4-inches. Subgrade shall be inspected and approved by the Owner before planting soil is placed. The use of herbicides for vegetation removal shall be proposed only with the permission of the Client.

### 3.02 PLANTING SOIL PREPARATION, PLACEMENT, AND FINE GRADING

- A. Refer to 02910 Planting Soils.
- B. SOIL ADDITIVE INCORPORATION FOR PLANTED AREAS:
  - 1. Soil additives shall be spread and thoroughly incorporated into the planting soil by harrowing or other methods approved by the Owner. The following soil additives shall be incorporated:
    - a. Ground limestone as required by soil analysis to achieve a pH of 6.0 to 6.5, but the maximum amount applied shall be 1 pound per square yard. Limestone may not be mixed with fertilizer for application and shall be applied a minimum of two (2) weeks prior to fertilizer application.
    - b. Fertilizer at the rate of five (5) pounds per 1,000 square feet, or more, as recommended by the soil analysis. Fertilizer may be applied hydraulically in one operation with hydroseeding and fiber mulching.
  - 2. Lime and fertilizer shall be spread mechanically rather than in one operation with hydroseeding:
    - a. After the planting soil is placed and before it is raked to true lines and rolled, limestone shall be spread evenly over planting soil surface and thoroughly incorporated with planting soil by heavy raking to a least on-half depth of planting soil.

- b. Fertilizer shall be uniformly spread and immediately mixed with the upper 2-in of topsoil.
3. Organic material and other bulk amendments (such as sand) required to be added to topsoil or mixed to make manufactured planting soil shall be thoroughly mixed in soil stockpile locations as specified in Article 3.1 or in a commercial facility, according to proportions determined by soil testing and approved mixing and test results, and not on grade after spreading.

### 3.03 PREPARATION OF SEEDED AREAS AND INCORPORATION OF ADDITIVES

#### A. Fine Grading of Seeded Areas and Preparation of the Seed Bed:

1. The whole surface shall then be fine graded by hand raking. Remove large stiff clods, lumps, brush, roots, stumps, litter, and other foreign matter. Remove all stones over one inch (1") in diameter from the top three inches (3") of the loam bed. Loam shall also be free of smaller stones in excessive quantities as determined by the Owner.
2. If seed bed is proposed to be seeded by hand broadcasting, smooth surface to meet finished grades with raking and broadcast seed according to requirements specified. Compact with rolling after seeding. If bed is proposed to be drill seeded or hydroseeded, roll and compact bed before seeding. The surface shall be compacted with a roller or other suitable means to achieve a maximum dry density of 88 to 90% for the placed loam in accordance with compaction standards of ASTM D1557, Method D. 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.

#### B. Incorporation of Soil Additives in the Seed Bed:

1. Soil additives shall be spread and thoroughly incorporated into the top four (4) inches of the loam layer by harrowing or as part of hydroseed slurry as approved by the Owner. Owner

### 3.04 GENERAL INSTALLATION METHODS FOR SEEDED AREAS

- A. Seed shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and the weed seed content shall not exceed 1% by weight. Where possible, seed stock shall come from a local source. The seed shall be furnished and delivered, in the proportion specified, in new, clean, sealed, and properly labeled containers. All seed shall comply with State and Federal seed laws. Submit manufacturer's Certificates of Compliance. Seed which has become wet, moldy, or otherwise damaged shall not be acceptable. The Contractor shall take care to handle and store the wildflower seed according to grower's recommendations and shall not subject the seed to extremes of heat, cold or moist conditions.



- B. Limits of seeding shall be as designated on plans and as directed by the Client and the Owner. All areas disturbed outside the limit of seeding shall also be seeded. Stake limits of Seeded Lawn Mix, before seeding, for review by the Owner, before seeding to ensure that proper seed mix is being installed to appropriate limits. Different methods for seeding are required, depending upon mix being installed.
- C. The planting of seed shall be done only during periods within the season, which is normal for such work as determined by weather conditions without additional compensation, but subject to the Owner's approval of time and methods.
  - 1. Seeding dates shall be approximately April 1 - June 1 or August 15 - September 30.
  - 2. Seeding outside of season shall occur only with permission of the Owner and may result in the requirement for re-preparing of seed bed and reseeded the following season until specifications requirements are met. Acceptance will not be given to seed outside of season until all the requirements of the specifications have been fulfilled and the lawns have met all grow-in requirements. Out-of-season seeding during hot weather will require shade mulching with netted hay-type erosion control fabric.
- D. Seed only when the bed is in friable condition, not muddy, dried, or frozen, and not in windy or weather or in weather where temperatures are expected to be less than 45 or higher than 75 degrees Fahrenheit during and for two (2) weeks after seeding. After seeding, the seed bed shall be thoroughly and evenly watered with a fine spray to penetrate the soil to a depth of at least six (6) inches, and the seed bed kept evenly moist until germination and acceptance.
- E. Protect all trees to remain with tree protection fencing during construction set to edge of canopy. All loaming and seed work within the fence limit must be done by hand with care not to disturb tree roots (no excavation) or fill more than 2" inches above existing grade. Fencing must remain until seeded lawn areas have been sown and fenced off with protective barriers.
- F. Seed shall be carefully sown and thoroughly raked in twice at right angles at each pass, overlapping by at least 25%, and lightly rolling after raking to ensure good soil to seed contact and even sowing. Specified rates for seeding shall meet or exceed requirements for any method used.

### 3.05 HYDROSEEDING MIX:

- A. Hydroseeding with hydro mulch and tackifier shall be the preferred method for seeding all seeded areas. Utilize a mobile tank to hydroseed with a capacity of at least 500 gallons, filled with water and seed in quantities so it may be sprayed on prepared loamed bed prepared in the specified proportions per unit of area to be hydroseeded.
- B. The slurry shall be thoroughly mixed by means of positive agitation in the tank. The slurry shall be applied by means of a centrifugal pump using the turret or hose application technique from the mobile tank. The hose or turret shall be equipped

with a nozzle of a proper design to insure even distribution of the hydroseeding slurry over the area to be hydroseeded. The hose or turret shall be operated by a person thoroughly familiar with this type of seeding operation.

- C. Differing quantities of hydro mulch, fertilizer, superphosphate, and limestone shall be included in slurry mix depending on seed type, application requirements, and recommendations for amendments based on results soil testing.

### 3.06 Owner

### 3.07 SEEDED AREA PROTECTION AND MAINTENANCE

- A. Protection: Seeded areas shall be protected by a three (3) foot high barrier constructed of two (2) inch x two (2) inch wood stakes set 18 inches in the ground at eight (8) foot spacing supporting plastic snow fencing. Barriers must be raised immediately after seeding and shall be maintained until acceptance. Barriers must be removed at the request of the Owner and not later than two (2) weeks after acceptance. If grass within fencing is damaged for any reason and fencing has not been kept taut and secure by the Contractor, Contractor shall replace grass within two (2) weeks, if during the growing season for that grass, within first two (2) weeks of next growing season.

#### B. Maintenance

1. Seeded area maintenance, reseeding, and repair shall be required during the one-year guarantee period.
2. Watering: Watering shall be no less than two (2) inches of water per week within a given area, reduced by amount of natural rainfall at installation and between the months of April through October. Provide for daily watering of all grass areas to maintain moist soil to depth of at least six (6) inches. Apply one complete coverage of water in an 8-hour period. Water shall not be applied within three (3) hours of dusk unless specifically approved by the Owner. Prevent erosion due to excessive watering. Prevent damage to seeded areas by watering equipment. All Work injured or damaged due over- or under-watering shall be Contractor's responsibility to correct and at Contractor's expense.
3. Fertilizing: Fertilizing shall be required during the first and second growing seasons. Fertilizing is permissible only in April, May, August, or September, and not before two (2) months of growing time after seeding unless fertilizer is manufactured specifically for newly seeded areas. Use fertilizer applied at rate according to manufacturer's instructions for newly seeded areas after germination. A second application of fertilizer, as specified herein, shall be applied to all seeded areas after one (1) season of growth of two (2) months duration. Fertilizer shall be applied only during the months of April, May, August, or September at rate according to manufacturer's instructions. Adjust nitrogen type and analysis for season of application (slow release in fall).

4. Disease and insect control: Application of all preventative and reactive insecticides or fungicides shall be performed by a turf specialist certified by the Commonwealth of Massachusetts and only after submittal and approval by the Owner of materials, methods, application rates and schedule and permission of the User Agency. The use of granular materials is typically preferred over spray applications.

### 3.08 SCHEDULING OF PLANTING

- A. Locate plant material sources and ensure that plants are shipped in timely fashion for installation. All trees shall be planted during the same planting season they are dug. Balled and burlapped and potted plant materials from cold storage shall be rejected.

- B. Seasons for Planting:

Spring: Deciduous and Evergreen materials – April 1 through June 15

Fall: Deciduous and Evergreen materials – October 1 through November 15

1. Summer digging of trees shall not be permitted for any reason.
2. Contractor shall secure plant material as soon as possible and with recent Massachusetts's regulations in mind, regarding importing clean out of state nursery stock inspected for the Oak bark beetle.
3. Evergreens planted in April or July-August, or out of season shall be sprayed with anti-desiccant twice during the guarantee period, once at planting and once in mid-winter.

### 3.09 PLANT MATERIAL DELIVERY, STORAGE AND HANDLING

- A. Deliver and plant only freshly dug trees. Do not use plants "heeled-in" from previous season. Balled and burlapped plant materials from cold storage shall be rejected. Do not prune before delivery, except as approved by the Owner. Protect bark, branches, and root systems from sunscald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery.
- B. Contractor shall be present at time of delivery of all plants to the site. Remove all tree wrapping at delivery and inspect tree trunks for damage. Report damaged plants immediately to the Owner. Wrap shall not be replaced except as specified herein.
- C. Handle balled and burlapped stock by root ball, not by trunk or branches.
- D. Deliver trees after preparations for planting have been completed and install immediately. If planting is delayed more than six (6) hours after delivery, set plants

vertically in their natural growing orientation in shade, protect from weather, dust, and mechanical damage, and keep roots moist. Set balled stock on ground or heeled into ground, and cover ball with soil, mulch, or as approved by the Owner. Storage for more than two (2) weeks shall not be allowed without permission from the Owner. Plant damage due to Contractor's planting delay shall be the responsibility of the Contractor.

- E. Water root systems of trees stored on site with a fine-mist spray. Water as often as necessary to keep root systems moist during storage and planting.
- F. Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from damage during delivery and while stored at site.

### 3.10 TREE AND SHRUB PLANTING

- A. Fill entire shrub bed or planting area to depths indicated on Drawings with approved planting soil, according to requirements in Article 2.1.
- B. Take care not to disturb any adjacent site improvements. If, in the opinion of the Owner, any damage to adjacent materials occurs as a result of planting operations, repair the damaged materials at no cost to the Client and/or the Owner.
- C. Stake location for all trees for review by the Owner before any plant pits or beds are dug, and before plant delivery to site. Stake locations with stakes or flagging, outline planting areas for massed planting, and obtain the Owner's review and acceptance before the start of planting work. The Owner reserves the right to determine the exact location of every tree and to change the location of any tree to an area of similar conditions.
- D. Keep plant roots and earth balls moist and protect from sun and wind during entire planting operation.
- E. Set balled and burlapped stock plumb in staked location. If top of rootball needs to be raised to conform to proposed finished grade, use leveling bed of compacted planting soil or existing subgrade to set ball. Set top of root ball for trees slightly higher ( $\frac{1}{2}$  inches) than surrounding grade, judging planting height to allow for settling, to meet grade after settling as plant grew in nursery; refer to detail drawing. Scarify soils on sides of pit to facilitate integration of backfill with existing soil for better root penetration as plants grow. Roll back top 12 inches of burlap and remove wire baskets from tops and sides of ball but do not remove materials from under large tree root balls. Planting stock with root balls cracked or broken before or during planting operation will be cause for rejection. Remove all non-biodegradable wrapping or binding material or containers from shrubs.
- F. Place planting soil around ball in six-inch layers, tamping to settle backfill and eliminate air pockets. When pit is approximately half backfilled, water thoroughly until no more is absorbed. Water again after placing and tamping final layer of backfill. Compact planting soil and planting soil mix to approximately 85%

maximum dry density. Do not over compact planting areas; the Owner reserves the right to reject over compacted soil installation and request removal and replacement of soil and plants.

G. All plant roots and earth balls shall be damp and thoroughly protected from sun and wind from the beginning of the digging operation, during transportation and at the site until the final planting. Remove container plants from containers prior to planting. All plants shall be planted in the center of the holes and at the same depth as they previously grew. After completion of planting installations, remove rope, wires, etc. from the top of the root balls. Remove burlap only from top third of root ball. Planting soil mix shall be backfilled in layers of not more than 6 inches and each layer watered sufficiently to settle before the next layer is put in place. Enough planting soil mix shall be used to bring the surface to finished grade when settled. A saucer shall be formed around each plant at a depth of 6 inches for trees and 4 inches for shrubs. All trees shall be planted 3 inches higher than the surrounding grade beyond the saucer.

H. Plant Fertilizing

1. Fertilizer packets for plants: Install one-half of the fertilizer packets at a depth of six (6) to eight (8) inches equally spaced around the plant 12 inches from the root ball, as planting soil is placed. Packets shall not be cut, ripped, or damaged. If it becomes necessary to remove and replace dead or unhealthy plants, used packets shall be replaced with new packets. The application rates for fertilizer packets shall be as follows:

<u>Type of Plant</u>	<u>Rate</u>
Deciduous Shade Tree tree.	One packet for each inch of caliper or four (4) packets, minimum for 3 ½-4-inch cal.
Evergreen Tree	One packet for every 18 inches of height
Shrub	One packet for every 12 inches of height.

I. Within one (1) day of planting, place mulch to 3” depth as indicated on detail drawings, over saucer areas of individual trees and over area of planting beds to a depth of three (3) inches after settlement. No mulch shall be spread within 4-inch diameter from tree or shrub trunk. Mounding of mulch will not be permitted.

J. All plants shall be watered immediately following planting as necessary to thoroughly moisten rootball and planting soil and thereafter shall be inspected frequently for watering needs and watered, as required, to provide adequate moisture in the planting pit. Inspect tree pits 24 hours after initial watering to confirm that they are draining properly. If surface water or excessively saturated plant pit soils exist, immediately notify the Owner.

3.11 PLANTING OF CONTAINERIZED MATERIALS

- A. Planting of containerized materials shall follow guidelines specified above, except that all containers shall be removed before planting. Plants that are pot bound may be rejected by Owner. Rough-up and open the sides of the balls of species which have tough, fibrous roots, to ensure that roots will spread out into the planting soil after establishment. Hand spread granular, pelletized superphosphate in the bottom of each plant pit, in amounts according to manufacturer's instructions and fertilize as required herein.

### 3.12 TREE PRUNING

- A. Pruning shall be done only to ameliorate minor damage to branches incurred during shipping and planting; any plants with major damage shall be replaced as directed by the Owner. Remove only dead wood, damaged branches, crossed branches, and suckering shoots, in accordance with TCIA standards, minimizing amount of live growth removed. Shape trees only if additional direction is given by the Owner, maintaining natural form. Tree pruning shall be consistent to full height of tree to avoid uneven appearance and structural imbalance. Do not apply tree wound dressing. Prune in accordance with TCIA Standards for Class I, "Fine Pruning," to preserve natural character of the plant.
- B. Never cut tree leader, unless permitted by the Owner.

### 3.13 TREE WRAPPING

- A. Trees and trunks shall be wrapped with protective fabric during transport and delivery to storage. Trees shall not be wrapped after planting, to avoid accumulation of moisture on bark, which increases susceptibility to hidden insect infestation, and mold.

### 3.14 CLEANUP AND PROTECTION

- A. Protect work from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged Work as directed by the Owner.
- B. Remove excess planting soil, waste material, and excess subsoil, unsuitable soil, trash, and debris, and legally dispose of material off site.
- C. Repair damage to site or structures to restore them to their original condition at no cost to the Client.

### 3.15 3.18 MAINTENANCE REQUIREMENTS FOR PLANTINGS

- A. Begin maintenance immediately after each area is planted and continue until the end of the one-year guarantee period after Final Acceptance.
- B. Maintenance shall consist of keeping plants in healthy growing condition and shall include but not be limited to watering, weeding saucers, grass areas, and planting

beds, mowing, cultivating, re-mulching, removal of trash, injured and dead material, resetting plants to proper grades or upright position, and maintaining mulched planting saucer.

- C. Inspect plants for watering needs at least twice each week and water as required to promote plant growth and vitality.
- D. Keep planting and grass areas free of weeds and maintain mulched saucers at required depths and size.
- E. Remove and replace immediately plants that die during the maintenance period and repair, re-seed, or re-sod all lawn areas and erosion control devices, from installation through the one (1) year guarantee period.
- F. Chemicals, pesticides, fungicides, insecticides, or herbicides within planted areas shall be applied by personnel licensed to do so in the Commonwealth of Massachusetts and only after obtaining written permission from the Owner, indicating the materials and dispensing methods allowed the dates, time and weather conditions under which procedures will occur, and traffic control, resident and pedestrian protection plan proposed. Spraying for insects, pests and diseases shall conform to the TCIA Standards under the section entitled "Standards for Pesticide Application Operations", as currently adopted.
- G. Remove trash from all planted areas weekly or as directed by the Client.
- H. During the maintenance period, any 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 horticulturists to inspect plant materials and to identify problems and recommend corrective procedures. The Owner shall be immediately advised of such actions. Inspection and recommendation reports shall be submitted to the Client.

### 3.16 ACCEPTANCE INSPECTION PROCEDURES

- A. Requirements of Division I shall apply to this Section.
- B. The Owner shall inspect work upon written request of Contractor, which shall be received by the Owner at least ten (10) days before the anticipated dates of inspection. Request inspection for acceptance of the plantings only after all aspects of planting operations are completed and maintained according to Specifications, all pertaining test results are acceptable, irrigation system is operating properly, and all extraneous equipment, materials and debris are removed from the project site. Do not request inspections for partially completed work. There will be no acceptance 'in parts' for planting work. All items on the punch list shall be completed to the satisfaction of the Owner before the initiation of the one-year plant establishment period (guarantee period) can commence.

- C. The Owner shall inspect work with Contractor present. At time of inspection if, in the Owner's opinion, a substantial amount of planting, materials or workmanship is deficient, Contractor's responsibility for maintenance of all work shall be extended until plant replacements are made or other deficiencies are corrected.
- D. A written report, or "punch list," issued by the Owner shall indicate to Contractor remedial items to be corrected before Final Acceptance is given.
- E. Acceptance: Acceptable plants are those that are to size and species as shown on the Drawings or accepted by the Owner, which show at least 85% live growth, actively growing or possessing live buds, with no indication of injury, disease, insect infestation, or decline due to environmental or other factors, which are plumb, mulched, and balls moist.
- F. All unsatisfactory plants shall be removed promptly. Replacement plants shall conform in all respects to Specifications for the originals and shall be planted and maintained in same manner until initial acceptance is made.
- G. Inspection request and procedure shall be repeated when remedial items are completed. Date of final acceptance of completed remedial work shall establish end of installation and initial maintenance period and commencement of guarantee period.
- H. Submit typed maintenance instructions for all plantings for the Owner's use.

### 3.17 PLANT ESTABLISHMENT PERIOD, GUARANTEE, AND FINAL INSPECTION

- A. Guarantee specified herein shall not deprive the Client of other rights it may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.
- B. The Contractor shall guarantee the plantings for two (2) years after acceptance. During guarantee period, make monthly inspections of plant material during April through November to document condition of plants and to provide remedial measures. Continue maintenance as specified. Submit inspection reports to the Owner. Dead plants and plants with less than 85% live wood noted in inspections shall be replaced with new plants of same size and species within one (1) month or in first month of next growing season, whichever comes first, as permitted by specifications. Replacement plants shall be installed according to the Drawings and Specifications.
- C. Notify the Owner at least ten (10) days in advance of requested date of inspection at end of one-year guarantee period. Submit to the Owner, before inspection, a list of plants replaced during guarantee period with species, location, and replacement dates.



- D. All plants will be inspected by the Owner one (1) year after final acceptance and shall be alive and in satisfactory growth at the end of that time. Trees, which have settled out of plumb shall be reset, plumb or be replaced.
- E. At end of guarantee period, all saucers flattened, mulch areas re-mulched and weeded, dead wood pruned and removed, and all replacements completed. All dead or unsatisfactory grass areas shall be weeded, top-dressed, repaired, fertilized, and/or bed prepared and re-seeded until satisfactory growth with intended species has occurred, as a condition of completion of all Work at final inspection.

END OF SECTION

SECTION 02910  
PLANTING SOILS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This Section specifies administrative and procedural requirements for manufactured planting soils (planting soils) including, but not limited, to the following:

1. Subgrade preparations.
2. Planting soil material acquisition.
3. Testing and analysis for specification conformance.
4. Layout of drainage lines and installation of drainage layer below planting soils.
5. Preparation of mixes and testing for conformance.
6. Mock Up.
7. Installation and placement of soils.
8. De-compaction and re-compaction of soils.
9. Final in-place testing of soils.
10. Coordination with other contractors.
11. Clean-up.

B. References to other Sections are given that would duplicate provisions in this Section.

1.02 RELATED WORK

- A. Section 02900 – Planting and Seeding
- B. Section 02210 – Earth Excavation, Backfill, Fill and Grading
- C. Section 02701 – Exfiltrating Bioretention Areas

1.03 REFERENCES

A. Definitions:

1. Refer to Section 02900 Planting and Seeding.

2. ASA: American Society of Agronomy.
3. Subgrade: Soil material and levels resulting from the approved rough grading work.
4. Seeded Areas and Planting Soils: Seeded areas and Planting Soils are composed of a blend of three base components: base loam, 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 are provided, but may require adjustment, depending on the final materials and with the approval of the Architect or their representative, in order to meet Specification requirements for each blend.

#### 1.04 TESTING, SUBMITTALS, MOCK-UPS AND INSPECTIONS

- A. Testing for Subgrade, Planting Soil Components and Planting Soil Mixes: Testing is required at the following intervals:
  1. Testing of individual components (Base Loam, Sand, and Compost) for planting soil mixes prior to blending of any soils for use at the Project Site. Tests are as described in this Section.
  2. After test results for components have been accepted, create sample Planting Soil Mixes of each planting soil mix and perform tests described in this Section.
  3. After the test results for each Planting Soil Mix have been accepted, and during the production of planting soils, test every 200 cubic yards of every Planting Soil Mix blended for: organic matter content, gradation, and pH. Before shipping of any Planting Soil Mix, the Contractor shall confirm that the Owner has accepted the mix. Testing applies to all soil layers of the planting profile. After three consecutive compliant tests, the Contractor may increase the interval of testing to 500 cubic yards.
  4. After horticultural tests have been approved, contractor shall submit representative samples of each soil blend to a geotechnical testing laboratory for ASAM 698 Standard Proctor tests to obtain optimum moisture content and maximum dry density values.
  5. In-place tests: Compaction tests of each type of material (soil layer) placed shall be in accordance with this Section. Infiltration tests shall be in accordance with this Section.
  6. Installation of Drainage Layer: Contractor shall notify Owner at least 5 days prior to the installation of drainage layers. Contractor shall demonstrate layout

and installation of drainage lines and drainage layer. Seeded areas and planting soil shall not be installed until drainage layer is accepted.

**B. Test Reports: Submit certified reports for tests as described in this Section.**

1. Mechanical gradation (sieve analysis) shall be performed for sand, silt, and clay content and compared to the USDA Soil Classification System using sieve size numbers: 10, 18, 35, 60, 140 and 270. The silt and clay (0.002 mm) content shall be determined by a Hydrometer Test (ASTM D-422-63) of soil passing the #270 sieve.
2. Chemical analysis shall be undertaken for Phosphorus, Potassium, Calcium, Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, organic matter content, acidity (pH) and buffer pH.
3. Tests shall be conducted in accordance with Recommended Soil Testing Procedures for the Northeastern United States, 2nd Edition, Northeastern Regional Publication No. 493; Agricultural Experiment Stations of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont and West Virginia. Tests include the following:
  - a. Test for soil Organic Matter by loss of weight on ignition, as described in Northeastern Regional Publication No. 493.
  - b. Test for soil CEC by exchangeable acidity method as described in Northeastern Regional Publication No. 493.
  - c. Test for soil Soluble Salts shall be by the 1:2 (v:v) soil:water Extract Method as described in Northeastern Regional Publication No. 493.
  - d. Test for Buffer pH by the SMP method as described in Northeastern Regional Publication No. 493.
  - e. Tests for pH shall be conducted on a 1:1 soil to distilled water ratio.
4. Certified reports on analyses from producers of composted organic materials shall be required and new test reports shall be submitted when compost sources are changed. Analyses shall include all tests for criteria specified in 2.1, K.
5. Saturated Hydraulic Conductivity: Test procedure ASTM D5856-95 (2000).
  - a. Hydraulic Conductivity tests shall be performed on samples during QA/QC testing at the Soil Supplier's facility.
6. Testing Agencies: The following firms are acceptable testing agencies for the various components and blends.

- a. Leaf Yard Waste Compost Comprehensive and Stability Test: Woods End Research Laboratory, P.O. Box 297, Mt. Vernon, ME, 04352, tel: 201.293.2457, fax: 201.293.2488.
  - b. Mechanical Gradation, Chemical Analysis and Organic Matter Content, All Soil Components and Planting Soil Mixes: University of Massachusetts, 203 Paige Laboratory, 161 Holdsworth Way, Amherst, MA 01003, <http://soiltest.umass.edu>, tel: 413.545.2311, fax: 413.545.1931 or approved equal.
7. Laboratory Density Testing: ASTM D698 - 12 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
- a. Density tests shall be performed on samples collected at the Soil Supplier's facility, to obtain the optimum moisture content and maximum dry density values.
- C. In-Place Testing
8. Density Tests: ASTM D1556 Density of soil and rock in place using "Sand Cone Method" or ASTM D6938-08a Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth). ASTM D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort. (Standard Proctor).
- a. In-place density tests shall be carried out at a rate of one test per each plant bed or seeded area.
  - b. Soil density shall meet the requirements specified herein, see
9. As required, in-place infiltration tests shall be performed using Turf-Tec IN2-W Infiltrometer utilizing manufacturer's operating instructions, or by the perforated canister method established in Section 3.5.
10. At the direction of the Owner, in-place planting soil blends shall be sampled and tested by the Owner for compliance with gradation and organic matter content as specified herein. Non-compliant materials shall be removed from the site or amended as specified by the Owner.
- C. Samples: Prior to ordering the below listed materials, submit representative composite samples to the Owner for selection and approval. Representative composite samples shall be composed of at least five equal-sized subsamples mixed thoroughly and resampled for submittal. Do not order materials until Owner's acceptance has been obtained. Delivered materials shall closely match the approved samples.
1. Components

- a. Compost: duplicate samples of 1 gallon.
  - b. Base Loam: duplicate samples of 1 gallon.
  - c. Medium to Coarse Sand: duplicate samples 1 gallon.
2. Test Blends
    - a. Planting Bed Soil: duplicate samples of 1 gallon.
    - b. Horticultural Subsoil: duplicate samples of 1 gallon.
  3. Production Stockpiles
    - a. Planting Bed Soil: duplicate samples of 1 gallon.
    - b. Horticultural Subsoil: duplicate samples of 1 gallon.
  4. Materials (as required)
    - a. Filter Fabric Mirafi 140N or equal: duplicate one square foot samples.
    - b. Underdrainage 12” Panel Drain w/Filter Fabric: duplicate samples of 1 foot.
    - c. Underdrainage 6” Non-perforated Pipe: duplicate samples of 1 foot.
- D. Sources for Base Loam, Sand, and Compost: Submit information identifying sources for all soil components and the firm responsible for mixing of planting soil mixes.
1. Owner shall have the right to reject any soil supplier or mixing facility.
  2. Soil mix supplier shall have a minimum of five years experience at supplying custom planting soil mixes.
  3. Submit supplier name, address, telephone and fax numbers and contact name.
  4. Submit certification that accepted supplier/ mixer is able to provide sufficient quantities and qualities of materials for the entire project.
  5. Final approval of soil supplier/ mixer shall be made after on-site review of supplier’s and mixer’s facility(ies) by the Owner.
- E. Subgrade Survey
1. Contractor shall submit for approval by the Owner a survey of final subgrade in all areas where planting soils will be placed. Placement of any drainage layer or planting soil shall not precede acceptance by the Owner.

F. Mock Up and Inspection

1. At the beginning of site work, the contractor shall demonstrate, in the presence of the Owner, subgrade preparations, including de-compaction and re-compaction methods and placement of sand blanket and drain lines that achieve the requirements of this Section. All subsequent subgrade preparations shall be in accordance with approved methods.
2. The Contractor shall not place Planting Soil, Horticultural Subsoil or Seeding Soil on prepared subgrade or drainage layer prior to inspection and approval of Owner for compliance with depth, compaction and percolation rate. The Contractor shall request inspection before proceeding at least ten working days prior to placement of soils.
3. The Contractor shall not plant any plant material prior to inspection and approval of Owner for compliance with soil depth and compaction specifications. The Contractor shall request inspection before proceeding at least ten working days prior to placement of soils.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 02210 Earthwork for overall material handling requirements.
- B. In addition, the following provision is established: 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 Section 02910 1.6.G. The Owner shall be consulted to determine if the soil is too wet to handle.
- C. Store and handle packaged materials in strict compliance with manufacturer's instructions and recommendations. Protect all materials from weather, damage, injury and theft.
- D. Sequence deliveries to avoid delay. On-site storage space is permissible only with written notice from Construction Manager. Deliver materials only after preparations for placement of planting soil have been completed.
- E. Prohibit vehicular and pedestrian traffic on or around stockpiled planting soil.
- F. Planting Soil that is to be stockpiled longer than two weeks, whether on or off site, shall not be placed in mounds greater than six feet high.
- G. Soil Moisture Content
  1. Contractor shall not move, blend or grade soil when moisture content is so great that free moisture is apparent, nor when it is so dry that dust will form in the air or that clods will not break readily, nor when it is frozen. Apply water, if

necessary, or allow to dry to bring soil moisture between 60% of optimum moisture content and optimum moisture content as determined by ASTM D698 prior to compaction, grading or planting.

2. Field Soil Moisture Test procedure is applicable for general soil moving and placement only and shall not be considered appropriate for compaction of soils, nor is a replacement for the above testing procedure.
  - a. Form soil in palm of hand, if soil retains shape and crumbles upon touching, the soil may be worked.
  - b. If the soil will not retain shape it is too dry and should not be worked.
  - c. If the soil retains shape and will not crumble, it is too wet and should not be worked.
  - d. If the soil glistens or free water is observed when the sample is patted in the palm of hand the soil is too wet and should not be worked.

#### 1.06 QUALIFICATIONS

##### A. Testing/Testing Agency

1. Refer to Section 02210 Earth Excavation Backfill and Grading
2. Refer to Section 02900 Planting and Seeding
3. Refer to this section, 1.5 B.

##### B. Contractor is solely responsible for quality control of the Work.

##### C. 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 in urban locations.

1. The installing Contractor shall be the same firm that is installing planting as described in Section 02900 Planting and Seeding.
2. Installer Field Supervision: Installer to maintain an experienced full-time supervisor on Project site when any Planting Soil preparation work is in progress.
3. The installer's crew shall be experienced in the installation of soil, grading and interpretation of grading plans in urban areas.

##### D. 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.

- E. 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.
- F. 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 Owner.
- G. Pre-installation Conference: Conduct conference at project site prior to the start of any work related to Planting Soil preparation
- H. Layout and Grading:
  - 1. Permanent benchmarks shall be established by a registered land surveyor or professional civil engineer, at the Contractor's expense. The Contractor shall maintain established bounds and benchmarks and replace them, if any are destroyed or disturbed.
  - 2. The Contractor shall maintain at the site, sufficient surveying equipment to accurately excavate to the required subgrade and install soil to the required finish grade. The Contractor shall be responsible to install soil profiles at the elevations and thickness shown on the Plans.

## PART 2 – PRODUCTS

### 2.01 SOIL MATERIALS

#### A. General

1. All plant mix material shall be imported and fulfill the requirements as specified and be tested to confirm the specified characteristics.
2. Samples of individual components of soil mixes in addition to blended soil mixes including mulch materials shall be submitted by the Contractor for testing and analysis to the approved testing laboratory. Comply with specific materials requirements specified.
  - a. No base component material or soil components for soil mixes shall be used until certified test reports by an approved soil testing laboratory and have been received and approved by the Owner.
  - b. As necessary, make any and all soil mix amendments and resubmit test reports indicating amendments until approved.
3. The Owner may request additional testing by Contractor for confirmation of mix quality and/or soil mix amendments at any time until completion. Changes in mix ratios may be required.

#### B. Soil Testing and Soils Testing Report Submittal

1. All testing of the soil mix components shall be carried out by the Soils Testing Laboratory. Recommendations for amending and/or correcting the soil mix will be provided to the Contractor by the Owner.
2. Failure of any material by testing and/or amendment procedure to meet Specification requirements shall require the Contractor to seek another source for the failed material and the initiation of all testing procedures for the new replacement material shall immediately take place.
3. The Contractor shall be responsible for recognizing that these critical project materials warrant timely and serious attention, that the testing process to achieve Approved materials should be considered a lead time item, and that under no circumstance shall failure to comply with all specification requirements be an excuse for “staying on project construction schedule.”

- C. Soil Samples: Contractor is responsible for paying costs for testing. Submit 1-gallon planting soil samples in two phases. Submit samples concurrent with horticultural soil test reports in both phases. Submit as phase one, planting soil base components for approval. Only after approval of phase one components, submit as phase two, soil

blend mixes / mediums for approval. All reports must be from recent analyses, less than 90 days old, and represent materials that are available for delivery to the site.

1. Phase One Submittals of Planting Soil Base Components:
  - a. Base Loam (Imported Topsoil)
  - b. Organic Amendment Materials (Compost)
  - c. Coarse Sand for Amending Soil
  - d. Crushed Stone
  - e. Fill Sand
2. Phase Two Submittals of Planting Mediums: mixing and batching of soil mediums to be submitted in the same manner as bulk soils and will be prepared prior to delivery to site.
  - a. Horticultural Subsoil
  - b. Seeded Area Soil
  - c. Planting Bed Soil
3. Phase Three Submittals shall be identical to Phase Two Submittals and be conducted initially for each 200 cubic yards of soil material prepared for the project site. After three compliant tests the QA/QC submittals may be reduced to every 500 cubic yards.
4. Submit reports for each of the above samples: Submit sample from each proposed source for testing and approval. Deliver samples to both the testing laboratory and the Owner. Send report directly to Owner's Representative.
5. Soil Sample Submittals: Sampling shall be done by the Contractor. The size of the samples and method of sampling shall be as follows: Samples shall be representative of the material to be brought to the site. Each sample shall be a Composite Sample, which consists of 5 separate sub samples taken from a minimum of (5) different locations at each source and mixed together to make the test sample.
6. The Contractor shall schedule this testing in order to permit reasonable time for testing, evaluation, and approvals prior to scheduled installation. Allow for a minimum of 4 weeks to perform testing and obtain approvals.

D. Imported Base Loam

1. Imported Base Loam, as required for blending with sand and compost, shall be a naturally occurring A-Horizon soil formed from geologic soil forming processes without admixtures of sand or organic matter sources (composts). Base Loam, which has been contaminated by incorporation of subsoil, shall not be acceptable for use. Base Loam as required for the work shall be free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris. Base Loam shall also be free of quack-grass rhizomes, Agropyron Repens, and the nut-like tubers of nutgrass, Cyperus Esculentus, and all other primary noxious weeds. Base Loam shall not be delivered or used for planting while in a frozen or muddy condition. Base Loam for mixing shall conform to the following grain size distribution for material passing the #10 sieve:

U.S. Sieve Size Number	Percent Passing	
	Minimum	Maximum
10	---	100
18	85	100
35	70	95
60	50	85
140	36	53
270	32	42
0.002mm	3	6

2. The ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 8 or less ( $D80/D30 < 8$ ).
3. Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
4. The organic content shall be between 4.0 and 8.0 percent by weight.
5. pH shall be between 5.8 and 7.0.
6. Chemical analysis shall be undertaken for Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH.

E. Medium to Coarse Sand

1. Sand for Planting Soil Blends, protection of filter fabric and for drainage as required, shall be uniformly graded medium to coarse sand consisting of clean, inert, rounded to sub-angular grains of quartz or other durable rock free from loam or clay, mica, surface coatings and deleterious materials with the following grain size distribution for material passing the #10 sieve:

U.S. Sieve Size Number	Percent Passing	
	Minimum	Maximum
10	100	--
18	60	80
35	25	45
60	8	20
140	0	8
270	0	3
0.002mm	0	0.5

2. Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.
3. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 2.8 or less ( $D70/D20 < 2.8$ ). Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422.
4. pH shall be less than 7.5.

F. Fill Sand Layer/Drainage Material

1. Sand for Fill or for Drainage shall meet the requirements of Coarse Sand above, or Alternate Fill Sand Drainage Material may be substituted, provided it meets the Specification ranges below, and is submitted and accepted by the Owner.
2. Free-draining sand and gravel borrow shall consist of inert, hard, durable stone and coarse sand, free from loam, clay, mica, surface coatings and deleterious materials and shall conform with the following gradation:

<u>U.S. Sieve No.</u>	<u>% Passing by Weight</u>	
	Minimum	Maximum
3 inch	100	-
1/2 inch	60	-
# 4	40	100
# 50	8	28
# 200	0	5

3. Fill Sand and drainage fill borrow shall be placed in lifts not more than nine inches thick before compaction. Compaction shall be by vibration to a density between 90 and 95% Standard Proctor. Saturated hydraulic conductivity of the sand and gravel shall be not less than 15 inches per hour according to ASTM D5856-95 (2000) when compacted to a minimum of 95% Standard Proctor, ASTM 698.

G. Organic Amendment (Compost)

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.
  - a. The ratio of carbon to nitrogen shall be in the range of 12:1 to 25:1.
  - b. 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.
  - c. 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 for particles passing a number 10 sieve.
  - d. 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.
  - e. Salinity: Electrical conductivity of a one to five soil to water ratio extract shall not exceed 2.5 mmhos/cm (dS/m).
  - f. 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.

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.

## 2.02 PLANTING SOIL MIXES

- A. All existing vegetation shall be removed from stockpiles prior to blending. Uniformly mix ingredients by windrowing/tilling on an approved hard surface area or by

alternately processing materials through a screening plant. All soil components and Organic Amendment shall be maintained moist, not wet, during mixing. Amendments shall not be added unless approved to extent and quantity by the owner and additional tests have been conducted to verify type and quantity of amendment is acceptable. Percentages of components are approximate and will be verified upon completion of individual test results for components of the various mixes. Due to variability of soil materials, mix ratios may require adjustment and re-submittal at the expense of the Contractor.

B. After component percentages are determined by the Owner, each planting soil mix shall be tested for physical and chemical analysis. Component percentages may be modified at any time by the Owner dependent upon the results of testing of the various components or final blends.

C. Planting Bed Soil

1. Planting Bed Soil shall consist of a combination of approximately equal parts by volume Stripped Existing or Imported Base Loam, Coarse Sand and Organic Amendment/Compost (1L:1S:1C) to create a uniform blend which meets the following requirements.
2. Gradation for material passing a Number 10 Sieve shall be achieved in the final mix.

U.S. Sieve Size No.	Percent Passing	
	Minimum	Maximum
10	100	
18	85	95
35	60	85
60	42	65
140	21	44
270	18	24
0.002 mm	2	4

3. Maximum size shall be one half-inch largest dimension. The maximum retained on the #10 sieve shall be 10% by weight of the total sample.
4. The ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 6 or less ( $D80/D30 < 6$ ).
5. The final mix shall have an organic content between 5 and 7 percent by weight.
6. pH shall be between 6.2 and 6.8.

7. The final mix shall have a hydraulic conductivity of not less than 1.5 inches per according to test procedure ASTM D5856-95 (2000) hour when compacted to a minimum of 86 percent Standard Proctor ASTM D 698. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
8. Chemical analysis shall be undertaken for Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH.



## PART 3 – EXECUTION

### 3.01 PRE-INSTALLATION EXAMINATION AND PREPARATION

- A. Reference Other Sections as necessary.
- 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 Owner 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. The Contractor shall not place any planting soil until all work in adjacent areas is complete and approved by the Owner.
- D. Kickoff Meeting: At least 10 working days prior to the start of work, the contractor shall request a landscape construction kickoff meeting with the Owner and any other parties involved with the landscaping. The contractor must demonstrate familiarity with this Section 02910 Planting Soils, and other relevant sections of the construction documents. The contractor shall articulate the means and methods of soil blending, subgrade preparation, soil placement and other steps outlined in the Specification.
- E. Examination of Subgrade: The subgrade shall be examined by the Contractor prior to the start of subgrade preparation, soil placement and planting. Any deficiencies shall be noted and related to the Owner in writing prior to acceptance of the subgrade by the Landscape Contractor. 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 and drainage layer.
  - 3. Incomplete irrigation and/or subsurface drainage installation.
  - 4. Incomplete lighting and exterior electrical installation.
  - 5. Conflict with underground utilities.
  - 6. Subgrade contaminated with oils, compressible material, silt or clay
  - 7. Subgrade without drainage layer must infiltrate water at the rate of at least one inch per hour.

- F. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.
  - 1. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace slopes where required and maintain sides of slopes of excavations in safe condition until completion of backfilling. Provide protection measures as required for public safety.
  - 2. All subgrade areas to be filled with Drainage Layer, Seeded Area or Planting Soil shall be free of construction debris, refuse, vegetation, compressible or decay able materials, all stones greater than 6 inches, concrete washout or soil crusting films of silt or clay that reduces or stops drainage from the Seeding or Planting Soil into the subsoil; and/or standing water. Such material shall be removed from the site.
  - 3. The subgrade must slope at a minimum of two percent towards the bottom of slopes and subdrains. Subgrade levels shall be adjusted as required to ensure that all planting and seeded areas have adequate drainage.
- G. Do not proceed with the installation of Drainage Layer, Seeding or Planting 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.
- H. Planting Soil Preparation: Refer to Section 02900 for planting soil and mixtures. Examine soil and remove foreign materials, stones and organic debris over 1/2" in size. Remove all vegetation from stockpiles prior to blending. Mix-in fertilizers and amendments as required by tests and as approved by Owner. All preparation and mixing shall be accomplished when the soil moisture content is compliant with Section 02900 1.6G and at a moisture content approved by the Owner. If lime is to be added, it shall be mixed with dry soil before fertilizer is added and mixed.

### 3.02 EXCAVATION AND REMOVAL

- A. Refer to 02210 - Earth Excavation, Backfill, Fill and Grading.

### 3.03 MIXING OF PLANTING SOIL MIXES

- A. Soil blends shall be produced with equipment that blends together each component in a thorough and uniform manner. This may be accomplished by a minimum of three handling events on a hard-surfaced area with earth moving equipment or by alternately passing soil components through a screener.
- B. Base components and Soil Mix stockpiles should be protected from wind and rain and shall not be permitted to be stored in standing water.

### 3.04 WORKING AROUND UTILITIES

- A. Carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.
- B. . 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.

### 3.05 SUBGRADE PREPARATION, INSPECTION AND PERCOLATION TESTING

- A. After subgrade levels have been reached, the Owner shall observe de-compaction and preparation of the subgrade according to this Section and inspect soil conditions to evaluate subsurface drainage conditions.
- B. Coordinate the following scarification work to eliminate subgrade compaction when located in seeded and planting areas. Maintain 12" clearance from any underground utilities during subgrade de-compaction.
  - 1. Heavy Site Subgrade Compaction Mitigation:
    - a. Heavily compacted subgrade areas such as, but not limited to, temporary parking areas, material stockpile areas, temporary roadways, construction areas and areas around structures and other similar areas.
    - b. Heavy Site Subgrade Compaction Mitigation is not required in newly placed fills with material meeting 2.1F Alternate Sand for Fills, or 2.1D Coarse Sand for Blending as provided in this Specification.
    - c. Prior to establishing the final subgrade, these areas shall be dug up or ripped to a depth of (18) inches to break up the soil hard pan, then re-compacted with two passes of the tracks of a wide track bulldozer size D-6 or smaller, or other approved equipment. Vibratory compaction of subgrade in planted areas is prohibited.
  - 2. General Site Subgrade Compaction Mitigation for fills and all seeded areas and planting areas that are not heavily compacted and would be mitigated as specified in Item 1 above:
    - a. Immediately prior to placing drainage layer or Planting Soil, the entire subgrade shall be loosened to a minimum depth of 8-inches using the teeth

of a backhoe or other suitable equipment, then re-compacted with two passes of the tracks of a wide track bulldozer size D-6 or smaller, or other approved equipment. Vibratory compaction of subgrade in planted areas is prohibited.

- C. After Subgrade has been scarified as described above, it shall be recompressed by using the tracks of a wide-tracked bulldozer, multiple passes of a skid steer loader, or the curled bucket of an excavator. In areas of subgrade with no drainage layer, verify the subgrade passes water at or greater than the minimum requirement.
- D. Remove all stones or debris greater than 6” in any dimension from the subgrade prior to placing Drainage Layer or Planting Soils.
- E. After the subgrade has been prepare, Percolation Tests shall be performed according to the following test procedures.
  - 1. Utilize perforated canisters or buckets seven to ten inches in diameter and a minimum of six inches high.
  - 2. A test hole shall be hand dug at the soil horizon to be tested approximately one-inch larger than the diameter of the test canister and approximately six inches deep. The sides of the test hole shall not be smoothed.
  - 3. Place one-half inch of clean coarse sand in the bottom of the hole and place the canister firmly into the hole. The space around the canister shall then be filled with coarse sand. Tamp the coarse sand to firmly fill any void space around the test canister.
  - 4. Fill the canister with water to the soil horizon level and allow to drain until approximately one inch of water remains, or a minimum of 1 hour.
  - 5. Refill the canister to the soil horizon level. After the water level drops approximately one inch, start the test. Record time versus water level as the water level drops. The percolation rate is the length of time for the water level to drop per inch. The rate of percolation shall be recorded for a minimum of one hour or until the water level has dropped a minimum of three inches after the start of measurements.
  - 6. All subgrade must be capable of drainage at a minimum of one inch per hour prior to placement of any seeded areas or planting soil. If the subgrade fails this requirement, contact the Owner to determine if a drainage layer is required.

### 3.06 BACKFILLING OF HORTICULTURAL SOIL LAYERS

- A. Soil Placement Preparation:

1. Verify that the subgrade preparations have been reviewed and accepted, including de-compaction and removal of large stones.
  2. Notify the Owner of soil placement operations at least seven calendar days prior to the beginning of work.
  3. In areas with no drainage layer, verify that the subgrade passes the minimum water infiltration requirement.
  4. Do not proceed with the installation of Seeded Area or Planting Soils, until all utility work in the area has been installed.
  5. The Contractor shall identify the locations of underground utilities prior to proceeding with soil work and shall protect all utilities from damage.
  - 6.
  7. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use plywood and/or plastic sheeting as directed to cover existing asphalt, concrete, metal and masonry work.
    - a. Clean up any soil or dirt spilled on any paved surface, including at the end of each working day.
    - b. Any damage to the paving or architectural work shall be repaired by the Contractor at the Contractor's expense.
- B. After the subgrade soils have been loosened, re-compressed and inspected, and/or Drainage Layer has been approved, or Seeded Areas and Planting Soil may be spread by using a wide track bulldozer size D-5 or smaller or may be dumped and spread with the bucket of a backhoe from the edge of the loosened area. No rubber-tired equipment or heavy equipment except for a small bulldozer shall pass over the subsoils (subgrade) after they have been loosened and recompressed. If the Contractor plans to utilize such areas for any use of heavy equipment, this work should be carried out prior to beginning the process of loosening soils or filling in that area.
- C. Placement of Planting Bed Soil, Horticultural Subsoil and Seeded Areas Soil:
1. Placement of Planting Bed Soil and plant stock shall be carried out simultaneously to prevent excessive traffic over soil lifts and to maintain the integrity of the soil layers. The contractor shall install plants simultaneously with the installation of the lower soil layers. The upper soil layers shall not be installed before all plants are installed and before the acceptance by the Owner.
    - a. After subgrade preparation and approval, in areas of tree and shrub planting with rootballs 12" in diameter or greater, crate a transition layer and place and compact Horticultural Subsoil as described in this Section.

- b. After inspection and approval of Horticultural Subsoil, place trees and shrubs in locations shown on the plans and at the proper elevations.
    - c. Create a transition layer as described in this Section. Place and compact Planting Bed Soil around trees and shrubs as described in this Section.
  2. Planting Bed Soil, Horticultural Subsoil, and Seeded Areas Soil shall be placed in lifts not to exceed 8 inches in thickness and compacted to meet minimum and maximum requirements as specified below:
    - a. A transition zone shall be formed between the prepared subgrade, drainage layer, Horticultural Subsoil, Seeded Area Soil and Planting Bed Soil by placing one inch of the upper-layer soil and raking into the lower soil to a two-inch thickness.
    - b. Planting Bed Soil shall be compacted to between 82 and 85 percent Standard Proctor.
    - c. Seeded Areas Soil shall be compacted to between 84 and 86 percent Standard Proctor.
    - d. Seeded Areas and Planting Soils shall not be compacted with vibratory equipment. must be compacted with vibratory equipment provided the moisture content is compliant with Section 329115 1.6H.
3. In all cases, the soil being placed shall be in a dry to damp condition. No wet soils shall be placed. All testing of in-place density for planting materials shall be according to ASTM D6938-10 Nuclear Methods after conducting ASTM D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
4. Prevention of compacted soils can be accomplished by beginning the work in corner, against walls, or the center of isolated beds, and progressing outwards towards the borders.
5. Seeded Areas Soil and Planting Soils shall never be moved or worked when wet or frozen.
6. The Contractor shall place barricades or steel plates as required to prevent any unnecessary compaction of planting soil from vehicles, equipment, or pedestrian traffic.
7. After Planting Soil and Seeded Area Soil has been spread, it shall be carefully prepared by hand raking. Stones and debris over one inch in any direction shall be removed from the premises. Fine grade planting beds to a smooth even surface with loose uniformly fine texture. Remove ridges and fill depressions as required to meet finish grades. Limit fine grading to areas that can be planted

immediately after grading. Maintain the finished surfaces at the grades shown and spread additional soil to correct settlement or erosion. Surface drainage shall be maintained. Soil shall be damp and free from frost during fine grading operations.

### 3.07 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 Owner 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 blends 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.
- D. 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.
- E. Till compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Owner. Planting Soil shall be tilled or replaced by the Contractor at no expense to the Owner.

### 3.08 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 kept in a central collection container. Do not bury trash and debris in back-fill.
- D. Once installation is complete, remove any excess soil from pavements or embedded in fixtures.

### 3.09 COORDINATION AND EXCESS MATERIALS

- A. Coordinate activities with other project contractors so that there is no soil disturbance from traffic or other construction activities subsequent to placement.
- B. Excess Planting Soil Mixtures and Materials: Remove the excess planting soil mixture and materials from the site at no additional cost to the Owner unless otherwise requested.

END OF SECTION



SECTION 02920  
SITE IMPROVEMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The principal Work of this Section includes, but may not be limited to:
  - 1. Relocated Boulders
  - 2. Accessible Crushed Stone Paving

1.02 RELATED WORK

- A. Section 02210 - Earth Excavation, Backfill, Fill and Grading
- B. Section 02900 Planting and Seeding

1.03 REFERENCES AND STANDARDS

- A. Where references are made in these Specifications to standard specifications, codes, etc., of the U.S. Government, State or local authorities, or professional and industrial societies and associations, the applicable portions thereof shall govern as fully as if they were recited at length herein and shall include all revisions thereto issued as of the date of the Notice to Contractors pertaining hereto.
  - 1. AASHTO: American Association of State Highway and Transportation Officials
  - 2. MA MassDOT (Massachusetts Department of Transportation) formerly Massachusetts Highway Department (MHD) "Standard Specifications for Highway and Bridges", latest edition and all supplements.

1.04 QUALITY ASSURANCE

- A. Contractor shall have at least five years of experience in Landscape Work similar in materials, design, and extent to that indicated for this project and with a record of successful landscape establishment. Installer shall maintain an experienced supervisor on the project site during all times that landscape construction is in progress. Provide written qualification data for firms and persons to be responsible for Work, to demonstrate their capabilities and experience. Include lists of completed projects, with project names, addresses, phone numbers, and names and address of designers and owners.

- B. Contractor shall attend a pre-construction conference at Project Site with the Engineer and Landscape Architect, to review landscape construction procedures, site conditions, and submittal requirements required in the Work of this Section, especially the requirements for refurbishing the salvaged boulders before any products are submitted for review and approval, or landscape construction commences.

#### 1.05 SUBMITTALS

- A. Submittals shall be made in compliance with Section 01300.
- B. Samples:
  - 1. Provide accessible crushed stone paving material for approval before installation.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism, and theft.

#### 1.07 ACCESSIBILITY AND SAFETY CODES

- A. From time to time there are changes made in the federal and /or state accessibility and/or building codes or it is determined that different codes are applicable to a site. Such determinations or changes may occur during the course of the construction of this project. If changes become necessary to meet codes a change order shall be issued by the DCR to cover statutory requirements.
- B. The 521 CMR Rules and Regulations of the AAB and ADA shall be adhered to on this project. The project must be constructed in accordance with the Wheelchair Ramp Standards booklet effective latest edition, and the Construction and Traffic Standard Details, 1996 Metric Edition, and as revised in current standard requirements.

#### 1.08 WARRANTIES/GUARANTEES

- A. The Contractor shall warrant all work of the Site Improvements, both materials and labor, for a period of not less than two years from date of Final Acceptance by the DCR. The Contractor shall be held strictly responsible for all of his work. If failure in the work develops within (2) years of the date of Final Acceptance of the work, the Contractor shall be required to replace all faulty materials at his/her full expense. To this end, the Contractor is advised to purchase materials under a warranty from the manufacturer guaranteeing proper service under the conditions, which are established by the Drawings, Specifications, and local conditions.

- B. The Contractor shall furnish labor and materials to fulfill the requirements of this warranty at no additional cost to the DCR. All labor shall include premium time to correct any faulty material or workmanship and all materials required to complete the work.

PART 2 – PRODUCTS

2.01 RELOCATED BOULDERS

- A. The boulders shall be selected by the Landscape Architect prior to installation.
- B. The boulders shall be cleaned of all dirt and stains (as practical) without damaging the structural integrity of the stone.
- C. The boulders shall be set as shown on the drawings with location and elevation verified in the field with the DCR and the Landscape Architect before final construction.

2.02 ACCESSIBLE CRUSHED STONE PAVING

- A. Refer to the Drawings for dimensions and installation. Stone shall be selected from a range of samples submitted before construction.
- B. Stone shall be durable, hard, inert, clean washed, graded crushed or ‘rotten’ granite or other crushed angular igneous stone mix meeting the following sieve analysis:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
½ in.	100
3/8 in.	75-90
No. 4	60-75
No. 100	20-40
No. 200	10-20

- C. Crushed stone material shall be light or medium grey, pink, or tan (or combination of warm colors). Clay, organic materials, rounded beach sand, bank run gravel sands, or dark gray stone are not acceptable. It is intended that some larger stone (3/8” and No. 4 or 1/4 “) be present in the graded mix and that not all material is crushed stone fines.
- D. Wood edging and anchoring pegs shall be manufactured from 1” x 6” nominal pressure treated lightly sanded Southern Yellow Pine with 2” x 4” x 18” long stakes of same material installed every 4’ on center, particularly at joints. Fasteners shall be stainless steel. A composite timber such as *Trex* may be substituted for wood edging, anchored with 18” long hot dipped galvanized steel stakes every 4’ on center. *Trex* color shall match or compliment color of the approved crushed stone mix, tan or light gray depending on approved stone.

- E. Crushed Stone Paving shall be reinforced with an 100% acrylic liquid *Soil Stabilizer* M10+50™, manufactured by Enviroseal Corporation, tel. 1 800 775-9474 email: [sales@enviroseal.com](mailto:sales@enviroseal.com) or approved equal, or dry additive, *Stabilizer*™, specifically manufactured for stabilizing crushed aggregate pedestrian paths, manufactured by *Stabilizer Solutions*, Inc. 33 South 28th St., Phoenix, AZ 85034; phone (602) 225-5900, (800) 336-2468; fax (602) 225-5902; website stabilizersolutions.com; email [info@stabilizersolutions.com](mailto:info@stabilizersolutions.com) and also available from Read Custom Soils, Canton, MA; readcustomsoils.com; tel. 1 888 875 5526 or approved equal.
- F. Path shall include a weed barrier fabric fabricated for use under stone paths or drives, laid on compacted gravel borrow base under the crushed stone layer, lapping up the wood edge sides. Fabric shall match *Dewitt Roc-Kloth*™ 3.5 ounces per SF in brown, manufactured by Dewitt, Inc; [info@dewittcompany.com](mailto:info@dewittcompany.com); tel; 1 800 888 9669 or approved equal meeting performance and materials specification, Fabric shall be installed with six-inch overlap minimum.

#### 2.03 ADA PARKING SIGNAGE

- A. Signs and posts as shown on Drawings and conforming to MUTCD standards for the type of sign indicated. For signs, see latest edition of MassDOT Standard Specifications.
- B. Posts shall be 1 ½”-2” outside diameter hot-dip galvanized schedule 40 steel tubing in concrete footing.

#### 2.04 BASE COURSES

- A. Gravel base courses typically shall meet the requirements of gravel Borrow type b of the Standard Specifications and SECTION 02210 - Earth Excavation, Backfill, Fill and Grading

### PART 3 – EXECUTION

#### 3.01 EXCAVATION

- A. 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 specified and approved compacted infill material as reviewed by the Designer.
- B. Contractor shall verify location of existing structures and utilities prior to excavation and to contact DIG-SAFE before construction. Contractor shall ensure all surrounding structures are protected from the effects of excavation. Excavation support, if required, is the responsibility of the Contractor.

### 3.02 GENERAL

- A. Examine all surfaces and contiguous elements to receive Work of this and related Sections. Report to the Designer any defect or anomaly that may affect the Work and correct, as part of the Work of this Contract, any defects that may affect installation. Commencement of work will be construed as complete acceptability of base surfaces and contiguous elements.

### 3.03 INSPECTIONS

- A. Contractor shall request that the Designer review in the field the layout and proposed elevations of the following items with 48 hours notice for the following items:
  - 1. Site samples and/or field mock-ups of site improvements
  - 2. Layout of all Site Improvements

### 3.04 FIELD CONDITIONS

- A. Cold-weather procedures shall be followed during construction when ambient temperature falls below 40°F (4°C) for the installation of cementitious materials or the temperature of stone is below 40°F.
  - 1. All material and ground with which stone is to come in contact shall be free from frost, ice, snow, and puddles.

### 3.05 SITE IMPROVEMENTS INSTALLATION

- A. All items located on the drawings shall be fabricated and installed by the Contractor as detailed on the Drawings, as reviewed by the Designer.
- B. Mark locations of all items in the field for approval by the Designer before commencing installations.
- C. Construct finished grades of stone dust pavement, subgrades, not to exceed minimum longitudinal slopes (1/2 percent) or maximum longitudinal slopes (4.9%) (unless curb ramp <8%) or maximum cross slopes (2%) or as shown on the Drawings, to insure proper drainage. Inform the Designer if these requirements cannot be met on site before construction. Ensure that adjacent landscape areas drain away from landscape pavements and ensure that puddling does not occur.
- D. Any incidence of damage, vandalism, or theft of any item during installation shall be reported immediately to the Designer, remedial action shall be decided, and repairs made to the satisfaction of the Designer. The Contractor is required to secure all items of the Work from access by the Public until Final Acceptance, unless otherwise permitted by the DCR.

### 3.06 RELOCATED BOULDERS

- A. Install at locations shown on the drawings, and locations as approved and directed by the Owner.

### 3.07 ACCESSIBLE CRUSHED STONE PAVING INSTALLATION

### 3.08 BASE COURSES

- A. Install all base courses as shown on the Drawings and ensure positive pitch according to the Drawings.
- B. Crushed stone paving shall be installed on weed barrier fabric on compacted Gravel Borrow type b laid on compacted subgrade to line, grades, and dimensions shown on the Drawings. The Contractor shall verify that path grades do not exceed ADA maximum allowable slopes in the field before final construction. Review layout and grading with the Designer before final construction and notify Designer if discrepancies are discovered that would affect meeting these requirements.
- C. Wood Edges and Weed Barrier Fabric: Wood edges shall be installed plumb and to radial and tangent lines and grades shown on the Drawings, securely set into compacted subgrade with top of edge flush with top of finished, compacted loam and/or mulch as applicable. Edges shall be securely anchored with wood pegs snugly fitting against wood edges and set slightly below finished grade of crushed stone surfacing. Top of edging shall be smooth and joints tight and aligned before installation of Crushed Stone Paving. Specified weed barrier fabric shall be installed on compacted subbase with minimum 6" horizontal overlap and extending up vertically to two inches below finished grade of crushed stone path. Fabric shall not be exposed or visible from the surface of the path.
- D. Environmental Conditions: Crushed Stone Paving shall not be installed when rain has occurred for 48 hours prior to installation, when subgrade or crushed stone is wet or freezing, when rain is expected within 24 hours of construction, or when ambient temperature is at or less than 45 degrees F. or more than 85 degrees F. Application of stabilizer shall be performed for entire length of pathway at one time, and not in short, discrete sections.
- E. Installing Path Stabilizer: Follow manufacturer's instructions for installing path stabilizer product. Application and compaction procedures vary. The following is provided for costing purposes.
  - 1. Install crushed stone paving with stabilizer only when temperature is above 40 degrees F. and is not expected to fall within 72 hours; when temperature is below 90 degrees F.; and when no rain is expected within 72 hours. Do not install over wet, contaminated, uncompacted, or frozen Gravel Borrow Base or subbase.

2. Crushed stone with stabilizer shall be installed on compacted gravel borrow base on approved weed barrier fabric with wood edges. All materials and product application shall be based on approved field mockup and review of proposed crushed stone by Manufacturer with specific recommendations for application procedures and environmental requirements by the Manufacturer.
3. Liquid *Enviroseal*<sup>TM</sup> M10+50 Application:
4. *Enviroseal*<sup>TM</sup> shall be mixed with approved Crushed Stone a minimum of six gallons to a maximum of ten gallons of stabilizer per cubic yard of stone, well mixed, in a rate of gallons per cubic yard determined by the Manufacturer from test results submitted before construction. The Contractor shall provide a minimum of five pounds of the approved crushed stone mix to the Manufacturer for this purpose of testing and developing application rates for field mockup.
  - a. Schedule: The Contractor shall allow enough time for the Manufacturer to test the approved stone mix and stabilizer, to make recommendation for application rate, and for construction of field mockup with stabilizer for review and approval before final construction of the Crushed Stone Paving begins. The Contractor shall schedule construction so that application and mixing of stabilizer and stone and path compaction shall be performed for an entire length or area of pathway in one application, and not in discrete sections over multiple days' time.
  - b. The stabilizer should be installed on a dry sunny day with a forecast of three dry days after installation.
  - c. Added Water Calculation with *Enviroseal*<sup>TM</sup>: Additional clean water may or may not be required to apply with the stabilizer product and stone mix during construction, as the difference between the on-site moisture content of the stone mix at time of application and the optimum moisture content required for compaction as evidenced by the dry density weight of the stone mix (95% dry density compaction as demonstrated and based on Manufacturer's recommendations for proportions of stabilizer, water, and specified, tested stone and existing conditions).
  - d. Mixing *Enviroseal*<sup>TM</sup>, or dry mix *Stabilizer*<sup>TM</sup> follows Manufacturer's instructions for installing path stabilizer, water, and stone mix. The following is provided for costing purposes: The top (4) inches of stone mix shall be blended with the stabilizer pre-blended with water (see par. 2) allowing (1) additional inch of stone mix assuming approximately 20% reduction in crushed stone thickness to 4 inches after compaction. Completely mix the full depth of stone material, stabilizer, and water with a soil mixer or tiller, thoroughly and evenly blending all the materials together. Follow Manufacturer's recommendations for achieving thorough and even mixing in the field.

5. Or dry mix *Stabilizer*<sup>TM</sup> follows Manufacturer's instructions for installing path stabilizer. The following is provided for costing purposes:
  - a. Blending *Stabilizer*<sup>TM</sup>: Pre-blend 12- 16 lbs. of *Stabilizer*<sup>TM</sup> product (exact amount of *Stabilizer*<sup>TM</sup> shall be specified by the Manufacturer based on tests with specific stone provided by the Contractor to the Manufacturer for that purpose before construction and from approved field mockup) mixed uniformly with absolutely dry crushed stone mix with mixer. Bucket mixing by hand or mixing with rake or shovel is not acceptable.
  - b. Placement: After pre-blending, place the stabilized aggregate on approved weed barrier fabric laid on prepared subbase. Level to desired grade (assume approximately 1-inch additional stone mix to allow for compaction) to desired grade and cross section.
  - c. Water entire pathway evenly for full –depth moisture penetration to the base of the crushed stone profile, as water activates the *Stabilizer*<sup>TM</sup>. Apply approximately 25-45 gallons of water per 1-ton of crushed stone, quantity to be accurately determined by the Contractor from approved field mockup and as recommended by the Manufacturer. Test to ensure full depth and even penetration without oversaturating base course and eroding top course of stone.
  
6. Compaction after Application of Stabilizer:
  - a. Liquid *Enviroseal*<sup>TM</sup> stabilizer: Wait for a minimum of six hours and up to 48 hours after placement to compact crushed stone paving. Compact the crushed stone path with *Enviroseal* stabilizer with 3–5-ton non-vibratory drum roller to 85-95% dry density. Do not use vibratory equipment as larger stones will fall to the bottom. Roll evenly with care not to damage the wood edging during compaction operations. Follow manufacturer's instructions for timing of compaction after stabilizer application.
  - b. *Stabilizer*<sup>TM</sup>: Upon thorough moisture penetration, compact aggregate screenings to 85% -95% dry density compaction with a 4-to-5-ton double drum roller, depending on depth of pathway to achieve density value. Do not use a vibratory plate compactor or vibration function on roller with *Stabilizer*<sup>TM</sup> product as vibration will separate large aggregate particles and path will not set up properly. Lightly mist surface of aggregate with clean water if surface has dried significantly more than subbase.



7. Finished surface of crushed stone paving shall be smooth, uniform, and solid, flush with top of wood edging. There shall be no evidence of chipping or cracking, or spongy areas. Loose material should not be present on the surface after installation but may appear in time. Top off or repair shall be minimal (less than 5% of path and less than ¼ inch depth) and shall be mixed into crushed stone material after topping off, misted in, and recompact to 85% minimum dry density with drum roller, meeting all compaction and line and grade requirements specified. Repair of pathway or reconstruction will require complete full depth reinstallation of the approved stone mix and original approved stabilizer as specified and as reviewed in the field.

### 3.09 ADA PARKING SIGNAGE AND PARK SIGN

- A. ADA Parking Signage and Park Sign shall be installed per the MassDOT Standard Specifications Section 828.
- B. Post signs shall be plumb and level, secure and clean for acceptance.

END OF SECTION

## SECTION 02930

### LANDSCAPE MAINTENANCE

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION

- A. Provide labor, materials, equipment, services, and transportation to complete work.
  - 1. Plant and turf maintenance including pruning, watering, drainage, irrigation, fertilizing, weed and pest control, and adjusting tree guys.
  - 2. Guaranty and replacement of unacceptable plants.
  - 3. Providing Owner with Maintenance Manual.

##### 1.02 RELATED WORK

- A. Section 02910 – Planting Soils for fertilizers and soil amendments
- B. Section 02900 – Planting and Seeding for related practices.

##### 1.03 REFERENCES

- A. Comply with applicable requirements of:
  - 1. MA Mass DOT (Massachusetts Department of Transportation) formerly Massachusetts Highway Department (MHD) Standard Specifications (for Highways and Bridges), 1988 editions, including all addenda.
  - 2. 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.

##### 1.04 DEFINITIONS

- A. Maintenance: consists of keeping turf, woody, perennial and annual plants in healthy growing condition including watering, weeding, cultivating, remulching, tightening and repairing of guys, removal and replacement of dead plant material, resetting plants to proper grades or upright positions and maintaining saucer.

##### 1.05 SUBMITTALS

- A. Submittals: in accordance with 01300 - Submittals
- B. Materials List: provide list of materials to be used in maintenance; materials shall be the same as approved in related sections.
- C. Pest and Disease Treatment

1. Submit plan for pest and disease treatment; identify proposed materials and methods.
2. Explain why a problem does or may exist.

#### D. Maintenance Manual

1. Provide a maintenance manual to Owner describing operations for on-going upkeep of the installed plants. The manual shall address itself to specified types and uses of plants installed and provide information for care of both newly installed plants and long-term maintenance.
2. Provide specific information on the following items:
  - a. Watering: Watering season; diagnosis of watering need; frequency of watering; amount; time of day; methods and equipment; equipment maintenance.
  - b. Fertilization: Fertilizing seasons; analysis for fertilizer selection; application rates and methods; preparation and conditions; application times; application equipment; post-application operations and care; precautions for fertilizer use.
  - c. Liming: Liming season; analysis for liming; application rate; method and equipment for application.
  - d. Pruning: Pruning goals and purposes; methods and techniques (relate to species); equipment; season; cleanup and disposal; precautions.
  - e. Mulching of beds: Depths of mulch; refreshment and replacement of mulch.
  - f. Miscellaneous plant maintenance: Weeding and weed control; pest and disease control; leaf and litter removal; bed edging; professional assistance for plant care; and plant replacement as necessary.
3. Include a month-by-month calendar of maintenance procedures, indicating operations listed above.
4. Include a developed Record Keeping document to be completed by the maintenance staff and submitted weekly to the Owner's Representative during active maintenance period.
5. Submit a copy of maintenance manual to Owner's Representative for approval. Submit prior to planting completion. Owner's Representative may request revisions to manual to meet intent of project design.
6. Submit three copies of manual to Owner at acceptance meeting for planting work. Acceptance shall not be granted until manual has been submitted and approved.

## 1.06 QUALITY ASSURANCE

A. Qualifications: contractor shall have minimum five years experience in landscape maintenance.

### B. Regulatory Requirements

1. Secure permits, licenses, and pay fees including traffic control.
2. Comply with laws, regulations, and quarantines for agricultural and horticultural products.

## 1.07 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: deliver materials in unopened containers bearing the manufacturer's name. Transport materials without damage. Protect finishes from abrasion, dirt, oils, grease, and chemicals. Pack materials to protect from weather.

B. Acceptance at Site: verify in writing that delivered materials conform to specifications and approved submittals.

### C. Storage and Protection:

1. Store materials in dry place, on pallets, off the ground; protect from sun.
2. Protect materials from theft, damage, weather, dirt, oils, grease, and construction.

## 1.08 PROJECT/SITE CONDITIONS

A. Environmental Requirements: do not work soils when dry, wet, or frozen.

### 1. Field Test

- a. Form soil in palm of hand, if soil retains shape and crumbles upon touching, the soil may be worked.
- b. If soil will not retain shape it is too dry and should not be worked.
- c. If soil retains shape and will not crumble, it is too wet and should not be worked.

B. Planting Seasons: see Section 02900 Planting and Seeding

## 1.09 SUBSTANTIAL COMPLETION

A. Upon completion of planting, request Owner's Representative's review to determine if work is substantially complete. If work is complete, Owner's Representative will issue a Letter of Substantial Completion that establishes the effective date of the start of the 60 day Maintenance Period for turf, and 18 months for all plantings.

1. If work is not substantially complete, Owner's Representative will make a list of outstanding work to be done on a timely schedule agreed upon by Contractor and Owner's Representative.
2. Contractor shall notify Owner's Representative when outstanding work is accomplished and ready for review. When outstanding work is complete, in the judgment of Owner's Representative, a Letter of Substantial Completion will be issued.

#### 1.10 PRELIMINARY ACCEPTANCE

- A. After the Letter of Substantial Completeness the work will be reviewed for completeness and of Preliminary Acceptance
- B. Plantings and turf shall be in thriving and vigorous condition at the time of review for Preliminary Acceptance. If plantings and turf are acceptable, Owner's Representative will issue a Letter of Preliminary Acceptance establishing the effective date of the Guaranty Period.
  1. If plantings are not thriving, in the judgment of Owner's Representative, remedial actions by Contractor will be required to repair or replace plantings.
  2. Remedial work shall be done immediately and in accordance with related work of other sections.
  3. At the conclusion of remedial work, Owner's Representative will review work and extend the Guaranty Period to incorporate new plantings.

#### 1.11 FINAL ACCEPTANCE

- A. After the 90 day / 2 year Maintenance and Guaranty Period, turf / plantings will be reviewed.
- B. Plantings and turf shall be in thriving and vigorous condition at the time of review for Final Acceptance. If plantings and turf are acceptable, Owner's Representative will issue a Letter of Final Acceptance.
  1. If plantings and turf are not thriving, in the judgment of Owner's Representative, remedial actions by Contractor will be required to replace plantings.
  2. Remedial work shall be done immediately and in accordance with related work of other sections.
  3. At the conclusion of remedial work, Owner's Representative will review work and extend the Maintenance and Guaranty Period until plantings are deemed acceptable.

### PART 2 – PRODUCTS

## 2.01 MATERIALS

A. Materials utilized during the maintenance period shall be the same specified in the work of the related sections:

1. Section 02701 – Exfiltrating BioInfiltration Areas
2. Section 02900 Planting and Seeding
3. Section 02910 Planting Soils

## 2.02 BIOLOGICAL, HORTICULTURAL, HERBICIDAL AND OTHER PEST CONTROL

A. Material Specification: shall be by a licensed pest control operator, with authority to purchase, utilize, and specify agricultural chemicals and agricultural products.

B. Use the least hazardous, least intrusive materials and methods.

## 2.03 EQUIPMENT

A. Vehicles: in good working order so oil and grease does not stain pavements and poison plantings. Signs identifying the vehicles shall be clearly displayed.

B. Machinery: in good working order so oil and grease does not stain pavements and poison plantings.

## 2.04 WATER

A. Water: Furnished by Contractor, suitable for irrigation and free from ingredients harmful to plant life.

B. Hoses and other watering equipment to be furnished by Contractor.

## PART 3 – EXECUTION

### 3.01 REASONABLE MAINTENANCE PRACTICES

A. Contractor shall be responsible for all maintenance activities that will promote good plant growth. Reasonable maintenance practices may be dictated by MassDCR and/or the Town of Oxford..

### 3.02 EXAMINATION

A. Verification of Conditions: in the event field conditions are not as shown on Drawings and outlined in the Specifications, notify Owner's Representative in writing.

### 3.03 PREPARATION

A. Protection:

1. Agricultural Chemicals: protect site improvements from contact with agricultural chemicals, soil amendments, and fertilizers.

### 3.04 DRAINAGE

- A. Observe drainage in plant pits with hand soil augur.
- B. Verify plant pits are draining; plant pits not draining shall be identified on the plan and brought to the attention of Owner's Representative.

### 3.05 IRRIGATION

- A. Water at a rate of one inch of water every five to seven days. Apply water such that it penetrates the soil to a depth of 6".
- B. Trees require a minimum of ten gallons each and shrubs a minimum of five gallons each per week.
- C. If spring or fall months experience below average rainfall, periodic watering could be extended as part of this contract and at no additional charge as requested by Owner's Representative.
- D. If natural rainfall provides water to meet watering requirements, weekly watering could be reduced but only at the request of Owner's Representative.
- E. Water trucks shall NOT be allowed to drive on sidewalks to water turf and plantings. Temporary irrigation shall be provided to minimize site and user impacts.
- F. Watering schedule shall be deep watering to promote strong drought resistant root growth.

### 3.06 FINISH GRADE

- A. Maintain finish grades around plantings, at pavement edges, and at irrigation fixtures.

### 3.07 MULCH

- A. Maintain mulch at 2" depth in planting areas with the exception of at stems and trunks of plants where mulch to be placed to a 0" depth and increasing to a depth of 2" at edge of rootballs and beyond.

### 3.08 MOWING

- A. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowing to maintain the following grass height: Mow to a height of 2 1/2 inches to 3 inches.

### 3.09 TREATMENT OF PEST AND DISEASES

- A. Spray for both insect pests and diseases during maintenance period with notification and permission of Owner's Representative. Apply herbicides, insecticides and fungicides as prescribed by their manufacturer and in accordance with State laws. Contractor shall possess from the Commonwealth of Massachusetts the proper registrations and permits for application of materials or have applications made by approved, qualified firm holding registrations and permits. Furnish copies of permits in connection with materials to Owner's Representative. Spraying to be considered only after full consideration has been given to alternative pest control strategies. The least toxic approach to pest control shall be used.

### 3.10 ADJUSTING

- A. Re-set settled plants to proper grade and position.
- B. Restore planting saucer and adjacent material.

### 3.11 CLEANING

- A. Clean up, remove and dispose off-site excess planting mixture, soil and debris generated under work of this section.
- B. Remove and dispose of stakes, guys and other accessories at end of Guaranty Period.
- C. Wash and sweep clean site improvements and building surfaces. Clean spills and oversprays immediately.
- D. Repair damage caused by maintenance operations.

### 3.12 PROTECTION

- A. Protect work of this section until Final Acceptance.
- B. Protect planted areas and soils from compaction by construction traffic and from contamination by construction materials.

END OF SECTION



SECTION 03100  
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide design and furnish materials for fabricating, erecting and removing formwork, false work and shoring for cast-in-place concrete as shown on the contract drawings and specified herein for a complete installation. The use of stay-in-place forms is expressly prohibited.
- B. Use formwork to cast all cast-in-place concrete structures.
- C. Provide and remove all formwork for architectural, civil, mechanical, and electrical work as shown on the drawings or specified under specified under those disciplines.

1.02 REFERENCES:

- A. American Concrete Institute (ACI):
  - 1. [117/117R](#): Standard Tolerances for Concrete Construction and Materials.
  - 2. [309.2R](#): Identification and Control of Visible Effects of Consolidation on Formed Concrete Surfaces.
  - 3. [318/318R](#): Building Code Requirements for Structural Concrete and Commentary.
  - 4. [347](#): Guide to Formwork for Concrete.
  - 5. [350/350R](#): Code Requirements for Environmental Concrete Structures and Commentary.
- B. Engineered Wood Association (APA)
- C. National Institute of Product Standards and Technology
  - 1. Voluntary Product Standard PS 1 Structural Plywood

1.03 DESIGN REQUIREMENTS:

- A. Design formwork in conformance with methodology of ACI 347R for anticipated loads, lateral pressures, depth of concrete placement and rate of concrete placement. Design shall consider any special requirements due to the use of self consolidating, plasticized and/or retarded set concrete. All forms and shoring shall be designed at the contractor's expense.

1.04 QUALIFICATIONS:

- A. Formwork Designer: Formwork, false work, and shoring design shall be by an engineer licensed in the state where the Project is located.

1.05 SUBMITTALS:

- A. Submit product data for form ties, spreaders, chamfer strips, rustication strips, form liners, form coatings, and bond breakers.
- B. Submit following shop drawings in accordance with 01300.
  - 1. Layout of panel joints and tie hole pattern for architectural formwork.
  - 2. Form Ties: Submit data sheets for form ties proposed for use.
  - 3. Form Ties-Tapered Through-Bolts: Proposed method of sealing and patching form tie holes.

1.06 QUALITY ASSURANCE:

- A. Comply with requirements in section 01400 and as specified.
- B. Design of Formwork:
  - 1. The Contractor shall assume responsibility for the design, engineering and construction of formwork. Forms shall be designed to produce concrete members identical in shape, lines and dimensions to members shown on the Contract Documents.
  - 2. When high range water reducer (superplasticizer) is used in concrete mix or when self consolidated concrete is specified, forms shall be designed for full hydrostatic pressure per ACI 347.
  - 3. The formwork shall be designed for the loads and lateral pressures in accordance with ACI 347 and wind loads as specified by the local building code.
  - 4. Construction and contraction joints, openings, offsets, keyways, recesses, moldings, chamfers, blocking, screeds, bulkheads, waterstops, anchorages, inserts, and other features shall be provided.
  - 5. Formwork shall be designed to be readily removable without impact, shock, or damage to 'green' concrete surfaces and adjacent materials.
  - 6. The maximum panel deflection shall be  $L/360$  of the span between structural members.
- C. Unless otherwise specified herein, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits as given in ACI 117.

- D. Materials, fabrications and workmanship found defective shall be promptly removed and replaced and new acceptable work shall be provided in accordance with Contract requirements at no additional cost to the owner.

1.07 DELIVERY, STORAGE AND HANDLING:

- A. Comply with the requirements in section 01610.
- B. Materials shall be delivered to the site in an undamaged condition and at such intervals as will avoid delay in the work.
- C. Material shall be stored and protected in a clean, properly drained location. Material shall be kept off the ground under a weather-tight covering permitting good air circulation. Formwork materials shall be stored on dry wood sleepers, pallets, platforms or other appropriate supports which have slope for positive drainage. Materials shall be protected from distortion, excessive stresses, corrosion and other damage. Materials shall not be stored on the structure in a manner that might cause distortion or damage to the supporting structure.

PART 2 - PRODUCTS

2.01 LUMBER:

- A. Lumber used in form construction shall be Douglas fir, No. 2 grade, S4S, Standard Grading and Dressing Rules No. 16, West Coast Lumber Inspection Bureau; or Southern Yellow Pine, No. 2, S4S, Standard Grade Rules Southern Pine Inspection Bureau. Boards shall be 6 inches or more in width.

2.02 PLYWOOD:

- A. Only grade-marked plywood conforming to APA shall be provided.
- B. Plywood used in form construction shall be Grade B-B, Class 1 plyform, mill-oiled, and sanded on both sides in conformance with U.S. Product Standard PS 1 Structural Plywood.
- C. Thickness shall be sized to maintain alignment and surface smoothness, but not less than 5/8-inch thick.

2.03 STEEL FORMS:

- A. Commercial grade sheets not less than 16 gage shall be provided.
- B. Stock material that is free from warps, bends, kinks, cracks, and rust or other matter that could stain the concrete shall be provided.

## 2.04 FORM MATERIAL LOCATIONS:

### A. Wall Forms:

1. Materials: Plywood, hard plastic finished plywood or steel in new and undamaged condition, of sufficient strength and surface smoothness to produce specified finish.

### B. All Other Forms: Materials as specified for wall forms.

### C. Chamfer Strips: Nonabsorbent material, compatible with form surface, fully sealed on all sides prohibiting loss of paste or water between the two surfaces.

## 2.05 FORM TIES:

### A. Locate form ties on exposed surfaces in a uniform pattern. Place form ties so they remain embedded in the concrete except for a removable portion at each end. Form ties shall have conical or spherical type inserts with a maximum diameter of 1 inch. Construct form ties so that no metal is within 1-1/2 inch of the concrete surface when the forms, inserts, and tie ends are removed. Do not use wire ties. Ties shall withstand all pressures and maintain forms within acceptable deflection limits.

### B. Flat bar ties for panel forms shall have plastic or rubber inserts having a minimum depth of 1-1/2 inch and sufficient dimensions to permit patching of the tie hole.

### C. Tapered form ties shall be tapered through-bolts or through-bolts that utilize a removable tapered sleeve.

### D. Water Stop Ties: For water-holding structures, basements, pipe galleries, and accessible spaces below finish grade, furnish one of the following:

1. Integral steel water stop 0.103 inch thick and 0.625 inch in diameter tightly and continuously welded to tie.
2. Neoprene water stop 3/16-inch thick and 15/16 inch diameter whose center hole is one-half diameter of tie, or molded plastic water stop of comparable size.

### E. Elastic Vinyl Plug:

1. Design and size of plug shall allow insertion with tool to enable plug to elongate and return to original length and diameter upon removal forming watertight seal.
2. Manufacturer:
  - a. Dayton Superior; A58 Sure Plug.
  - b. Or acceptable equivalent product.

### F. Mechanical EPDM Rubber Plug:

1. Mechanical plug for taper tie
2. Manufacturers:
  - a. Sika Greenstreak, St. Louis, MO; X-Plug
  - b. Or acceptable equivalent product.
3. Friction fit plugs shall not be allowed.

2.06 BOND BREAKER:

- A. Bond breaker shall be a V.O.C.-compliant nonstaining type that will provide positive bond prevention.
- B. Manufacturers:
  1. Edoco Burke; Clean Lift 90 W.B..
  2. Nox-Crete, Inc.; Silcoseal 97EC.
  3. Or acceptable equivalent product.

2.07 FORM CAULKING:

- A. Form caulking shall be a one-component, gun-grade silicone sealant that is capable of producing flush, watertight and non-absorbent surfaces and joints. Sealant shall be compatible with the type of forming material and concrete ingredients used.
- B. Products:
  1. Series 1200 Construction Caulking; GE Silicones.
  2. Dow Corning 999-A; Dow Corning Co..
  3. Sikasil WS-295; Sika Corporation.
  4. Or acceptable equivalent product.

2.08 CHAMFER STRIPS:

- A. Provide 3/4 inch by 3/4-inch chamfer strips milled from clear, straight-grain pine, surfaced each side or extruded vinyl type with or without nailing flange unless otherwise shown on the Contract Documents.

2.09 INSERTS:

- A. Provide galvanized cast steel or galvanized welded steel inserts, complete with anchors to concrete and fittings such as bolts, wedges and straps.

2.10 DOVETAIL ANCHOR SLOTS:

- A. Provide dovetail anchor slots manufactured from 22 gage, galvanized steel with removable felt or polyurethane.

2.11 FORM RELEASE AGENT:

- A. Form release agent shall not bond with, stain, or adversely affect concrete surfaces and shall not impair subsequent treatments of concrete surfaces. Form release agent shall be a ready-to-use water-based material formulated to reduce or eliminate surface imperfections and containing no mineral oil or organic solvents.
- B. Manufacturers and Products:
  - 1. BASF; MBT, Rheofinish 211.
  - 2. Cresset Chemical Company; Crete-Lease 20-VOC.
  - 3. Unitex Chemicals; Farm Fresh.
  - 4. Symons Corporation: Magic Kote
  - 5. Or acceptable equivalent product.

PART 3 - EXECUTION

3.01 FORM TOLERANCES:

- A. Comply with the requirements of ACI 117 for tolerances for formed surfaces except as specified in Table 03100-1.

<b>Table 03100-1</b>	
Vertical alignment (plumbness)	1/4-inch in any 10 feet and 1-inch maximum for entire length
Variation in the lines and surfaces of foundation mats, base slabs and walls	1/4-inch in any 10 feet and 1-inch max. for entire length
Variation from the level or from the grades indicated on the drawings	1/4-inch in any 10 feet
Variation of the linear building lines from established position in plan	1/2-inch in any 20 feet and 1-inch maximum for entire length
Variation of distance between walls	1/4-inch in any 10 feet and 1-inch maximum for entire length and height
Variation in the sizes and locations of sleeves, floor openings and wall openings	Minus 1/4-inch. Plus 1/2-inch.
Variation in cross-sectional dimensions of columns and beams and in the thickness of	Minus 1/4-inch. Plus 1/2-inch.

slabs and walls	
Offset between adjacent panels of formwork facing material	1/2-inch (ACI 117 Class C finish).
Offset between adjacent panels of formwork facing material for exposed surfaces where appearance is of importance	1/8-inch (ACI 117 Class A finish).

- B. Tolerances are not cumulative
- C. Where equipment is to be installed, comply with manufacturer's tolerances if more restrictive than above.
- D. Failure of the forms to produce the specified concrete surface and surface tolerance shall be grounds for rejection of the concrete work. Rejected work shall be repaired or replaced at no additional cost to the Owner.

3.02 PREPARATION:

- A. Clean form surfaces to be in contact with concrete of foreign material prior to installation. Tape, gasket, plug, and/or caulk joints, gaps, and apertures in forms so that the joint will remain watertight and withstand placing pressures without bulging outward or creating surface irregularities.
- B. Coat form surfaces in contact with concrete with a form release agent prior to form installation.
- C. Keep form coatings off steel reinforcement, items to be embedded, and previously placed concrete.
- D. Steel Forms: Apply form release agent to steel forms as soon as they are cleaned to prevent discoloration of concrete from rust.
- E. Form liners for architectural concrete finish shall be installed in accordance with the manufacturer's recommendations.

3.03 ERECTION AND INSTALLATION:

- A. Forms shall be constructed in accordance with ACI 347 to required dimensions, plumb, straight and mortar tight. Forms shall be substantial, properly braced, and tied together to maintain position and shape and to resist all pressures to which they may be subject. Unless otherwise indicated on the Contract Documents, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits in ACI 117 and herein specified.
- B. Provide means for holding adjacent edges and ends of form panels tight and in accurate alignment to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete.

- C. Provide one cleanout and inspection opening 12 inches wide by 18 inches high every 7 feet at the bottom of each lift of forms.
- D. Provide exterior corners of concrete members with chamfers as specified.
- E. Provide means for removing forms without injury to the surface of finished concrete.
- F. Do not embed any form-tying device or part thereof other than metal in the concrete.
- G. Locate large end of taper tie on the "wet" side of the wall.
- H. Use only form or form-tying methods that do not cause spalling of the concrete upon form stripping or tie removal.
- I. Form surfaces of concrete members except where placement of the concrete against the ground is shown in the drawings or as indicated below. The dimensions of concrete members shown in the drawings apply to formed surfaces, except where otherwise indicated. Add 2 inches of concrete where concrete is placed against trimmed undisturbed ground in lieu of forms. Placement of concrete against the ground shall be limited to footings and other nonexposed concrete and only where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing.
- J. Provide openings with continuous keyways and water stops. Provide a slight flare to facilitate grouting and the escape of entrained air during grouting. Provide formed openings with additional reinforcement as shown in the typical structural details. Reinforcing shall be at least 2 inches clear from the opening surfaces and encased items.
- K. Set anchor bolts and other embedded items accurately before placing concrete and hold securely in position until the concrete is placed and set. Check special castings, channels, or other metal parts that are to be embedded in the concrete prior to and again after placing concrete. Check nailing blocks, plugs, and strips necessary for the attachment of trim, finish, and similar work prior to placing concrete.

#### 3.04 PROTECTION:

- A. During installation, the forms shall not be used as a storage platform nor as a working platform until the forms have been permanently fastened in position.

#### 3.05 PIPES AND WALL CASTINGS CAST IN CONCRETE:

- A. Install wall castings, wall flanges, and wall anchors before placing concrete. Do not weld, tie, or otherwise connect the wall castings or anchors to the reinforcing steel.
- B. Pipes or wall castings located below operating water level shall have water stop ring collars and shall be cast in place. Do not block out such piping and grout after the concrete section is cast unless permitted, authorized or directed by the Engineer. Pipes fitted with thrust rings shall be cast in place.



3.06 REMOVAL OF FORMS:

- A. Forms shall be removed in accordance with ACI 347 recommendations without damage to concrete and in a manner to ensure complete safety to the structure. Forms, form ties and bracing shall not be removed without specific permission of the Contractor's Registered Professional Engineer.
- B. The following table indicates the minimum allowable time after the last cast concrete is placed before forms, shoring, or wall bracing may be removed; during which the air surrounding the concrete is above 50 degrees F.

<b>Table 03100-2</b>	
Sides of footings and encasements; Walls; Vertical sides of slabs, beams, girders; Columns; Similar members not supporting loads.	24 hours
Bottom forms of slabs, beams, and girders; and shoring for slabs, beams, and girders with immediate reshoring.	Until concrete strength reaches 70 percent specified 28-day strength
Bottom forms of slabs, beams, and girders; and shoring for slabs, beams, and girders without reshoring	Until concrete strength reaches specified 28-day design strength

- C. Removal times will be increased if the concrete temperature following placement is permitted to drop below 50 degrees F.
- D. Do not remove supports and reshore.

3.07 PATCHING OF TAPERED TIE HOLES:

- A. Clear tie hole of all loose debris with a taper tie void brush and flush debris from tie hole with air or water.
- B. Install plug from larger tie hole end in accordance with manufacturer's instructions using an insertion tool as recommended by the manufacturer.
- C. Fill each side of hole with mortar. Apply mortar to the "wet" side of the wall first. Consolidate mortar solidly into the hole.

3.08 CLOSEOUT:ACTIVITIES:

- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 03200

### CONCRETE REINFORCEMENT

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Provide concrete reinforcement as indicated and specified:
  - 1. Section Includes:
    - a. Reinforcement bars.
    - b. Welded wire reinforcement.
    - c. Reinforcement accessories.
- B. Provide concrete reinforcement for civil and mechanical, as shown on the drawings or specified under those disciplines.

##### 1.02 REFERENCES:

- A. ASTM International (ASTM):
  - 1. [A184](#): Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
  - 2. [A615](#): Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - 3. [A616](#): Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement.
  - 4. [A617](#): Standard Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement.
  - 5. [A706](#): Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
  - 6. ASTM A1064/A1064M - Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
- B. American Concrete Institute (ACI):
  - 1. [301](#): Standard Specification for Structural Concrete.
  - 2. [315](#): Details and Detailing of Concrete Reinforcement.

3. [318](#): Building Code Requirements for Structural Concrete.
4. [350](#): Building Code Requirements for Environmental Engineering Concrete Structures

C. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Standard Practice.
2. Placing Reinforcing Bars.

D. American Welding Society (AWS):

1. [D1.4](#): Structural Welding Code, Reinforcement Steel.

E. Where reference is made to one of the above standards, the version in effect at the time of bid opening shall apply.

1.03 SUBMITTALS:

A. Unless otherwise acceptable to the Engineer, each submittal shall include reinforcement only for a single structure or part thereof. Shop drawings depicting multiple structures on the same sheet are not acceptable.

B. Shop Drawings:

1. Submit bar lists and placing drawings for all reinforced concrete and masonry structures in accordance with Section 01300.
2. Detail reinforcement in conformance with ACI 315.
3. Clearly indicate bar sizes, spacing, locations, quantities and total weight of reinforcement steel and wire reinforcement, bending schedules, and supporting and spacing devices. Show joints, with applicable joint reinforcement and waterstops.
4. Coordinate bar splicing and placement with Contractor's concrete placing schedule and joint locations. Do not add or delete joints without permission from the Engineer.
5. Show wall reinforcement in elevation. Show entire elevation of wall from top to bottom and end to end. Do not show partial elevations. Show all dowels, joints and pockets in walls.
6. Show slab reinforcement in plan view. Show all dowels, joints, openings and recesses in slabs.
7. Show location and size of all penetrations greater than 12-inches in diameter or least dimension of the opening with the corresponding added reinforcement around the penetrations.

8. Clearly show marking for each reinforcement item.
  9. Indicate locations of reinforcement bar cut-offs, splices and development lengths.
- C. Submit Certificates: Submit AWS qualification certificates for welders employed on the Work for the appropriate electrode and class of material. Testing shall be conducted and witnessed by an independent testing laboratory prior to welding reinforcement in work. Maintain qualification and certification records at the job site, readily available for examination of test results.
  - D. Submit certified copies of mill test reports of reinforcement analysis dated within the last three months for each shipment of reinforcement with specific lots in shipments identified.
  - E. Chemical composition of reinforcement steel: Ladle analysis indicating percentage of carbon, phosphorous, manganese and sulfur present in steel.
  - F. Where mechanical couplers are required or permitted to be used to splice reinforcement steel, submit Manufacturer's literature that contains instructions and recommendations for installation for each type of coupler used; certified test reports that verify the load capacity of each type and size of coupler used; and Shop Drawings that show the location of each coupler with details of how they are to be installed in the formwork.
- 1.04 QUALITY ASSURANCE:
- A. Comply with requirements in Section 01600 and as specified.
  - B. Do not fabricate reinforcement until shop and placement drawings have been reviewed and accepted by the Engineer.
  - C. Perform concrete reinforcement work in accordance with CRSI Manual of Practice and ACI 315.
  - D. An independent testing agency accepted by Engineer shall visually inspect and test reinforcing steel welds in accordance with AWS D1.4/D1.4M.
  - E. An independent testing agency accepted by Engineer shall inspect each mechanical coupler and verify each component is installed in accordance with Manufacturer's instructions and ICC Evaluation Services Report or equivalent code agency report.
- 1.05 QUALIFICATIONS:
- A. Welders: AWS qualified within previous 12 months.
- 1.06 INSPECTION AND TESTING:
- A. In no case shall any reinforcement steel be covered with concrete until the installation of the reinforcement has been observed by the Engineer and the Engineer's authorization to

proceed with the concreting has been obtained. The Engineer shall be given a minimum of 48 hours prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the Engineer has finished observations of the reinforcement steel.

- B. Provide Engineer with access to fabrication plant to facilitate inspection of reinforcement. Notify Engineer of commencement and duration of shop fabrication, in sufficient time to allow for proper inspection.

#### 1.07 DELIVERY STORAGE AND HANDLING:

- A. Comply with the requirements in Section 01610.
- B. Keep reinforcement steel free from mill scale, rust, dirt, grease or other foreign matter.
- C. Ship and store reinforcement steel with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same "mark" designations as those shown on the submitted placing drawings.
- D. Store reinforcement steel off the ground, protected from moisture and kept free from dirt, oil or other injurious contaminants.

### PART 2 - PRODUCTS

#### 2.01 REINFORCEMENT STEEL:

- A. Reinforcement Steel: ASTM A615/A615M, 60 ksi yield strength; deformed billet steel bars.
- B. Reinforcement Steel to be Welded: ASTM A706/A706M, 60 ksi yield strength; deformed low-alloy steel bars.
- C. Reinforcement Steel Plain Bar and Rod Mats: ASTM A704/A704M, ASTM A1064, Grade 60; steel bars or rods, unfinished.
- D. Reinforcement shall be clean and free from loose mill scale, dirt, grease, oil, form release agent, dried concrete or any material reducing bond with concrete.
- E. Welded Wire Reinforcement:
  - 1. Provide welded wire reinforcement conforming to ASTM A1064 in flat sheets.
  - 2. Provide deformed welded wire reinforcement conforming to ASTM A1064 in flat sheets.
  - 3. Provide support bars and reinforcement bar supports as specified herein to obtain the concrete cover indicated.

## 2.02 ACCESSORY MATERIALS:

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, and Spacers: sized and shaped for strength and support of reinforcement during concrete placement including load bearing pad on bottom of base slabs and slabs on grade to prevent puncturing the vapor retarder.
- C. Special Chairs, Bolsters, Bar Supports, and Spacers Adjacent to Weather Exposed Concrete Surfaces: plastic coated steel, stainless steel or plastic type; size and shape as required.
- D. Provide 3-inch by 3-inch plain precast concrete blocks, precast concrete doweled blocks or concrete brick for support of bottom reinforcement in foundation mats, base slabs, footings, pile caps, grade beams and slabs on grade. Provide block thickness to produce concrete cover of reinforcement as indicated.
- E. Mechanical Couplers
  - 1. Reinforcement Tension Bar Splicers:
    - a. Cadweld or Lenton rebar splicers by Erico Products, Inc. and Dayton Barsplice, Inc.
    - b. DB-SAE splicer system by Richmond Screw Anchor Company, Inc., C2D rebar flange coupler by Williams Form Engineering Corporation and Lenton Form Saver by Erico Products, Inc.
    - c. Develop minimum 125 percent of yield capacity of bars spliced in tension when tested as assembly in accordance with ASTM A370 and A615.
- F. Reinforcement Compression Bar Splicers:
  - 1. Manufacturers: G-Loc splicers by Gateway Building Products Division
  - 2. Speed-Sleeve by Erico Products, Inc.
- G. Provide epoxy for grouting reinforcement bars specifically formulated for such application for the moisture condition, application temperature, and orientation of the hole to be filled. Epoxy grout shall meet the requirements in Section 03600 Grout.

## 2.03 FABRICATION:

- A. Fabricate concrete reinforcement in accordance with CRSI Manual of Standard Practice, ACI 315 and ASTM A184/A184M.
- B. Weld reinforcement in accordance with AWS D1.4 only when permitted by the Engineer.

- C. Locate reinforcement splices not indicated on Drawings, at point of minimum stress.
- D. Cold bend bars. Do not straighten or rebend bars.
- E. Do not heat reinforcement steel to bend or straighten.
- F. Bend bars around a revolving collar having a diameter of not less than that recommended by ACI 318.
- G. Cut bar ends that are to be butt spliced, or threaded by saw cutting. Terminate such ends in flat surfaces within 1-1/2 degrees of a right angle to the axis of the bar.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position. Place reinforcement a minimum of 2 inches clear of any metal pipe or fittings.
- B. Do not displace or damage vapor retarder.
- C. Position dowels accurately. Rigidly support, align and securely tie dowels normal to the concrete surface before concrete placement. Setting dowels into wet concrete is prohibited.
- D. Position wall dowels projecting from base slabs on grade with templates or guides held in place above the concrete placement line. Position the templates to obtain the required clearance between the dowels and the face of the walls.
- E. Bars additional to those indicated that may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at no additional cost to the Owner.
- F. Do not extend continuous reinforcement or other fixed metal items through expansion joints. Provide 2 inches clearance from each face of expansion joint.
- G. Provide additional reinforcement bars to support top reinforcement in slabs. Do not shift reinforcement bars from positions in upper layers to positions in lower layers as a substitute for additional support bars.
- H. Support reinforcement steel in accordance with CRSI "Placing Reinforcement Bars" with maximum spacing of 4'-0".
- I. Tie reinforcement steel at intersections in accordance with CRSI "Placing Reinforcement Bars":

1. Maximum tie spacing for footings, walls and columns: every third intersection or 3 feet.
  2. Maximum spacing for slabs and other work: every fourth intersection or 3 feet.
  3. Tie a minimum of 25 percent of all intersecting bars in foundation mats, base slabs, footings, pile caps, slabs on grade and elevated slabs.
  4. Secure all dowels in place before placing concrete.
  5. Tie wires shall be bent away from the forms and from finished concrete surfaces in order to provide the required concrete coverage.
- J. Locate reinforcement to avoid interference with items drilled in later, such as concrete anchors.
- K. Extend welded wire reinforcement to within 2 inches of edges of slab or section. Lap sheets at least 12 inches or two wire spaces, whichever is greater, at ends and edges and wire tightly together. Stagger end laps.
- L. Unless shown otherwise on Drawings, place welded wire reinforcement in slabs on grade between the upper third point and mid-point of slab. Placing welded wire reinforcement on the subgrade and pulling it up during concrete placement is not permitted.
- M. Support welded wire reinforcement placed over the ground on wired concrete blocks spaced not more than 3 feet on centers in any direction.
- N. Support welded wire reinforcement placed over horizontal forms on slab bolsters spaced not more than 30 inches on center.
- O. Mechanical coupler systems may be substituted for dowels at Contractor's option when permitted by Engineer.
- P. Provide additional reinforcement bars to support ties and stirrups in beams where top reinforcement is not continuous.
- Q. Securely support and tie reinforcement steel to prevent movement during concrete placement.
- R. Unless otherwise shown on the Drawings or permitted by the Engineer, do not bend reinforcement bars that project from in-place concrete.
- S. Do not weld reinforcement steel bars (including tack welded) either during fabrication or erection unless specifically shown on the Drawings or specified herein, or unless prior written permission has been obtained from the Engineer. Immediately remove bars that have been welded, including tack welds, without such permission from the work. Comply with AWS D1.4 when welding of reinforcement is or called for.



- T. Reinforcement steel interfering with the location of other reinforcement steel, conduits or embedded items may be moved up to 3 inches. Make greater displacement of bars to avoid interference only with the permission of the Engineer. Do not cut reinforcement to install inserts, conduits, mechanical openings or other items without the prior permission from the Engineer.
- U. Setting bars and welded wire reinforcement on layers of fresh concrete as the work progresses or adjusting reinforcement during the placement of concrete is prohibited.
- V. Provide and place safety caps on all exposed ends of vertical reinforcement that pose a danger to injury or life safety.

### 3.02 REINFORCEMENT AROUND OPENINGS AND PENETRATIONS:

- A. Accommodate placement of formed openings and penetrations.
- B. Unless specific additional reinforcement around openings and penetrations is shown on the Drawings, provide additional reinforcement steel on each side of opening or penetration equivalent to one half of the cross-sectional area of the reinforcement steel interrupted by an opening or penetration. The bars shall have sufficient length to be fully developed at each end beyond the opening or penetration.
- C. Refer to details on Drawings for additional diagonal bars around openings or penetrations and bar extension length on each side of openings or penetrations.

### 3.03 SPLICING OF REINFORCEMENT:

- A. Splices may be used to provide continuity due to bar length limitations. Do not splice reinforcement that is detailed to be continuous in the Drawings.
- B. Provide tension lap splices at all laps in compliance with ACI 318. Class A splices may be used when 50 percent or less of the bars are spliced within the required lap length. Use Class B splices at all other locations.
- C. Except as otherwise indicated on the Drawings, stagger splices in circumferential reinforcement in circular walls using Class B tension splices. Do not splice adjacent bars within the required lap length.
- D. Make splices for reinforcement in tension tie members, with a full mechanical or full welded splice and staggered at least 30 inches.
- E. Make splices in column spiral reinforcement, when necessary, by a lap of 1-1/2 turns.
- F. Reinforcement shall be continuous through construction joints.
- G. Reinforcement may be spliced at construction joints provided that entire lap is placed within only one concrete placement.

### 3.04 ACCESSORIES:

- A. Provide accessories such as chairs, chair bars and the like in sufficient quantities and strength to adequately support the reinforcement and prevent its displacement during the erection of the reinforcement and the placement of concrete.
- B. Use precast concrete blocks where the reinforcement steel is to be supported over soil.
- C. Provide stainless steel bar supports or steel chairs with plastic tips where the chairs are set on forms for a concrete surface that will be exposed to weather, high humidity or liquid (including bottom of slabs over liquid containing areas) unless otherwise noted on contract documents.
- D. Do not use metal chairs, ferrous clips, nails, etc. that extend to the surfaces of the concrete. Do not use stones, brick or wood block supports.
- E. Do not use alternate methods of supporting top steel in slabs, such as steel channels supported on the bottom steel or vertical reinforcement steel fastened to the bottom and top mats unless permitted by the Engineer.
- F. Mechanical Couplers:
  - 1. Couplers that are located at a joint face can be a type that can be set either flush or recessed from the face as indicated.
  - 2. Seal couplers during concrete placement to completely eliminate concrete or cement paste from entering.
  - 3. Recess couplers intended for future connections a minimum of 1/2 inch from the concrete surface. After the concrete is placed, plug the coupler with plastic plugs that have an O-ring seal and the recess filled with sealant to prevent any contact with water or other corrosive materials.
  - 4. Unless indicated otherwise, provide mechanical coupler spacing and size to match the spacing and size of the reinforcement indicated for the adjacent section.

### 3.05 FIELD QUALITY CONTROL:

- A. Remove reinforcement with kinks or bends not shown on shop or placement drawings. Remove such reinforcement from job site and replace with new fabricated steel. Do not field bend of reinforcement unless reinforcement is indicated or specified to be field bent.
- B. Protect reinforcement from rusting, deforming, bending, kinking and other injury. Clean in-place reinforcement that has rusted, or been splattered with concrete using sand or water blasting prior to incorporation into the Work.

3.06 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 03250

### CONCRETE JOINTS AND ACCESSORIES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. This section describes materials, testing, and installation of concrete joints and accessories as specified and as shown on contract drawings.

##### 1.02 REFERENCES:

- A. ASTM International (ASTM):

1. [A276](#): Standard Specification for Stainless Steel Bars and Shapes.
2. [C920](#): Specification for Elastomeric Joint Sealants
3. [C1193](#): Guide for Use of Joint Sealants
4. [D1752](#): Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

- B. Environmental Protection Agency (EPA):

1. [40 CFR 59](#): National Volatile Organic Compound Emission Standards for Consumer and Commercial Products.

- C. Corps of Engineers:

1. CRD-C 572: Specifications for Polyvinylchloride Waterstop.

- D. Federal Specifications:

1. TT-S-00230C: Sealing Compound: Elastomeric Type, Single Component

##### 1.03 SUBMITTALS:

- A. Submit following shop drawings in accordance with 01300.

1. Manufacturer's printed data and application instructions for specified materials and locations where materials are to be used.
2. Submit one sample of each type of water stop.
3. Submit layouts for joints.

4. Certification that materials used within the joint system are compatible with each other.

1.04 QUALITY ASSURANCE:

- A. Comply with requirements in section 01400 and as specified.
- B. Do not add, relocate or omit joints without written permission from the Engineer.
- C. Reject material exceeding expiration date for use.
- D. Clean concrete surfaces to receive expansion joint compound in accordance with the printed instructions of the joint compound manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Comply with the requirements in section 01610.
- B. Transport, handle and deliver materials to the job site in the manufacturer's sealed bags, unopened containers or banded pallets.
- C. Store materials off the ground on a platform or skids and protect with covers from snow, rain and ground splatter.
- D. Store expansion joint compounds in a dry location where they cannot freeze.
- E. Store plastic products under cover in a dry location, out of direct sunlight.

1.06 MANUFACTURER'S SERVICES:

- A. Prior to joint preparation for joints receiving sealant materials, require joint manufacturer's technical representative to demonstrate, on site, joint preparation, priming, and sealant materials application for the Contractor's personnel performing joint work.

PART 2 - PRODUCTS

2.01 ELASTOMERIC JOINT SEALANT:

- A. Federal Specification TT-S-00230C Type 1, Class A, single component, cold applied, pourable, polyurethane.
  1. Products:
    - a. Euclid Chemical Corp; Eucolastic 1
    - b. Mameco ; Vulkem 45

- c. Or accepted equivalent product.

2.02 JOINT SEALANT FOR CONCRETE STRUCTURES:

- A. Joint sealant shall be a multipart, gray, nonstaining, nonsagging, gun grade polyurethane sealant, which cures at ambient temperature to a firm, flexible, resilient, tear-resistant rubber. Sealant shall comply with ASTM C920, Type M, Grade P, Class 25 for horizontal joints and Grade NS, Class 25 for vertical joints and be recommended by the manufacturer for continuous immersion in water. Troweling of sealants into joints will not be permitted. Sealant shall meet requirements in Table 03250-1.

<b>TABLE 03250-1</b>	
<b>Characteristic or Parameter</b>	<b>Technical Requirements</b>
Pot life	1 to 3 hours
Hardness	35 Shore A, +/- 5
Elongation	650 percent, ASTM D412
Tensile strength	200 psi, ASTM D412
Peel strength on concrete	No adhesion loss at 25 pounds
Temperature service range	40 to 167 degrees F
Immersion in water	Continuous

- B. Products:
  - 1. Tremco; Vulkem 227 or Vulkem 245 (for Type M, Grade P, Class 25)
  - 2. Sika Corporation; Sikaflex-2CNS (for Grade NS, Class 25), Sikaflex-2CSL
  - 3. Or accepted equivalent product.
- C. For applications on walls and surfaces inclined more than 30 degrees from the horizontal, use multi-component chemical resistant polysulfide sealant conforming to ASTM C920, Type M, Grade NS, Class 25.
  - 1. Sonneborn ; Sonolastic Two-part
  - 2. Tamms; Hornflex-L
  - 3. DuPont; Cormax PSC
  - 4. Or accepted equivalent product.

2.03 EPOXY JOINT SEALANT:

- A. 100 percent solids per ASTM D1259, two-part epoxy with an instantaneous Shore D hardness of 50 to 65 per ASTM D2240.

1. Metzger-McGuire Co.; MM80 or Edge Pro50
2. Euclid Chemical Corp. ; Euco700
3. Or accepted equivalent product.

2.04 BOND BREAKER TAPE:

- A. Provide an adhesive-backed glazed butyl or polyethylene tape that will adhere to the premolded joint material or concrete surface. The tape shall be the same width as the joint. The tape shall be compatible with the sealant.

2.05 PREMOLDED JOINT FILLER FOR PAVEMENTS AND SLABS:

- A. Joint filler shall be preformed, nonextruded type constructed of closed-cell neoprene conforming to ASTM D1752, Type I
- B. Bituminous-type preformed expansion joint filler conforming to ASTM D994.

2.06 VOC LIMITS FOR SEALANTS, AND SEALANT PRIMERS:

- A. VOC limits for sealants, and sealant primers to comply with content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24), or applicable state and local codes containing more stringent requirements.

2.07 BOND BREAKER FOR JOINT COMPOUNDS:

- A. Provide polyethylene tape.

PART 3 - EXECUTION

3.01 JOINTS:

- A. Make joints only at locations shown on the contract drawings or as permitted by the Engineer. Any addition or relocation of construction joints proposed by the Contractor, must be submitted to the Engineer for written permission.
- B. Relocate additional joints where they least impair strength of the member.
- C. Do not use horizontal joints within foundation mats, base slabs, footings, or slabs on grade.
- D. Provide waterstops at locations shown on the contract Drawings. Do not provide metal waterstops unless permitted by Engineer.
- E. Construction Joints

1. Provide flat ribbed waterstops at construction joints where shown on contract drawings and specified herein.
2. Where joint key ways are shown on contract drawings form keyways by beveled strips or boards placed at right angles to the formed face. Except where otherwise shown on contract drawings or specified, keyways shall be at least 1-1/2 inches in depth over at least 25 percent of the width of the section.
3. After the placement has been completed to the construction joint and the concrete has hardened, thoroughly clean the entire surface of the joint of surface laitance, loose concrete, foreign material, and expose clean aggregate by sandblasting or waterblasting the surface of construction joints before placing the new concrete. Cover horizontal construction joints with mortar. Spread uniformly and work thoroughly into irregularities of the surface. The water-cement ratio of the mortar in place shall not exceed that of the concrete to be placed, and the consistency of the mortar shall be suitable for placing and working.
4. In case of emergency, place additional construction joints. (An interval of 45 minutes between two consecutive batches of concrete shall constitute cause for an emergency construction joint.)

#### 3.02 INSTALLATION OF JOINT SEALANTS:

- A. Immediately before installing the joint sealant, clean the joint cavity by sandblasting or power wire brushing. Install bond breaker tape per manufacturer's instructions.
- B. Apply masking tape along the edges of the exposed surface of the exposed joints.
- C. Application criteria for the sealant materials, such as temperature and moisture requirements and primer cure time, shall be in accordance with the recommendations of the sealant manufacturer.
- D. After the joints have been prepared as described above, apply the joint sealant. Apply the primer, if required, and joint sealant only with the equipment and methods recommended by the joint sealant manufacturer.
- E. Trowel the joints smooth with a tuck pointing tool wiped with a solvent recommended by the sealant manufacturer.
- F. After the sealant has been applied, remove the masking tape and any sealant spillage.
- G. Sealants used in water retaining structures shall achieve final cure at least seven days before the structure is filled with water.



3.03 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 03255

### NON-EXPANDING WATERSTOPS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Provide polyvinyl chloride (PVC) waterstops in construction between dry areas and sources of liquid, between dry areas and the ground, and between sources of liquid and the ground as indicated on the drawings and specified herein.

1. Waterstops shall form a continuous watertight diaphragm to prevent leakage.
2. Provide 6" ribbed waterstops in construction joints.

##### 1.02 REFERENCES:

- A. ASTM International (ASTM):

1. [D412](#): Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
2. [D570](#): Standard Test Method for Water Absorption of Plastics
3. [D624](#): Standard Test method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
4. [D638](#): Standard Test Method for Tensile Properties of Plastics
5. [D746](#): Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
6. [D747](#): Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam.
7. [D792](#): Standard Test Methods for Density and Specific Gravity of Plastics by Displacement.
8. [D1171](#): Standard Test Method for Rubber Deterioration – Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)
9. [D1259](#): Standard Test Methods for Nonvolatile Content of Resin Solutions.
10. [D2240](#): Standard Test Method for Rubber Property – Durometer Hardness

- B. Corps of Engineers:

1. CRD-C 572: Specifications for Polyvinylchloride Waterstop.

1.03 SUBMITTALS:

A. Submit following shop drawings in accordance with 01300.

1. Manufacturer's printed data and application instructions for specified materials and locations where materials are to be used.

1.04 QUALITY ASSURANCE:

A. Comply with requirements in section 01400 and as specified.

B. Reject waterstops containing scrap or reclaimed material or pigment.

C. Position waterstops in construction as indicated.

D. Use factory made and tested crosses, tees and ells at corners and intersections.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Comply with the requirements in section 01610.

B. Transport, handle and deliver materials to the job site in the manufacturer's sealed bags, unopened containers or banded pallets.

C. Store materials off the ground on a platform or skids and protect with covers from snow, rain and ground splatter.

D. Store plastic products under cover in a dry location, out of direct sunlight.

PART 2 - PRODUCTS

2.01 PVC WATERSTOP:

A. Provide polyvinyl chloride waterstops manufactured from virgin polyvinyl chloride plastic compound conforming to Corps of Engineers Specification CRD-C572.

B. Provide waterstops of type, shape and size indicated with looped galvanized steel wire or grommets spaced at 12 inches on center along both edges.

C. Provide factory-made crosses, tees and ells fabricated by the waterstop manufacturer using thermostatically controlled electric heat source.

D. Provide waterstops resistant to chemical action with Portland cement, alkalis, acids, and not affected by mildew or fungi. It shall show no effect when immersed for 10 days in a 10 percent solution of sulfuric or hydrochloric acid, saturated lime solution or salt water.

Water stops shall be such that any cross section will be dense, homogeneous, and free from porosity and other imperfections. They shall be symmetrical in shape.

E. The material shall meet the requirements in Table 03255-1.

<b>TABLE 03255-1</b>		
<b>Property</b>	<b>Test Method</b>	<b>Limit</b>
Water Absorption	ASTM D 570	5% maximum
Tear Resistance	ASTM D 624	250 #/inch minimum
Ultimate Elongation	ASTM D 638	300% minimum
Tensile Strength	ASTM D 638	1750 psi minimum
Low Temperature Brittleness	ASTM D 746	No Failure at -35°F
Stiffness in Flexure	ASTM D 747	600 psi minimum
Ozone Resistance	ASTM D 1149	No Failure
Volatile Loss	ASTM D 1203	0.50% maximum
Hardness, Shore A	ASTM D 2240	65 to 80
Tensile strength after accelerated extraction	CRD C 572	1500 psi minimum
Elongation after accelerated extraction	CRD C 572	280% minimum
Effect of Alkalis after 7 days - Weight Change	CRD C 572	-0.10% to +0.25%
Effect of Alkalis after 7 days - Hardness Change	CRD C 572	+5 maximum

F. PVC waterstops for construction joints: Flat ribbed type, 6 inches wide with a minimum thickness of 3/8-inches.

1. Products:
  - a. Greenstreak: Model 679
  - b. Vinylex; Model R638
  - c. BoMetals, Inc.; Model TFR-638
  - d. Or accepted equivalent product.

## PART 3 - EXECUTION

### 3.01 FABRICATION:

- A. Make all splices on a bench following manufacturer's printed instructions and splicing procedures.
- B. Use miter guide and portable power saw to cut spliced ends.
- C. Maintain continuity of characteristic features of waterstop cross section including ribs through splice.
- D. Remove looped steel wire along both edges of waterstop adjacent to saw cut prior to splicing.
- E. Make splices by heat sealing adjacent surfaces using a thermostatically controlled electric heat source in conformance with manufacturer's printed instructions.
- F. Reform waterstop at splices using a remolding iron having a pattern matching the waterstop.
- G. If splice shows any separation or lack of fusion, reject the splice, re-cut back at least one inch from rejected splice each side, re-weld.
- H. Replace or repair damaged or punctured waterstops in conformance with manufacturer's printed instructions at no additional cost to the Owner.
- I. Clean waterstops of curing compound, foreign materials and protrusions of hardened concrete and mortar.
- J. Provide waterstops with an integral fastening system consisting of grommets or pre-punched holes.

### 3.02 INSTALLATION:

- A. Place waterstop to form a continuous watertight diaphragm in joints.
- B. Center waterstops in joints unless otherwise indicated.
- C. Install waterstops in continuous lengths to minimize field splices.
- D. Maintain 1-in. minimum clearance between waterstop and reinforcement and embedded items.
- E. Use factory-made crosses, tees and ells at all corners and intersections.
- F. Do not fold waterstops against bulkhead forms.

- G. Secure waterstops in position with tie wire from loops to adjacent reinforcement on both sides every 12 in. along each edge.
  - H. Consolidate concrete during placement in vicinity of waterstop without damaging or dislodging waterstop.
  - I. Protect exposed waterstop from damage.
  - J. Terminate vertical waterstops three inches below top of concrete walls in open tanks, at the underside of elevated framed slabs that are above maximum process liquid levels and above finish grade in exterior foundation walls.
  - K. Do not use split waterstops.
- 3.03 CLOSEOUT ACTIVITIES:
- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 03256

### EXPANDING WATERSTOPS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. This section describes materials, testing, and installation of concrete joints and accessories as specified and as shown on contract drawings.

##### 1.02 REFERENCES:

- A. ASTM International (ASTM):
  1. [D638](#): Test Method for Tensile Properties of Plastic.
  2. D1149: Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber
  3. D1203: Test Methods for Volatile Loss from Plastics Using Activated Carbon Methods.
  4. [D2240](#): Standard Test Method for Rubber Property – Durometer Hardness

##### 1.03 SUBMITTALS:

- A. Submit following shop drawings in accordance with 01300.
  1. Manufacturer's printed data and application instructions for specified materials and locations where materials are to be used.

##### 1.04 QUALITY ASSURANCE:

- A. Comply with requirements in section 01400 and as specified.
- B. Reject and replace waterstops which have become wet or exhibit swelling prior to concrete placement.
- C. Position waterstops in joints as indicated.
- D. Provide waterstops in maximum practical lengths to minimize joints.
- E. Use adhesives manufactured by or recommended by the waterstop manufacturer for attachment of the waterstop to concrete.
- F. Waterstops shall be positioned to provide a minimum of 3" concrete cover.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Comply with the requirements in section 01610.
- B. Transport, handle and deliver materials to the job site in the manufacturer's sealed bags, unopened containers or banded pallets.
- C. Store materials off the ground on a platform or skids and protect with covers from snow, rain and ground splatter.
- D. Store hydrophilic waterstops under cover in a dry location, out of direct sunlight.
- E. Waterstop shall be maintained in a dry condition until concrete placement.

PART 2 - PRODUCTS

2.01 HYDROPHILIC GASKET WATERSTOP:

- A. Provide a bentonite free rubber waterstop. Waterstop shall expand by a minimum of 80 percent of dry volume in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast. Provide minimum concrete cover as recommended by the waterstop manufacturer.
- B. Provide hydrophilic rubber gasket waterstops fabricated of non-vulcanized rubber, chloroprene rubber, urethane polymers, vinyl ester polymers or combinations of these materials.
- C. Provide waterstop as recommended by manufacturer for specific installation.
- D. Provide hydrophilic gasket waterstops which meet the criteria in Table 03256-1.

<b>Property</b>	<b>Test Method</b>	<b>Limit</b>
Ultimate Elongation	ASTM D 638	70% minimum
Tensile Strength	ASTM D 638	25 psi minimum
Ozone Resistance	ASTM D 1149	No Failure
Volatile Loss	ASTM D 1203	0.50% maximum
Hardness, Shore A	ASTM D 2240	20 to 60

- E. Provide hydrophilic rubber gasket waterstops as manufactured by:
  - 1. Duroseal Gasket Waterstop manufactured by BBZ USA;
  - 2. Adeka Ultraseal MC-2010M manufactured by Adeka North America;



3. Swellseal 8 manufactured by de neef Construction Chemicals, Inc.;
4. Or accepted equivalent product.

2.02 HYDROPHILIC PASTE WATERSTOPS:

- A. Provide hydrophilic rubber paste waterstops of urethane paste, thixotropic vinyl monomer or similar materials.
- B. Hydrophilic rubber paste shall be compatible with gasket waterstop material.
- C. Hydrophilic paste shall be 100% solids.
- D. Provide hydrophilic paste waterstops which meet or exceed the criteria in Table 03256-2.

<b>Table 03256-2</b>		
<b>Property</b>	<b>Test Method</b>	<b>Limit</b>
Ultimate Elongation	ASTM D 638	50% minimum
Tensile Strength	ASTM D 638	25 psi minimum
Ozone Resistance	ASTM D 1149	No Failure
Volatile Loss	ASTM D 1203	0.50% maximum
Hardness, Shore A	ASTM D 2240	20 to 60

- E. Provide hydrophilic rubber paste as manufactured by:
  1. Duroseal Paste manufactured by BBZ USA;
  2. Adeka Ultraseal P-201 manufactured by Adeka North America;
  3. de neef; Swellseal WA
  4. Or acceptable equivalent product.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Provide hydrophilic rubber gasket and paste waterstops where specifically indicated.
- B. Center waterstops in joints unless otherwise indicated.
- C. Consolidate concrete during placement in vicinity of waterstop without damaging or dislodging waterstop.

- D. Clean joint surface of dirt, dust, debris and laitence immediately before applying waterstop and remove standing water.
- E. Protect waterstops from moisture until concrete is placed. Waterstops which exhibit swelling prior to concrete placement shall be removed and replaced at the contractor's expense.

### 3.02 HYDROPHILIC GASKET WATERSTOPS:

- A. Install hydrophilic gasket waterstops in continuous lengths to minimize joints. Provide waterstop in one continuous length insofar as practicable. Butt ends at joints of waterstop or overlap a minimum of 2" per manufacturer's instructions.
- B. Seal joints in hydrophilic gasket waterstops with a hydrophilic rubber paste compound as recommended by the manufacturer.
- C. Do not bend hydrophilic gasket waterstop. Cut square and butt joints at corners.
- D. Waterstop shall be in continuous contact with the concrete surface.
- E. Attach hydrophilic gasket waterstop to concrete surface by one of the following methods:
  - 1. Fix hydrophilic gasket waterstop to concrete surface with continuous bead of hydrophilic rubber paste or adhesive. Paste or adhesive shall be provided by or as recommended by the waterstop manufacturer.
  - 2. Fix hydrophilic gasket waterstop to concrete surface with masonry or concrete nails or power activated fasteners at a maximum 12 inch spacing.
- F. Provide one fastener one inch from the top and a second fastener four inches from the top of vertical hydrophilic gasket waterstops regardless of which fastening method is used.
- G. Do not compress or otherwise deform hydrophilic gasket waterstop when fastening to concrete.
- H. Do not wrap hydrophilic gasket waterstops around pipes less than the minimum diameter recommended in the manufacturer's printed instructions.

### 3.03 HYDROPHILIC PASTE WATERSTOPS:

- A. Clean dirt and debris from area to receive hydrophilic paste waterstop.
- B. Bead of hydrophilic paste waterstop shall be a minimum of 1/4 by 1/2 inches.
- C. Apply hydrophilic paste waterstop such that there is no break in the bead.

- D. Place hydrophilic paste waterstop bead continuously around pipe near the center of the wall where used for sealing pipe penetrations. Allow hydrophilic paste waterstop to cure for 24 hours before placing concrete.
- E. Install hydrophilic paste waterstops in accordance with the manufacturer's printed instructions.

3.04 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 03300

### CAST-IN-PLACE CONCRETE

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Provide all labor, materials, equipment and incidentals necessary to furnish and install cast-in-place concrete as specified and as shown on contract drawings.
- B. Provide cast-in-place concrete for architectural, civil, mechanical, and electrical work as shown on the drawings or specified under specified under those disciplines.

##### 1.02 REFERENCES:

###### A. American Concrete Institute (ACI):

- 1. [ACI 211.1](#): Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- 2. [ACI 301](#): Specifications for Structural Concrete
- 3. [ACI 304R](#): Guide for Measuring, Mixing, Transporting and Placing Concrete
- 4. ACI 304.2R: Placing Concrete by Pumping Methods
- 5. [ACI 305.1](#): Specification for Hot Weather Concreting
- 6. [ACI 306.1](#): Standard Specification for Cold Weather Concreting
- 7. [ACI 308.1](#): Specification for Curing Concrete
- 8. [ACI 318](#): Building Code Requirements for Structural Concrete
- 9. [ACI 350](#): Code Requirements For Environmental Engineering Concrete Structures

###### B. ASTM International (ASTM) Publications:

- 1. [A 123](#): Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- 2. [A 153](#): Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- 3. [C 31](#): Standard Practice for Making and Curing Concrete Test Specimens in the Field

4. [C 33](#): Standard Specification for Concrete Aggregates
5. [C 39](#): Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
6. [C 40](#): Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
7. [C 42](#): Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
8. [C 87](#): Standard Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
9. [C 88](#): Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
10. [C 94](#): Standard Specification for Ready-Mixed Concrete
11. [C 109](#): Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or (50-mm) Cube Specimens)
12. [C 123](#): Standard Test Method for Lightweight Particles in Aggregate
13. [C 136](#): Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
14. [C 138](#): Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
15. [C 143](#): Standard Test Method for Slump of Hydraulic Cement Concrete
16. [C 150](#): Standard Specification for Portland Cement
17. [C 157](#): Standard Test Method for Length Change of Hardened Hydraulic Cement, Mortar and Concrete
18. [C 171](#): Standard Specification for Sheet Materials for Curing Concrete
19. [C 172](#): Standard Practice for Sampling Freshly Mixed Concrete
20. [C 192](#): Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
21. [C 231](#): Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
22. [C 260](#): Standard Specification for Air-Entraining Admixtures for Concrete
23. [C 295](#): Standard Guide for Petrographic Examination of Aggregates for Concrete

24. [C 309](#): Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
25. C 311: Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete
26. [C 494](#): Standard Specification for Chemical Admixtures for Concrete
27. [C 595](#): Standard Specification for Blended Hydraulic Cements
28. [C 618](#): Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
29. C 881: Standard Test Method for Epoxy Resin Base Bonding Systems for Concrete
30. [C 882](#): Standard Test Method for Bond Strength of Epoxy Resin Systems Used with Concrete by Slant Shear
31. [C 989](#): : Standard Specification for Slag Cement for Use in Concrete and Mortars
32. [C 1017](#): Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
33. [C 1064](#): Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete
34. [C 1107](#): Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
35. [C 1116](#): Standard Specification for Fiber Reinforced Concrete
36. [C 1240](#): Standard Specification for Silica Fume Used in Cementitious Mixtures
37. C 1260: Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
38. C 1293: Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
39. C 1567: Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
40. C 1602: Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
41. [D 75](#): Standard Practice for Sampling Aggregates

42. [E 154](#): Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
43. [E 329](#): Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials used in Construction

C. American Association of State Highway and Transportation Officials (AASHTO):

[M182](#): Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats

1.03 SUBMITTALS:

A. Section 01300- Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Manufacturer's specifications and instructions for all admixtures, and curing materials. Manufacturer's certification of compatibility of all admixtures.

C. Shop Drawings:

1. Provide certification that cement used complies with ASTM C150 and these specifications.
2. Provide certification that aggregates comply with ASTM C33. Submit gradation analysis with concrete mix designs.
3. Provide certification of compliance with these specifications from the manufacturer of the concrete admixtures.
4. Prepare mix designs in accordance with ACI 318, except as modified herein.
  - a. Submit concrete mix designs, laboratory 7-day and 28-day compressive test results and laboratory shrinkage test results for review and approval by the Engineer.
  - b. Alternatively, submit test reports of 7- and 28-day compressive tests and shrinkage test results of the proposed mix where that same mix has been used on two previous projects in the past twelve months.
  - c. Do not use any concrete mixes in the work that have not been approved by the Engineer.
5. Plant Qualification: Submit certification from the National Ready Mixed Concrete Association indicating compliance with the specified qualification requirements.

D. Test and Evaluation Reports

1. Provide results of drying shrinkage tests from trial concrete mixes by the Contractor's testing laboratory firm.
- E. Manufacturers' Instructions
1. Provide epoxy bonding compound manufacturer's specific instructions for use. Provide manufacturer's certifications as to suitability of product to meet job requirements with regard to surface, pot life, set time, vertical or horizontal application, and forming restrictions.
- F. Field Quality Control Submittals
1. Provide delivery tickets for ready-mix concrete or weigh masters certificate per ASTM C94, including weights of cement and each size aggregate and amount of water added at the plant and record of placements. Record the amount of water added on the job on the delivery ticket. Water added at the plant shall account for moisture in both coarse and fine aggregate and liquid admixtures.
  2. Batch tickets shall include the following information:
    - a. Load number, truck number and driver's name
    - b. Strength of concrete (compression strength)
    - c. Amount of concrete (cu. yds.)
    - d. Time truck was charged with cement
    - e. Type, brand and amount of cement
    - f. Type, brand and amount of admixtures
    - g. Amount of water withheld at the plant (if any)
    - h. Information necessary to calculate total mixing water
    - i. Maximum size of aggregate
    - j. Weights of fine and coarse aggregates
    - k. Signature of ready-mix representative
    - l. Concrete temperature at batching plant
    - m. Type and amount of fly ash, other pozzolan or slag cement.



#### 1.04 SHRINKAGE TESTS:

- A. The testing laboratory shall perform drying shrinkage tests for the trial batches as specified herein. Shrinkage limitations apply only to concrete for liquid containing structures.
- B. Fabricate, cure, dry, and measure specimens in accordance with ASTM C157 modified as follows:
  - 1. Remove specimens from molds at an age of 23 hours +/- 1 hour after trial batching, place immediately in water at 70 degrees F +/- 3 degrees F for at least 30 minutes, measure within 30 minutes thereafter to determine original length, and then submerge in saturated lime water at 73 degrees F +/- 3 degrees F.
  - 2. At age seven days, take measurements to determine expansion, expressed as a percentage of original length. This length at age seven days shall be the base length for drying shrinkage calculations (zero days' drying age).
  - 3. Immediately place specimens in a humidity-controlled room maintained at 73 degrees F +/- 3 degrees F and 50 percent +/- 4 percent relative humidity for the remainder of the test.
  - 4. Report measurements to determine shrinkage expressed as percentage of the base length separately for 7, 14, 21, and 28 days of drying after 7 days of moist curing.
- C. Compute the drying shrinkage deformation of each specimen as the difference between the base length (at zero days' drying age) and the length after drying at each test age.
  - 1. Compute the average drying shrinkage deformation of the specimens to the nearest 0.0001 inch at each test age.
  - 2. If the drying shrinkage of any specimen departs from the average of that test age by more than 0.0004 inch, disregard the results obtained from that specimen.
  - 3. Report results of the shrinkage test to the nearest 0.001 percent of shrinkage.
- D. Take compression test specimens in each case from the same concrete used for preparing drying shrinkage specimens. These tests shall be considered a part of the normal compression tests for the project.
- E. Acceptance of Test Results: The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21-day drying age or at 28-day drying age, shall be 0.028 percent or 0.032 percent, respectively.
  - 1. Use only mix designs for construction that have first met the trial batch shrinkage and compression requirements.

2. If the trial batch specimens do not meet both the strength and shrinkage requirements, revise the mix designs and/or materials and retest.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400.
- B. Concrete not meeting the minimum specified 28-day design strength shall be cause for rejection and removal from the work.
- C. Perform concrete work in conformance with ACI 301 unless otherwise specified.
- D. Do not use calcium chloride or admixtures containing calcium chloride.
- E. Do not place concrete until design mix, material tests and trial concrete batch mix compression and shrinkage test results are approved by the Engineer. Approvals shall be obtained at least 30 days prior to the need for use on the job site.
- F. The Contractor shall employ an independent testing laboratory, acceptable to the Engineer, to develop concrete mix designs and testing.
- G. The Contractor shall employ an independent testing laboratory, acceptable to the Engineer, to test the conformity of materials proposed for use in the concrete mixes to the project specifications and to design and test concrete mixes proposed for use. Concrete testing shall be performed by an ACI Concrete Field Technician, Grade I or equivalent. The Contractor shall allow free access to obtain test samples.
- H. The Owner shall employ an independent testing laboratory, acceptable to the Engineer, to test conformity of materials placed into the work during construction. Concrete testing shall be performed by an ACI Concrete Field Technician, Grade I or equivalent. The Contractor shall allow free access to obtain test samples.
- I. Methods of Sampling and Testing:
  1. Fresh Concrete Sampling: ASTM C 172
  2. Specimen Preparation: ASTM C 31
  3. Compressive Strength: ASTM C 39
  4. Air Content: ASTM C 231
  5. Slump: ASTM C 143
  6. Temperature: ASTM C 1064
  7. Unit Weight: ASTM C 138
  8. Obtaining Drilled Cores: ASTM C 42

9. Drying Shrinkage: ASTM C 157

- J. Acceptance of Structure: Acceptance of completed concrete work requires conformance with dimensional tolerances, appearance and strength as indicated or specified.
- K. Hot weather concrete to conform to ACI 305 and as specified herein.
- L. Cold weather concrete to conform to ACI 306 and as specified herein.
- M. Reject concrete delivered to job site that exceeds the time limit specified.
- N. Reject concrete delivered to job site that exceeds the concrete temperature limitations specified.
- O. Do not place concrete in water or on frozen or uncompacted ground.

1.06 WORKABILITY:

- A. Concrete shall be of such consistency and composition that it can be worked readily into the forms and around the reinforcement without excessive vibrating and without permitting the materials to segregate or free water to collect on the surface.

1.07 DELIVERY, STORAGE, AND HANDLING:

- A. Provide in conformance with Section 01610 and as specified herein.
- B. Deliver concrete to discharge locations in watertight agitator or mixer trucks without altering the specified properties of water- cementitious materials ratio, slump, air entrainment, temperature and homogeneity.
- C. Reject concrete not conforming to specification, unsuitable for placement, exceeding the time or temperature limitations or not having a complete delivery batch ticket.

1.08 SITE CONDITIONS:

- A. Do not place concrete until conditions and facilities for making and curing control test specimens are in compliance with ASTM C 31 and as specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Cement:
  - 1. Portland cement, ASTM C150, Type II; or blended hydraulic cement, ASTM C595, Type IP (MS).

2. Type IP (MS) shall not be used for concrete to come in contact with potable water.
3. Use only one brand of cement in any individual structure. Use no cement that has become damaged, partially set, lumpy, or caked. Reject the entire contents of the sack or container that contains such cement. Use no salvaged or reclaimed cement.
4. Maximum tricalcium aluminate shall not exceed 8 percent. The maximum percent alkalis shall not exceed 0.6 percent.

B. Fly Ash:

1. Provide fly ash conforming to the following requirements:
  - a. Class F fly ash conforming to ASTM C 618 for chemical and physical properties.
  - b. Supplemental requirements in percent:
    - (1) Maximum carbon content: 3%
    - (2) Maximum sulfur trioxide (SO<sub>3</sub>) content: 4%
    - (3) Maximum loss on ignition: 3%
    - (4) Maximum water requirement (as a percent of control): 100%
    - (5) Fineness, maximum retained on No. 325 sieve: 25%

C. Slag Cement:

1. Slag cement, when used, shall meet the requirements of ASTM C989, Grade 100 or better.

D. Silica Fume:

1. Silica fume, when used, shall meet the requirements of ASTM C1240.
  - a. Products:
    - (1) BASF Corporation; MasterLife SF 100.
    - (2) Sika Corporation; Sikacrete 950DP
    - (3) Euclid Chemical Company; Eucoshot MSA
    - (4) Or accepted equivalent product.

E. Fine Aggregates:

1. Clean, sharp, natural sand conforming to requirements of ASTM C33 with a fineness modulus between 2.50 and 3.0.
2. Confirm aggregates intended for use in concrete do not contain pyrrhotite or other deleterious materials by petrographic testing.
3. Test conformity of aggregate and confirm that aggregates intended for use in concrete are potentially non-reactive when tested in conformance with ASTM C1260, ASTM C1293 or ASTM C1567.

F. Coarse Aggregate:

1. Well graded crushed stone, natural rock conforming to requirements of ASTM C33.
2. Limit deleterious substances in accordance with ASTM C33, Table 3, Severe Weathering Regions, limit clay lumps not to exceed 5.0 percent by weight, and limit loss when tested for soundness using magnesium sulfate to 12 percent.
3. Test conformity of aggregate and confirm that aggregates intended for use in concrete are potentially non-reactive when tested in conformance with ASTM C1260, ASTM C1293 or ASTM C1567.
4. Confirm aggregates intended for use in concrete do not contain pyrrhotite or other deleterious materials by petrographic testing.

G. Water and Ice:

1. Use water and ice free from injurious amounts of oil, acid, alkali, salt, organic matter or other deleterious substances and conforms to requirements of ASTM C1602.
2. Water shall not contain more than 500 mg/L of chlorides or more than 500 mg/L of sulfate.
3. Heat or cool water to obtain concrete temperatures specified, and in conformance with ACI 305.1 and ACI 306.1.

H. Color Additive for Exterior Electrical Duct Encasement:

1. For exterior electrical duct concrete encasements, use a color additive for identification purposes.

I. Concrete Admixtures:

1. Maintain compressive strength and maximum water-cementitious materials ratios specified in Table 03300-1 when using admixtures. Include all admixtures in

solution form in the water-cementitious materials ratio calculations. Do not use any admixture that contains intentionally-added chlorides or other corrosive elements. Admixtures shall be used in compliance with the manufacturer's printed instructions. The manufacturer shall certify the compatibility of multiple admixtures used in the same mix. Do not use admixtures in greater dosages than recommended by manufacturer.

2. Air Entrainment:
  - a. Air-entraining admixture shall conform to ASTM C260.
  - b. Products:
    - (1) BASF Corporation – MasterAir AE 90, MasterAir VR 10, or MasterAir AE 200
    - (2) Sika Corporation, AER.
    - (3) WR Grace & Co.; Darex II-AEA
    - (4) Or accepted equivalent product.
  - c. Adjust the admixture content to accommodate fly ash or other pozzolan requirements, and other admixtures when used, in order to obtain the specified air content.
3. Water Reducing:
  - a. Water-reducing admixture shall conform to ASTM C494, Type A and be compatible with the air-entraining admixture.
  - b. Products:
    - (1) BASF Corporation; MasterPozzolith Series or MasterPolyHeed Series
    - (2) Sika Corporation, Plastocrete 161
    - (3) WR Grace & Co.; Daracem 65
    - (4) Euclid Chemical Company; Eucon NW
    - (5) Or accepted equivalent product.
4. Water Reducing and Retarding:
  - a. Water-reducing and retarding admixture shall conform to ASTM C494, Type D and compatible with the air-entraining admixture.
  - b. Products:

- (1) BASF Corporation; MasterPozzolith Series
  - (2) Sika Corporation; Plastiment
  - (3) WR Grace & Co.; WRDA 64
  - (4) Or accepted equivalent product.
5. Accelerating:
  - a. Accelerating admixture shall conform to ASTM C494, Type C or E.
  - b. Products:
    - (1) BASF Corporation – MasterSet AC 534 or MasterSet FP 20
    - (2) WR Grace & Co.; Lubricon NCA or Polarset
    - (3) Euclid Chemical Company: Accelguard NCA
    - (4) Or accepted equivalent product.
6. High-Range Water-Reducing Admixture (Superplasticizer):
  - a. High-Range water-reducing admixture shall conform to ASTM C494, Type F or ASTM C1017, Type I.
  - b. Products:
    - (1) BASF Corporation; MasterRheobuild 1000 or MasterGlenium Series
    - (2) WR Grace & Co.; Daracem 100
    - (3) Euclid Chemical company; Eucon SPC
    - (4) Or accepted equivalent product.
7. Workability-Retaining Admixture:
  - a. Workability-enhancing admixture shall conform to ASTM C 494, Type S.
  - b. Products:
    - (1) BASF Corporation – MasterSure Z 60
    - (2) WR Grace & Co.; Adva XT2
    - (3) Or accepted equivalent product.
8. Shrinkage Reducing Admixture:

- a. Shrinkage-reducing admixture is permitted to be used in the mix to meet shrinkage limitations provided that specified strength are met and there is no reduction in sulfate resistance and no increase in permeability. Quantity of shrinkage-reducing admixture used in the mix shall be added to the quantity of water for purposes of determining the water/cementitious materials ratio.
- b. Products:
  - (1) BASF Corporation; MasterLIFE SRA 20
  - (2) WR Grace & Co.; Eclipse 4500
  - (3) Euclid Chemical company; Eucon SRA
  - (4) Or accepted equivalent product.

J. Epoxy Bonding Agent:

1. Epoxy bonding agent shall conform to ASTM C881 Type I, II, IV or V; Grade 2 for epoxy resin adhesives, depending on the application. The class of epoxy bonding agent shall be suitable for all ambient and substrate temperatures.
2. Products:
  - a. Sika Corp.; Sikadur 32 Hi-Mod
  - b. Euclid Chemical Company; Duralcrete
  - c. BASF Corporation; MasterEmaco ADH 326
  - d. Or accepted equivalent product

K. Vapor Retarder: 10 mil polyethylene sheet conforming to ASTM E 154

L. Curing Compound:

1. Liquid form, which will form impervious membrane over, exposed surface of concrete when applied to fresh concrete by means of spray gun. Compound shall not inhibit future bond of floor covering or concrete floor treatment. Use Type I-D compound with red fugitive dye, Class B, having 18 percent minimum solids conforming to ASTM C 309.
2. Products:
  - a. BASF Corporation; MasterKure EC 1315
  - b. Euclid Chemical Company; Super Diamond Clear VOX
  - c. W. R. Meadows, Inc.; VOCOMP-30



- d. Dayton Superior Corp; Safe Cure and Seal 30% J23UV
- e. Or accepted equivalent product.

M. Burlap Mats:

- 1. Conform to AASHTO M182.

N. Sisal-Kraft Paper and Polyethylene Sheets for Curing:

- 1. Conform to ASTM C171.

2.02 MIXES:

A. Conform to ASTM C94, except as modified by these specifications.

B. Air content as determined by ASTM C231:

5 ± 1 1/2 percent for concrete using 1-1/2 inch maximum aggregate size.

6 ± 1 1/2 percent for concrete using 3/4 inch maximum aggregate size.

C. Provide minimum cementitious material content as follows in Table 03300-1:

<b>Table 03300- 1</b>		
<b>Nominal Maximum Aggregate Size (in.)</b>	<b>Coarse Aggregate (ASTM C 33) Size No.</b>	<b>Minimum Cementitious Materials (lb/yd<sup>3</sup>)</b>
1 - 1/2	467	515
1	57	535
3/4	67	560
1/2	7	580
3/8	8	600

D. Provide concrete with the following compressive strengths at 28 days and proportion it for strength and quality requirements in accordance with ACI 318 and ACI 350. The resulting mix shall not conflict with limiting values specified in Table 03300-2.

<b>Table 03300- 2</b>		
<b>Type of Work</b>	<b>28-Day Minimum Compressive Strength (in psi)</b>	<b>Maximum Water/Cement Ratio</b>
Pavement	3,000	0.54
Mud mats and concrete under foundations	1,500	0.76
Concrete not otherwise specified	4,000	0.44

E. Measure slump in accordance with ASTM C143:

1. Proportion and produce the concrete to have a maximum slump of 4 inches. A tolerance of up to 1 inch above the indicated maximum is allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit. Concrete of lower than usual slump may be used provided it is properly placed and consolidated.
2. Mixes containing water reducers shall have a maximum slump of 6 inches after the addition of a mid-range water reducer and maximum slump of 8 inches after the addition of a high range water reducer.

F. Pozzolan Content:

1. Fly ash shall not exceed 20 percent of the total cementitious content.
2. Slag cement will be permitted as a substitute for fly ash at no additional cost to the Owner, in the event that Class F Fly Ash is not available. The slag substitution shall be in the same proportions and percentages of the total cementitious material as shown for fly ash.
3. Use silica fume concrete where indicated on the drawings. Silica fume not to exceed 10 percent of the total weight of the silica fume plus cement.

G. Aggregate Size:

1. The maximum aggregate size shall be:
  - a. 1-½ inches for walls greater than 18 inches in thickness, grade beams, footings, foundation mats, and base slabs.
  - b. 3/8 inches for floor fill in clarifiers, in congested areas where approved by the engineer, for fireproofing around structural steel beams and columns and to fill cored holes.
  - c. 3/4 inches for all other concrete.
2. Combined aggregate grading shall be as specified in Table 03300-3:

<b>Table 03300-3</b>				
Maximum Aggregate Size	1-1/2"	1"	3/4"	3/8"
Aggregate Grade per ASTM C33	467	57	67	8

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Contractor shall examine the substrate and the conditions under which work is to be performed and notify the Engineer in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions are corrected in a manner acceptable to the engineer.

3.02 MIXING AND TRANSPORTING CONCRETE:

- A. General: Conform to concreting procedures set forth in ASTM C 94, ACI 304R and as specified herein.
  - 1. Transport concrete to discharge locations without altering the specified properties of water-cement ratio, slump, air entrainment, temperature and homogeneity.
  - 2. Discharge concrete into forms within 1-1/2 hours after cement has entered mixing drum or before the drum has revolved 300 revolutions after the addition of water, whichever occurs first.
  - 3. Do not add water at the jobsite unless permitted by the engineer. If it is necessary to add water to obtain the specified slump, add water per ASTM C 94, but do not exceed the amount of water that has been held back at the plant. Added water shall be incorporated by additional mixing of at least 35 revolutions. Quality control sampling shall be done after the water has been added and the batch thoroughly mixed.
  - 4. Do not add water to concrete containing high range water reducing admixture.
  - 5. Keep a record showing time and place of each placement of concrete, together with transit-mix delivery slips certifying the contents of the placement.

Discharge of concrete shall be completed within the limits set out in Table 03300-4.

<b>Table 03300-4</b>	
<b>MAXIMUM TIME TO CONCRETE DISCHARGE</b>	
<b>Concrete Temperature</b>	<b>Limit</b>
Over 90 Degree F	Remove concrete from jobsite and discard concrete
86 to 90 Degree F	45 minutes
81 to 85 Degree F	60 minutes

70 to 80 Degree F	75 minutes
Below 70 Degree F	90 minutes

- B. Conveying: Convey concrete from agitator or mixer truck to place of final deposit in forms by one of the following methods:
1. Buckets or hoppers with discharge gates having a clear opening equal to not less than one-third the maximum interior horizontal area or five times the maximum aggregate size being used, whichever is greater, and side slopes of not less than 60 degrees to horizontal.
  2. Buggies or wheelbarrows equipped with pneumatic tires.
  3. Round bottom, metal or metal-lined chutes with inclined slope of between two to three feet horizontally to one foot vertically and of sufficient capacity to avoid overflow.
  4. Circular drop pipes with a top diameter of at least eight times the maximum aggregate size, but not less than 6 inch, or tapered to not less than six times maximum aggregate size.

### 3.03 CONCRETE ACCEPTANCE:

- A. The Contractor shall accept or reject each batch of concrete delivered to the point of agitator or mixer truck discharge. The signature of a Contractor's authorized representative on the delivery batch ticket shall indicate concrete acceptance.
- B. The Contractor shall reject concrete delivered without a complete concrete delivery batch ticket as specified herein. The concrete supplier will furnish copies of the signed batch ticket to the Contractor and Engineer.
- C. The testing agency shall perform field tests at the point of agitator or mixer truck discharge. Accept or reject concrete on the basis of conformity with slump, air content and temperature specified.
- D. The testing agency shall inspect concrete transit truck's barrel revolution counter and gauge for measuring water added to the concrete. Reject concrete which exceeds the maximum barrel revolution of 300, the limits in Table 03300-3 or concrete that has water content exceeding the specified water-cement ratio.
- E. The Contractor shall reject concrete not conforming to specification before discharging into the forms.

### 3.04 PREPARATION AND COORDINATION:

- A. Contractor shall notify the Engineer or the Engineer's Representative of readiness to place concrete in any portion of the work a minimum of 48 hours prior to concrete

placement. Failure to provide this notification will be cause for delay in placing until inspections can be completed and arrangements for testing established.

- B. All reinforcement, installation of waterstop, positioning of embedded items, and condition of formwork shall be inspected by the Engineer or the Engineer's representative prior to concrete placement.
- C. Coordinate the sequence of placement to assure that construction joints will occur only where indicated on the drawings.
- D. Schedule sufficient equipment for continuous concrete placement. Provide for backup equipment and procedures to be implemented in case of an interruption in placement.
- E. Compact the subbase and/or bedding. The subbase and/or bedding shall be uniformly moist at the time of concrete placement. Spraying water on the subbase and/or bedding may be necessary prior to placement of concrete. Concrete shall not be placed on standing water, mud, and foreign matter.
- F. Provide mud slabs to obtain a dry and stable working platform for placement of slabs on grade and foundation mats as indicated on the drawings or as may be required.
- G. Install a granular base beneath slabs on ground where shown on contract drawings, Place granular material on a compacted subgrade and compact the granular base.
- H. Place vapor retarder under structural slabs and buildings and where shown on contract drawings. Install material with 6 inch lap at joints and seal joints with tape as recommended by the vapor retarder manufacturer. Tape material cut for slab penetrations to the pipe, conduit or other items passing through the slab. Use tape recommended by the vapor retarder manufacturer.
- I. Install vapor retarder without punctures or tears and protect against punctures and breaks.
- J. Where concrete is required to be placed and bonded to existing concrete, coat the contact surfaces with epoxy bonding agent. The method of preparation and application of the bonding agent shall conform to the manufacturer's recommendations.

### 3.05 JOINTS AND EMBEDDED ITEMS

- A. Provide construction joints as specified in Section 03250:
  - 1. Clean all construction joints to remove loose concrete and laitance before placing adjoining concrete. Do not damage exposed concrete edges, key grooves, waterstops or reinforcement.
  - 2. Intentionally roughen surfaces of set concrete to receive new concrete to 1/4" amplitude in a manner to expose bonded aggregate uniformly at joints.

3. Do not place concrete against construction joints for at least 72 hours after initial concrete set.

B. Embedded Items:

1. Secure castings, inserts, conduits and other metalwork encased in concrete to prevent them from being displaced or deformed during concrete work. Use templates to secure items in place.
2. Clean embedded items of oil and all foreign matter.
3. Install inserts, anchors, sleeves and other items into formwork where indicated or specified under other sections of these specifications.
4. Build dovetail anchor slots into new concrete against which facing brick, concrete masonry units, tile, stone or any type ashlar is to be installed. Provide vertically at 16-in. centers where facing brick, etc., passes by concrete. Provide one continuous anchor slot where facing brick, etc., abuts the concrete work.
5. Aluminum embedded in concrete shall be coated to prevent galvanic corrosion with a zinc chromate primer and one of the following products:
  - a. Bitumastic Super Service Black by Koppers Co., Inc.
  - b. Tarmastic 100 by Porter Coatings Division, Porter Paint Co.
  - c. 450 Heavy Tnemecol by Tnemec Company.
  - d. Or accepted equivalent product.
6. Check location and support of piping, electrical conduits and other embedded items before depositing concrete. Correct locations as required and secure in place.
7. Complete required tests on embedded piping before starting concrete placement.

C. Embedded Pipes And Conduit:

1. Embedded pipes and conduit in concrete shall conform to the requirements and limitations of ACI 318, ACI 350 and these specifications and shall be as approved by the engineer.
2. Conduits, pipes, and sleeves of any material not harmful to concrete and within the limitations specified herein shall be permitted to be embedded in concrete with the approval of the Engineer.
3. Conduits and pipes of aluminum shall not be embedded in concrete.

4. Pipes passing through walls of a liquid-containing structure shall include an integral waterstop.
5. Conduits, pipes, and sleeves passing through a slab, wall, or beam shall not impair significantly the strength of the construction.
6. Conduits and pipes, with their fittings, embedded within a column shall not displace more than 4 percent of the area of cross section.
7. Except when drawings for conduits and pipes are approved by the structural engineer, conduits and pipes embedded within a slab, wall, or beam (other than those merely passing through) shall satisfy the following:
  - a. Conduits and pipes shall not be larger in outside dimension than 1/3 the overall thickness of the slab, wall, or beam in which they are embedded.
  - b. Conduits and pipes shall not be spaced closer than 3 times the outside diameters on center.
  - c. Conduits and pipes shall be placed within the middle third of the element and between reinforcement layers. Do not install runs of piping or conduit between formwork and reinforcement.
  - d. Avoid crossing pipes and conduit in concrete.
8. Pipes and fittings shall be designed to resist the effects of the material, pressure, and temperature to which they will be subjected.
9. No liquid, gas, or vapor, except water not exceeding 90 F or 50 psi pressure, shall be placed in the pipes until the concrete has attained its design strength.
10. Reinforcement with an area not less than 0.002 times area of concrete section shall be provided perpendicular to piping or conduit at a maximum spacing of 12 inches.
11. Piping and conduit shall be so fabricated and installed that cutting, bending, or displacement of reinforcement from its proper location will not be required.
12. Close ends of conduits, piping and sleeves embedded in concrete with caps or plugs prior to concrete placement.

### 3.06 CONCRETE PLACEMENT:

- A. Placement shall conform to ACI 304R as modified by these specifications.
- B. Intentionally roughen surfaces of set concrete to receive new concrete to ¼” amplitude in a manner to expose bonded aggregate uniformly at joints.

- C. Do not place adjacent sections of walls and slabs until seven days after placement of the previously placed concrete.
- D. Do not place concrete until all free water has been removed from the forms, clear of the work. Do not permit free or storm water to flow over surfaces of concrete so as to injure the quality or surface finish.
- E. Do not place concrete during inclement weather. Protect concrete placed from inclement weather. Keep sufficient protective covering ready at all times for this purpose.
- F. Deposit concrete at or near its final position to avoid segregation caused by rehandling or flowing. Do not deposit concrete in large quantities in one place to be worked along the forms with a vibrator.
- G. Deposit concrete continuously and in level layers 1 to 2 feet thick. Avoid inclined layers and cold joints. Place concrete at lower portion of slope first on sloping surfaces.
- H. Do not deposit partially hardened concrete in forms. Retempering of partially hardened concrete is not permitted. Remove all partially hardened concrete from site at no additional compensation.
- I. Do not allow concrete to fall freely in forms to cause segregation (separation of coarse aggregate from mortar). Limit maximum free fall of concrete to 4 feet. Do not move concrete horizontally more than four feet from point of discharge. Space points of deposit not more than eight feet apart.
- J. At least two hours shall elapse after depositing concrete in the columns or walls before depositing in beams, girders, or slabs supported thereon. Place beams, girders, brackets, column capitals, and haunches monolithically as part of the floor or roof system, unless otherwise shown on contract drawings.
- K. Consolidate concrete using mechanical vibrators operated within the mass of concrete and/or on the forms conforming to procedures set forth in ACI 309R and as specified herein.
- L. Conduct vibration to produce concrete of uniform texture and appearance, free of honeycombing, streaking, cold joints or visible lift lines.
- M. Conduct vibration in a systematic manner with regularly maintained vibrators. Furnish sufficient backup units at job site. Use vibrators having minimum frequency of 8,000 vibrations per minute and of sufficient amplitude to consolidate concrete. Use not less than one vibrator with crew for each 35 to 40 cubic yards of concrete placed per hour.
- N. Insert and withdraw vibrator vertically at a uniform spacing over the entire area of placement. Space distances between insertions such that spheres of influence of each insertion overlap.



O. Use additional vibration with pencil vibrators on vertical surfaces and on all exposed concrete to bring full surface of mortar against the forms so as to eliminate air voids, bug holes and other surface defects. Employ the following additional procedures for vibrating concrete as necessary to maintain proper consolidation of concrete:

1. Reduce distance between internal vibration insertions and increase time for each insertion.
2. Insert vibrator as close to face of form as possible without contacting form or reinforcement.
3. Thoroughly vibrate area immediately adjacent to waterstops without damaging the waterstop.
4. Use spading as a supplement to vibration where particularly difficult conditions exist.

P. Pumping Concrete:

1. Conform to the recommendations of ACI 304.2R except as modified herein.
2. Use equipment and procedures and schedule deliveries to maintain steady flow of concrete at the discharge end of pipe.
3. Maintain concrete properties of slump, air content and temperature. Make adjustments in concrete proportions as necessary to provide concrete properties in accordance with the approved concrete design mix and as specified herein.
4. Use pipe with inside diameter of at least three times the maximum coarse aggregate size, but not less than 4 inches.
5. Do not use aluminum pipes for delivery of concrete to the forms.
6. Take samples at the point of agitator or mixer truck discharge.
7. Furnish labor and assistance as required by the testing laboratory in obtaining and handling test specimens.

### 3.07 CURING AND PROTECTION:

A. General:

1. Protect concrete from premature drying, hot or cold temperatures, and mechanical injury, beginning immediately after placement and maintain concrete with minimal moisture loss at relatively constant temperature.
2. Comply with curing procedures set forth in ACI 301, ACI 308.1 and as specified herein.

3. Perform hot weather concreting in conformance with ACI 305.1 and as specified herein when the ambient atmospheric temperature is 80 degrees F or above.
4. Perform cold weather concreting in conformance with ACI 306.1 and as specified herein when the ambient atmospheric temperature is 40 degrees F or below.
5. Concrete required to be moist cured shall remain moist for the entire duration of the cure. Repeated wetting and drying cycles of the curing process will not be allowed.

B. Curing Duration:

1. Start initial curing after placing and finishing concrete as soon as free moisture has disappeared from unformed concrete surfaces. Initial curing starts as soon as concrete achieves final set. Forms left tightly in place are considered as part of the curing system, provided that wooden forms are kept continuously moist. Keep continuously moist for not less than 72 hours.
2. Begin final curing procedures immediately following initial curing and before the concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301 procedures for a total curing period, initial plus final, of at least 10 days.
3. Avoid rapid drying at the end of the final curing period

C. Curing Requirements:

1. Unformed Surfaces: Cover and cure entire surface of newly placed concrete immediately after completing finishing operations and water film has evaporated from surface or as soon as marring of concrete will not occur. Protect finished slabs from direct rays of the sun to prevent checking, crazing and plastic shrinkage.
2. Formed Surfaces: Minimize moisture loss for formed surfaces exposed to heating by the sun by keeping forms wet until safely removed. Keep surface continuously wet by warm water spray or warm water saturated fabric immediately following form removal.
3. Liquid containing and below grade structures: Moist cure by the application of water to maintain the surface in a continually wet condition. Use water that is free of impurities that could etch or discolor exposed concrete surfaces.
4. Other concrete: Moist cure by moisture-retaining cover curing, or by the use of curing compound.

D. Curing Methods:

1. Water Curing: Use water curing for unformed surfaces. Continuously water cure all exposed concrete for the entire curing period. Provide moisture curing by any of the following methods:
  - a. Keeping the surface of the concrete continuously wet by ponding or immersion.
  - b. Continuous water-fog spray or sprinkling.
  - c. Covering the concrete surface with curing mats, thoroughly saturating the mats with water, and keeping the mats continuously wet with sprinklers or porous hoses. Place curing mats so as to provide coverage of the concrete surfaces and edges, with a 4-inch lap over adjacent mats. Weight down the curing cover to maintain contact with the concrete surface, as necessary.
  
2. Sealing Materials:
  - a. Use common sealing materials such as plastic film or waterproofing (kraft) paper when permitted by the Engineer.
  - b. Lap adjacent sheets a minimum of 12 inches. Seal edges with waterproof tape or adhesive. Use sheets of sufficient length to cover sides of concrete member.
  - c. Place sheet materials only on moist concrete surfaces. Wet concrete surface with fine water spray if the surface appears dry before placing sheet material.
  - d. The presence of moisture on concrete surfaces at all times during the prescribed curing period is proof of acceptable curing using sheet material.
  
3. Membrane Curing Compound:
  - a. Apply membrane-curing compound uniformly over concrete surface by means of roller or spray at a rate recommended by the curing compound manufacturer, but not less than 1 gallon per 150 sq. ft. of surface area. Agitate curing material in supply container immediately before transfer to distributor and thoroughly agitate it during application for uniform consistency and dispersion of pigment
  - b. Do not use curing compounds on construction and expansion joints or on surfaces to receive liquid hardener, dustproofer/sealer, concrete paint, tile, concrete fills and toppings or other applications requiring positive bond.
  - c. Reapply membrane-curing compound to concrete surfaces that have been subjected to wetting within 3 hours after curing compound has been applied by method for initial application.

- E. Protection from environmental conditions: Maintain the concrete temperature above 50 degrees F continuously throughout the curing period. Make arrangements before concrete placing for heating, covering, insulation or housing as required to maintain the specified temperature and moisture conditions continuously for the curing period.
  - 1. When the atmospheric temperature is 80 degrees F and above, or during other climatic conditions which will cause too rapid drying of the concrete, make arrangements before the start of concrete placing for the installation of wind breaks or shading, and for fog spraying, wet sprinkling, or moisture-retaining covering.
  - 2. Protect the concrete continuously for the entire curing period.
  - 3. Maintain concrete temperature as uniformly as possible, and protect from rapid atmospheric temperature changes.
  - 4. Avoid temperature changes in concrete that exceed 5 degrees F in any one hour and 50 degrees F in any 24-hour period.
- F. Protection from physical injury: Protect concrete from physical disturbances such as shock and vibration during curing period. Protect finished concrete surfaces from damage by construction equipment, materials, curing procedures and rain or running water. Do not load concrete in such a manner as to overstress concrete.
- G. Protection from Deicing Agents: Do not apply deicing chemicals to concrete.

### 3.08 FIELD QUALITY CONTROL:

- A. Hot Weather Requirements
  - 1. During hot weather, give proper attention to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation in accordance with ACI 305.1 and the following.
  - 2. When the weather is such that the temperature of the concrete as placed would exceed 90 degrees F, use ice or other means of cooling the concrete during mixing and transportation so that the temperature of the concrete as placed will not exceed 90 degrees F.
  - 3. Take precautions when placing concrete during hot, dry weather to eliminate early setting of concrete. This includes protection of reinforcing from direct sunlight to prevent heating of reinforcing, placing concrete during cooler hours of the day, and the proper and timely application of specified curing methods.
  - 4. There will be no additional reimbursement to the Contractor for costs incurred for placing concrete in hot weather.

## B. Cold Weather Requirements

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather in accordance with ACI 306.1 and the following.
2. When the temperature of the surrounding atmosphere is 40 degrees F or is likely to fall below this temperature, use heated mixing water not to exceed 140 degrees F. Do not allow the heated water to come in contact with the cement before the cement is added to the batch.
3. When placed in the forms during cold weather, maintain concrete temperature at not less than 55 degrees F. All materials shall be free from ice, snow, and frozen lumps before entering the mixer.
4. Maintain the air and the forms in contact with the concrete at temperatures above 40 degrees F for the first five days after placing, and above 35 degrees F for the remainder of the curing period. Provide thermometers to indicate the ambient temperature.
5. There will be no additional reimbursement made to the Contractor for costs incurred for placing concrete during cold weather.

## C. Backfill Against Walls

1. Do not place backfill against walls until the concrete has obtained a compressive strength equal to the specified 28-day compressive strength. Where backfill is to be placed on both sides of the wall, place the backfill uniformly on both sides.
2. Do not backfill the walls of structures that will be laterally restrained or supported by suspended slabs or slabs on grade until the slab is placed and the concrete has reached the specified compressive strength.

## D. Concrete Testing

1. Concrete Quality Test Specimen:
  - a. Perform sampling and curing of test specimen in accordance with ASTM C31.
  - b. Testing agency personnel will record truck and load number from the delivery batch ticket, the concrete placement location of each specimen, the date, concrete strength, slump, air content and temperature.
  - c. For each 50 cu. yd. of each mix design of concrete but not less than once a day nor less than once for each 5,000 sq. ft. of surface area of foundation mats, base slabs, footings, slabs on grade, grade beams, walls, or elevated slabs, the testing agency will cast a minimum of:

- (1) One set of four (4) 6"x12" test specimens or
  - (2) One set of seven (7) 4"x8" test specimens
- d. Once a cylinder size has been selected, the size and number of specimens representing a strength test for each concrete mix shall remain constant.
- e. For 6"x12" test cylinders:
- (1) The testing agency will compression test one (1) of each set of four 6"x12" specimens at 7 days.
  - (2) Test two (2) of the remaining cylinders at 28 days for concrete strength acceptance.
  - (3) The fourth cylinder shall be held for testing at 56 days only if the 28 day cylinder strengths are deficient. The fourth cylinder of each set shall be discarded if the 28 day strengths meet or exceed the specified minimum strength.
- f. For 4"x8" test cylinders:
- (1) The testing agency will compression test two (2) of each set of seven 4"x8" specimens at 7 days.
  - (2) Test three (3) of the remaining cylinders at 28 days for concrete strength acceptance.
  - (3) The last two cylinders shall be held for testing at 56 days only if the 28 day cylinder strengths are deficient. The 6<sup>th</sup> and 7<sup>th</sup> cylinders of each set shall be discarded if the 28 day strengths meet or exceed the specified minimum strength.
2. The laboratory firm shall immediately notify the Contractor and the Engineer if the seven day strength is deficient.
  3. The acceptance test result is the average of the strengths of the two specimens tested at 28 days.
  4. The laboratory firm shall submit compression test results to both the Contractor and the Engineer. Concrete acceptance shall be based on the requirements of ACI 318 and ACI 350.
  5. Field cured cylinders conforming to ASTM C31 will be required to determine field compressive strength of concrete. Laboratory cured cylinders for concrete quality testing shall not be used for determining field compressive strength.

E. Concrete Coring:

- a. When the concrete quality test specimen compression tests fail to be in compliance with the Contract Documents or when the Engineer detects deficiencies in the concrete, the Contractor will take concrete cores at least 4 inches in diameter from the structure in conformance with ASTM C 42 at locations determined by the Engineer.
- b. Obtain at least three representative cores from each member or area of concrete that is considered potentially deficient.
- c. Obtain additional cores to replace cores that show evidence of having been damaged subsequent to or during removal from the structure.
- d. The testing agency shall compression test the cores taken from the structure in conformance with ASTM C 39 and submit test strength test results of cores specified above to the Contractor and to the Engineer.
- e. All costs associated with coring and testing of cores will be borne by the Contractor at no additional cost to the Owner.

3.09 REPAIRS:

- A. Provide in accordance with Section 03730.

3.10 CONCRETE FINISHES:

- A. Do not use curing compound where epoxy, urethane, mortar bed, grout, additional concrete or other toppings or adhesive will be applied.
- B. Do not sprinkle with dry cement or add water when finishing concrete surfaces.
- C. Finish concrete surfaces in accordance with the following schedule:

<b>Table 03300-5</b>	
<b>Finish Designation</b>	<b>Area Applied</b>
F-1	Exterior walls not exposed to liquids or view.
F-3	Walls exposed to view.
E-1	Exposed edges.
E-2	Top of walls and similar unformed surfaces.

- 1. Finish F-1: Repair defective concrete, fill depressions deeper than 1/2-inch, and fill tie holes.
- 2. Finish F-3: Repair defective concrete, remove fins, fill depressions 1/4-inch or deeper, and fill tie holes, fill depressions and airholes with mortar. Dampen surfaces and then spread a slurry consisting of one part cement and one and one-

half parts sand by damp loose volume, over the surface with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.

3. Finish E-1: Provide 3/4 inch chamfer on external corners of exposed concrete walls, beams columns, equipment pads and exposed edges of construction joints. Do not chamfer columns flush with concrete block walls.
  4. Finish E-2: Strike smooth and float to an F-3 or F-4 finish.
- D. Protect finished concrete surfaces from damage by construction equipment, materials, curing procedures and rain or running water.

### 3.11 FINISHING OF FORMED SURFACES:

- A. Cure surfaces until finishing and repairing are completed.
- B. Perform finish work in accordance with the schedule in Table 03300-5 as soon as possible after forms are removed.
- C. Conform to the requirements specified in Section 03100 for tolerances for formed surfaces.

### 3.12 FINISHING OF UNFORMED SURFACES:

- A. Perform finish work in accordance with the schedule in Table 03350-5.

### 3.13 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01700.

END OF SECTION



## SECTION 03600

### GROUT

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Furnish all labor, materials, equipment, and incidentals required, and install grout complete as shown on the Drawings and as specified herein.

##### 1.02 SUMMARY:

###### A. Section Includes:

1. Material for grouting reinforcing bars, anchor bolts into existing or newly placed concrete.
2. Material for grouting under bearing plates for columns or beams.
3. Materials for grouting under equipment.
4. Materials for grouting under and around steel tanks.
5. Materials for miscellaneous grouting including but not limited to railing posts, equipment guides, bollards, precast concrete joints and supports etc.

##### 1.03 REFERENCE STANDARDS:

###### A. American Association of State Highway and Transportation Officials (AASHTO):

1. [M182](#): Burlap Cloth made from Jute or Kenaf

###### B. American Petroleum Institute (API):

1. [RP 686](#): Recommended Practice for Machinery Installation and Installation Design

###### C. ASTM International (ASTM):

1. [C33](#): Standard Specification for Concrete Aggregates
2. [C109](#): Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or (50-mm) Cube Specimens)
3. [C150](#): Standard Specification for Portland Cement

4. [C531](#): Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts, and Monolithic Surfacing
5. C579 Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
6. [C827](#): Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixes
7. C939 Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
8. [C1107](#): Standard Specification for Packaged Dry, Hydraulic, Cement Grout (Non-shrink)
9. [D695](#): Standard Test Method for Compressive Properties of Rigid Plastics

D. U.S. Army Corps of Engineers Standard (CRD):

1. [C621](#): Corps of Engineers Specification for Non-shrink Grout

1.04 SUBMITTALS:

A. Submit the following shop drawings in accordance with Section 01300.

B. Product Data:

1. Commercially manufactured non-shrink, non-metallic cementitious grout:
  - a. Include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to referenced ASTM standards, and Material Safety Data Sheet.
2. Commercially manufactured non-shrink epoxy grout:
  - a. Include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to referenced ASTM Standards and Material Safety Data Sheet.
3. Cement grout:
  - a. Include the type and brand of the cement, the gradation of the fine aggregate, product data on any proposed admixtures, and the proposed mix of the grout.
4. Concrete grout:
  - a. Include data for concrete as delineated in Section 03300. This includes the mix design, constituent quantities per cubic yard, and the water/cement ratio.

5. Bonding Agent:
    - a. Include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to referenced ASTM standards, and Material Safety Data Sheet.
  - C. Laboratory Test Reports.
    1. Submit laboratory test data as required under Section 03300 for concrete to be used as concrete grout.
  - D. Mill test reports for each shipment of cement, regardless of quantity, prior to incorporation into the work.
  - E. Manufacturer's specifications and instructions for all admixtures, curing materials, adjustable inserts and non-shrink non-metallic grout. Manufacturer's certification of compatibility of all admixtures.
- 1.05 QUALITY ASSURANCE:
- A. Qualifications
    1. Grout manufacturer to have a minimum of 5 years of experience in the production and use of the type of grout proposed for the Work.
  - B. Field Testing
    1. Field testing and inspection services required will be provided by the Owner. Provide assistance in the sampling of materials and provide any ladders, platforms, etc. for access to the Work. Comply with the applicable ASTM Standards for testing.
    2. The field testing of concrete grout will be as specified for concrete in Section 03300.
    3. Take compression test specimens from the first placement of each type of grout to ensure compliance with these Specifications.
      - a. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing one at seven days and two at 28 days.
      - b. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C579, Method B. A set of three specimens will be made for testing at seven days.

1.06 RESPONSIBILITIES:

- A. Assist the Owner in obtaining specimens for testing and furnish all materials necessary for fabricating the test specimens.
- B. The cost of laboratory tests on grout will be paid by the Owner except where test results show the grout to be defective. In such case, the Contractor shall pay for the tests, removal and replacement of defective work, and re-testing all at no cost to the Owner.

1.07 WARRANTY:

- A. Warrant the materials and products specified in this Section against defective materials and workmanship with the manufacturer's standard warranty, but for no less than one year from the date of substantial completion.
- B. Warrant the work against defects for one year from the date of substantial completion.

1.08 DELIVERY, STORAGE, AND HANDLING:

- A. Comply with the requirements in Section 01610.
- B. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers, and printed instructions.
- C. Store materials in accordance with the manufacturer's recommendations. Total storage time from date of manufacture to date of installation shall be limited to six months or the manufacturer's recommended storage time, whichever is less.
- D. Reject material that becomes damp, lumpy or otherwise unacceptable and immediately remove from the site and replace with acceptable material at no cost to the Owner.
- E. Deliver non-shrink cement based grouts as pre-blended, prepackaged mixes requiring only the addition of water.
- F. Deliver non-shrink epoxy grouts as premeasured, prepackaged, three component systems requiring only blending as directed by the manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Provide materials produced by one manufacturer or supplier in order to provide standardization of appearance.

2.02 APPLICATION:

- A. Unless indicated otherwise, provide grouts as listed below:

<b>Table 03600-1</b>	
<b>Type of Grout</b>	<b>Application</b>
Cement Grout	Surface repairs
Non-Shrink – Class I	Storage tanks and other non-motorized equipment.
	Filling block-out spaces for embedded items such as railing posts, gate guide frames, etc. (Where placement time is less than 20 min.).
	Repair of holes and defects in concrete members that are not water bearing and not in contact with soil or other fill material.
Non-Shrink – Class II	Column base plates.
	Filling block-out spaces for embedded items such as railing posts, gate guide frames, etc. (where placement time exceeds 20 min.)
	Under precast concrete elements.
Non-Shrink Epoxy	Machinery subject to severe shock loads and high vibration.
Concrete Grout	Toppings and concrete/grout fill.

2.03 MATERIALS:

A. Non-shrink Class I Grout:

1. Non-shrink Class I Grout shall have a minimum 28-day compressive strength of 5,000 psi, when mixed at a fluid consistency.
2. Non-shrink Class I grout shall meet the requirements of ASTM C1107, Grade B or C, when mixed to fluid, flowable and plastic consistencies.
3. Products:
  - a. Sika Corporation; SikaGrout 212
  - b. BASF Corporation; MasterFlow 713
  - c. Euclid Chemical Comany; Euco NS
  - d. Or acceptable equivalent product.

B. Non-shrink Class II Grout:

1. Non-shrink grout shall be a high precision, fluid, extended working time grout. The minimum 28-day compressive strength shall be 7,500 psi, when mixed at a fluid consistency.

2. Grout shall have an extended working time of 30 minutes minimum when mixed to a fluid consistency as defined in ASTM C827 at temperature extremes of 45 to 90 degrees F in accordance with ASTM C1107.
3. Non-shrink grouts shall meet the requirements of ASTM C1107; Grade B or C when tested using the amount of water needed to achieve fluid consistency per ASTM C939.
4. The grout when tested shall not bleed or segregate at maximum allowed water.
5. Products:
  - a. BASF Corporation; Masterflow 928
  - b. Euclid Chemical Co.; Hi-Flow Grout
  - c. Sika Corporation; SikaGrout 212
  - d. Or acceptable equivalent product.

C. Cement Grout:

1. Cement grouts shall be a mixture of one part Portland cement conforming to ASTM C150 types I, II, or III and one to two parts sand conforming to ASTM C33 with sufficient water to place the grout. The water content shall be sufficient to impart workability to the grout, but not to the degree that it will allow the grout to flow.
2. Cement grout materials shall be as indicated in section 03300 cast-in-place concrete.

D. Concrete Grout:

1. Concrete grout shall conform to the requirements of Section 03300 except as specified herein. Proportion with cement, coarse and fine aggregates, water, water reducer, and air entraining agent to produce a mix having an average strength of 4,000 psi at 28 days. Coarse aggregate size shall be 3/8-inch maximum. Keep the W/C ratio as low as practical while still retaining sufficient workability.

E. Non-shrink epoxy-based grout:

1. Provide a pre-proportioned, three component, 100 percent solids system consisting of epoxy resin, hardener, and blended aggregate. It shall have a compressive strength of 14,000 psi in seven days when tested in conformity with ASTM D695 and have a maximum thermal expansion of  $30 \times 10^{-6}$  when tested in conformity with ASTM C531.
2. Products:

- a. BASF Corporation; MasterFlow 648
- b. Five Star Products, Inc.; HP Epoxy Grout
- c. Sika Corporation; Sikadur 42 Grout-Pak
- d. Euclid Chemical Company; High Strength Epoxy Grout
- e. Or acceptable equivalent product.

F. Dry Pack Grout:

1. Dry pack (to be packed or tamped in place) shall be mixed to a zero slump consistency.
2. When mixing the batch, add only enough water to the dry materials to produce a rather stiff mixture. Additions of water shall be made in small increments until the desired consistency is obtained.

G. Non-epoxy Bonding Compound:

1. Provide non-epoxy bonding compound that is re-wetable for up to two weeks.
2. Products:
  - a. Larsen Products Corporation; Weld-Crete
  - b. Sta-Dry Manufacturing Corporation; Link
  - c. Euclid Chemical Company; Euco Weld
  - d. Or acceptable equivalent product.

2.04 CURING MATERIALS:

- A. Curing materials for cement grout shall be as specified in Specification 03300 and as recommended by the manufacturer for prepackaged grouts.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Grout shall not be placed until base concrete or masonry has attained its design strength.
- B. Prepare surfaces for curing, and protection of cement grout in accordance with Section 03300 Cast-in-Place Concrete.

- C. Shade the work sites from sunlight for at least 24 hours before and 48 hours after grouting.
- D. Contact the grout manufacturer's representative for assistance on hot and cold weather grouting techniques and precautions if applicable.

### 3.02 PREPARATION:

- A. Clean concrete surfaces to receive grout free of ice, frost, dirt, grease, oil, curing compounds, laitance and paints, and free of all loose or unsound material or foreign matter that may affect the bond or performance of the grout.
- B. Roughen concrete surfaces by chipping, sandblasting, or other mechanical means to ensure bond of the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance and firmly embedded into the parent concrete.
- C. Remove all loose rust, oil or other deleterious substances from metal embedments prior to the installation of the grout.
- D. Wash concrete surfaces clean and keep them moist for at least 24 hours prior to the placement of cementitious or cement grout. Saturate by covering the concrete with a plastic sheet or using either a soaker hose, flooding the surface or other method acceptable to the Engineer. Remove visible water from the surface upon completion of the 24-hour period prior to grouting. Use an accepted adhesive bonding agent in lieu of surface saturation when accepted by the Engineer for each specific location of grout installation.
- E. Epoxy based grouts do not require the saturation of the concrete substrate. Surfaces in contact with epoxy grout shall be completely dry before grouting.
- F. Construct grout forms or other leak proof containment. Forms shall be lined or coated with release agents recommended by the grout manufacturer.
- G. Support equipment during alignment and installation of grout by shims, wedges, blocks, or other accepted means. Prevent the shims, wedges, and blocking devices from bonding to the grout by appropriate bond breaking coatings and remove them after grouting unless otherwise accepted by the Engineer.

### 3.03 GROUTING MACHINERY FOUNDATIONS:

- A. After the machinery has been set in position and placed at the proper elevation by steel wedges, the space between the bottom of the machinery base and the original placement of concrete shall be filled with a pourable non-shrink grout. Grout and grouting procedure shall be in accordance with API 686.



### 3.04 INSTALLATION:

#### A. Cement Grouts and Non-shrink Cementitious Grouts:

1. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel, or admixtures without prior approval by the grout manufacturer and the Engineer.
2. Avoid mixing by hand. Pre-wet the mixer and empty excess water. Add premeasured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the additional water required to obtain workability. However, do not exceed the manufacturer's maximum recommended water content.
3. Place grout into the designated areas in a manner that will avoid segregation or entrapment of air. Do not vibrate grout to release air or to consolidate the material. Placement should proceed in a manner that will ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary. Place grout rapidly and continuously to avoid cold joints. Do not place cement grouts in layers. Do not add additional water to the mix (re-temper) after initial stiffening.
4. Just before the grout reaches its final set, cut back the grout to the substrate at a 45-degree angle from the lower edge of bearing plate unless otherwise accepted by the Engineer.
5. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement or longer if recommended by the manufacturer.

#### B. Non-shrink Epoxy Grouts:

1. Mix in accordance with the procedures recommended by the manufacturer. Do not vary the ratio of components or add solvent to change the consistency of the grout mix. Do not over mix. Mix full batches only to maintain proper proportions of resin, hardener, and aggregate. Partial mixes will be rejected and will require the suspect grout to be removed and be replaced.
2. Monitor ambient weather conditions and contact the grout manufacturer for special placement procedures to be used for temperatures below 60 degrees F or above 90 degrees F.
3. Place grout into the designated areas in a manner that will avoid trapping air. Placement methods shall ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.
4. The extension of grout horizontally beyond base plate shall be less than or equal to the grout thickness.

5. Epoxy grouts are self-curing and do not require the application of water. Maintain the formed grout within its recommended placement temperature range for at least 24 hours after placing, or longer if recommended by the manufacturer.

C. Concrete Grout:

1. Provide the underlying concrete surface with a broomed finish. Protect and keep the surface clean until placement of concrete grout.
2. Remove the debris and clean the surface of all dirt and other foreign materials.
3. Saturate the concrete surface for at least 24 hours prior to placement of the concrete grout. Remove excess water just prior to placement of the concrete grout. Place a cement slurry immediately ahead of the concrete grout so that the slurry is moist when the grout is placed. Work the slurry over the surface with a broom until it is coated with approximately 1/16- to 1/8-inch thick cement paste.

D. Dry Pack:

1. Dry pack consistency shall be such that the grout is plastic and moldable but will not flow.
2. The use of pneumatic pressure for dry-packed grouting requires acceptance of the Engineer.

3.05 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 03730

### CONCRETE REPAIR

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Provide materials labor, equipment, and services necessary to repair concrete as specified.
- B. Complete concrete repair operations in accordance with these specifications and the various system manufacturers' instructions regarding surface preparation, application, inspection and requirements for safety.
- C. Complete crack repair work in accordance with these specifications and crack repair material manufacturer's instructions.
- D. Complete joint repair work in accordance with these specifications and the joint repair material manufacturer's instructions.
- E. The areas of concrete repair shall be determined by the Contractor and the Engineer and shall include any location where acidic attack of the concrete surfaces has reached a depth of ½" or deeper and at any air voids, bug holes or poorly consolidated concrete areas where the specified filler/surfacer materials cannot be used for filling or surfacing of the concrete.
- F. If repair work is required for an area indicated to receive protective lining or coating, provide such repair in accordance with the requirements of this specification and the related lining or coating specifications.
- G. The repair work specified herein is intended to cover the requirements for repair of concrete only, to a maximum depth of approximately 4-inch. If after blasting and cleaning, an area is discovered that requires a repair greater than 4-inch deep, or an area is discovered that requires repair or replacement of reinforcing steel notify the Engineer so that details may be provided to the Contractor to complete the repair.

##### 1.02 REFERENCES:

- A. National Association of Corrosion Engineers (NACE):
  - 1. 6D-173: "A Manual for Painter Safety"
  - 2. 6F-163: "Surface Preparation of Steel or Concrete Tank Interiors"
  - 3. TPC2: "Coatings and Linings for Immersion Service"
- B. American Concrete Institute (ACI):

1. [503.4](#): Standard Specification for Repairing Concrete with Epoxy Mortars

C. ASTM International (ASTM ):

1. [C33](#): Standard Specifications for Concrete Aggregates

2. [C150](#): Standard Specification for Portland Cement

3. [C321](#): Standard Test Method for Bond Strength of Chemical-Resistant Mortars

4. [C882](#): Test Method for Bond Strength of Epoxy Resin Systems

5. [D570](#): Test Method for Water Absorption of Plastics

6. [D638](#): Test Method for Tensile Properties of Plastics

7. [D695](#): Test Method for Compressive Properties of Rigid Plastics

8. [D790](#): Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

9. [D4262](#): L.R. Standard Test Method for pH of Chemically Cleaned or Acid Etched Concrete Surfaces

10. E329: Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

11. [E337](#): L.R. Standard Practice Test Method for Measuring Humidity with a Psychrometer.

1.03 MEASUREMENT:

A. Crack Repair: The quantities in linear feet to be measured for payment shall be the actual length of cracks repaired by the methods and materials specified under.

1. Epoxy crack repair.

2. Flexible polyurethane crack repair.

3. Rigid polyurethane crack repair.

B. Spall Repair Depth 4-inch or less: The quantities in square feet to be measured for payment shall be the actual square footage of spalled concrete repaired by the method and materials specified under spall repair.

C. Spall Repair Depth Greater Than 4-inch: The quantities in cubic feet to be measured for payment shall be the actual cubic footage of spalled concrete repaired by the method and materials specified under spall repair.

- D. Crystalline Waterproofing Crack and Joint Repair: The quantities in linear feet to be measured for payment shall be the actual length of joints repaired by the methods and materials specified under crystalline waterproofing crack and joint repair.
- E. Pipe Penetrations: The quantities in linear feet to be measured for payment shall be the actual circumference repaired by the methods and materials specified under pipe penetrations.
- F. Waterproofing Treatment: The quantities in square feet to be measured for payment shall be the actual square footage of concrete surface to which the coating shall be applied specified under waterproofing treatment.

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300.
  - 1. Procedures proposed for the accomplishment of repair work. Include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations to be coordinated with other works in progress.
  - 2. Manufacturer's recommendations and product data sheets for all repair materials including performance criteria, surface preparation, ambient condition requirements and applications, curing requirements, volatile organic compound (VOC) data, and safety requirements.
  - 3. Material Safety Data Sheets (MSDS) for any materials brought on-site including all repair system materials, solvents and abrasive blast media.
  - 4. Qualifications of foreman and epoxy gun operators and demonstration of meeting the minimum requirements specified.
  - 5. Design Mixes: Provide concrete and cement mortar in conformance with Section 03300 and as specified herein.

1.05 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01400.
- B. Furnish the names of all subcontractors proposed for use for this work including necessary evidence and/or experience records to ascertain their qualifications in the application of epoxy, polyurethane, polymer-modified and cement-based compounds.
- C. Include in accepted applicator qualifications:
  - 1. A minimum of five years experience in applying epoxy, polyurethane and polymer-modified and cement-based compounds, and crystalline waterproofing repair systems similar to those specified in this Section.

2. A letter from the manufacturer of the specified materials, on the manufacturer's letterhead, signed by an officer of the company, stating that the subcontractor/applicator has been trained in the proper techniques for the preparation of the surface, and proper methods for mixing, placing, curing, and caring of the manufacturer's products. This letter shall further state that the subcontractor/applicator is on the manufacturer's approved list of contractors.
- D. Adhere strictly to the manufacturer's printed recommendations supplied with the product regarding temperature at time of application for all work. Do not use epoxy materials when either the temperature of the concrete to be repaired or the ambient temperature is below 50 degrees F 24 hours before, during, or for a period of 48 hours after the completion of the repair. Do not use crystalline waterproofing materials when either the temperature of the concrete to be repaired or the ambient temperature is below 40 degrees F 24 hours before, during, or for a period of 48 hours after the completion of the repair. Temporary heat may be used to meet the specified requirements.
  - E. Use new materials and use within the shelf life limitations set forth by the manufacturer. Clearly mark the shelf life limitations of each container.
  - F. The Contractor is ultimately responsible for the concrete repair work. Inspections by the Engineer or others do not limit the Contractor's responsibility.
  - G. Make all parts of the work accessible for inspections by the Engineer. Correct any conditions not in conformance with the specifications at no additional cost to the Owner.
  - H. Provide a Representative on site at all times when work is ongoing to represent the Contractor and to have authority to receive and execute all instructions given by the Engineer.
  - I. Allow changes in the specified repair work methods only with the permission of the Engineer.
  - J. Provide technical field support or training services required by the accepted material manufacturers at no additional cost to the Owner.
  - K. Provide materials from a single manufacturer for all components of a single repair.
- 1.06 SERVICES OF MANUFACTURERS REPRESENTATIVES:
- A. Provide the services of a qualified manufacturer's technical representative to instruct the Contractor's personnel in the mixing, proper use and application of the epoxy, polyurethane, polymer-modified, crystalline repair systems and cement-based compounds.
  - B. Provide written certification from the manufacturers' representative that materials have been mixed and applied properly and surfaces to receive these products have been prepared properly, all in conformance with manufacturer's requirements.

- C. Provide on-site time required for the manufacturer's representative to achieve a successful installation at no additional cost to the Owner.

1.07 DELIVERY, STORAGE AND HANDLING:

- A. Comply with the requirements in section 01610.
- B. Provide shelter to store materials in area or areas designated by the Owner solely for this purpose. Confine mixing, thinning, clean-up and associated operations and storage of repair mortar materials debris before authorized disposal, to these areas.
- C. Mix all specified materials in the sheltered mixing operation and materials from direct sunlight and inclement weather. Protect facilities from staining and damage.
- D. Do not dispose of waste materials on-site.
- E. Store waste temporarily in closed, nonflammable containers until final disposal. Keep no rubbish in Contractor's area longer than 24 hours.
- F. Deliver all materials to the job site in new, unopened containers. Each container shall bear the manufacturer's name and label. Labels on all material containers shall contain the following information:
  - 1. Name of product.
  - 2. Federal Specification Number if applicable.
  - 3. Manufacturer's batch number.
  - 4. Manufacturer's name.
  - 5. Generic type of material.
  - 6. Hazardous material identification label.
  - 7. Shelf life date.
- G. Clearly mark all containers indicating any safety hazards associated with the use of or exposure to the materials.
- H. Handle and store materials to prevent damage or loss of label. Protection of materials is the Contractor's responsibility.

1.08 PROJECT/SITE CONDITIONS:

- A. Environmental Requirements:
  - 1. Comply with the repair material manufacturer's recommendations as to environmental conditions under which materials can be applied and cured.

2. Do not apply materials when dust is being generated.
- B. Protection:
1. Cover or otherwise protect finish work or other surfaces not being repaired.
- C. Ventilation:
1. Provide ventilation to meet product requirements prior to, during, and after application.

## PART 2 - PRODUCTS

### 2.01 WATER:

- A. Use water free from injurious amounts of ice, oil, acid, alkali, salt, organic matter, or other deleterious substances and conforms to requirements of ASTM C1602.
- B. Water shall not contain more than 500 mg of chlorides or more than 500 mg of sulfates.
- C. Heat or cool water to obtain concrete repair product temperatures in accordance with manufacture's printed recommendations, and in accordance with ACI 305.1 and ACI 306.1.

### 2.02 AGGREGATE:

- A. All aggregates shall conform to ASTM C33 and section 03300.

### 2.03 EPOXY BONDING AGENT:

- A. Epoxy bonding agent shall conform to ASTM C881 Type I, II, IV or V; Grade 2 for epoxy resin adhesives, depending on the application. The class of epoxy bonding agent shall be suitable for all ambient and substrate temperatures.

B. Products:

1. Sika Corporation; Sikdur 32 Hi-Mod
2. Euclid Chemical Company; Duralcrete
3. BASF Corporation; MasterEmaco ADH 326
4. Or acceptable equivalent product.

### 2.04 ANTI-CORROSION COATING:

- A. Anti-corrosion coating shall be a three-component, solvent free, and moisture tolerant epoxy-modified cementitious material.



B. Products:

1. Sika Corporation; Sika Armatec 110
2. Sto Corporation; CR 246
3. Euclid Chemical Company; Duralprep A.C.
4. Or acceptable equivalent product.

2.05 EPOXY CRACK REPAIR BINDER:

A. Epoxy crack repair binder shall be a two-component, 100 percent solids, high-modulus, low viscosity epoxy adhesive suitable for crack grouting by injection or gravity feed.

B. Products:

1. Sika Corporation; Sikadur 52
2. Euclid Chemical Company; Duralcrete LV
3. BASF Corporation; MasterInject 1380
4. Or acceptable equivalent product.

2.06 RIGID POLYURETHANE CRACK REPAIR MATERIAL:

A. Rigid polyurethane crack repair material shall be a one-component, water-activated polyurethane hydrophobic injection grout capable of 700 percent expansion. Polyurethane grout shall form a tough rigid foam seal that is impenetrable to water.

B. Products:

1. Euclid Chemical Company; Dural Aqua-Dam LV
2. Prime Resins; Prime Flex 920
3. Sika Corporation; Sikafix HH LV
4. Or acceptable equivalent product.

2.07 EPOXY REPAIR MORTAR:

A. Epoxy Repair Mortar shall be two-component, 100 percent solids, and 100 percent reactive epoxy resin system.

B. Spall repair mortar for use in horizontal applications.

1. Products:

- a. BASF Corporation; MasterEmaco ADH 327
- b. Sika Corporation; Sikadur 22 Lo-Mod
- c. Euclid Chemical Company; Euco #4565 Mortar
- d. Or acceptable equivalent product.

C. Spall repair mortar for use in vertical and overhead applications.

1. Products:

- a. Sika Corporation; Sikadur 23 Lo-Mod Gel
- b. BASF Corporation; MasterEmaco ADH 327
- c. Or acceptable equivalent product.

#### 2.08 SPALL REPAIRS USING NON-SHRINK CEMENTITIOUS MORTAR:

A. Products:

1. BASF Corporation; MasterEmaco S 488CI
2. Sika Corporation; Sika Repair 224
3. Sauereisen, Inc.; Restokrete Underlayment No. F-120
4. Or acceptable equivalent product.

#### 2.09 SPALL REPAIRS USING POLYMER MODIFIED CEMENTITIOUS MORTAR:

A. Repair spalls repair not requiring formwork using a two-component, polymer-modified cementitious mortar having a minimum 28-day compressive strength of 6,000 psi.

B. Spall repair mortar for use in horizontal applications.

1. Products:

- a. Sika Corporation; Sikatop 122 Plus
- b. Euclid Chemical Company; Duraltop Flowable Mortar
- c. BASF Corporation; MasterEmaco T302
- d. Or acceptable equivalent product.

C. Spall repair mortar for use in vertical applications.

1. Products:

- a. Sika Corporation; Sikatop 123 Plus
- b. Euclid Chemical Company; Duraltop Gel
- c. BASF Corporation; MasterEmaco N 423RS
- d. Or acceptable equivalent product.

#### 2.10 SPALL REPAIRS REQUIRING FORMWORK:

- A. Repair spalls repair requiring formwork using a two-component, polymer-modified cementitious mortar/pea gravel mixture and shall have a minimum 28-day compressive strength of 5,000 psi. Mix each unit of mortar with Saturated Surface Dry (SSD) pea gravel to form the repair material following the manufacturer's recommendations.
- B. Products:
  1. Sika Corporation; Sikatop 111 Plus
  2. Euclid Chemical Company; Duraltop Flowable Mortar
  3. BASF Corporation; MasterEmaco N 1500HCR Self Consolidated-Extended
  4. Or acceptable equivalent product.

### PART 3 - EXECUTION

#### 3.01 GENERAL REQUIREMENTS:

- A. Perform exterior work during dry weather and appropriate temperature conditions in accordance with the manufacturer's recommendations. Protect unfinished work during inclement weather with tarpulins or heavy gage polyethylene sheeting.
- B. Perform work in spaces within structures at temperature and conditions suitable for proper curing in accordance with the manufacturer's recommendations.
- C. Coordinate concrete rehabilitation work with other work being performed.
- D. Remove scaling, broken, loose and disintegrating materials by use of hand tools or power driven saws, down to solid unyielding material.
- E. Clean surfaces thoroughly of efflorescence, oils, grease and other objectionable material in area to be repaired in accordance with the manufacturer's recommendations.

#### 3.02 EPOXY BONDING AGENT:

- A. Use epoxy bonding agent to adhere fresh mortar to existing concrete. Roughen existing concrete surfaces prior to application of bonding agent. Concrete surface shall be clean

and sound, free of all foreign particles and laitance. Place repair material while bonding agent is still tacky or per the written instructions of the manufacturer. Reapply bonding agent if bonding agent cures prior to placement of repair material.

- B. Conform to all the requirements of ACI 503.4, and as specified herein.

### 3.03 ANTI-CORROSION COATING:

- A. Sandblast, clean and coat reinforcing steel that is cut or exposed during alteration and/or repair operations with an anti-corrosive coating.
- B. Cover all exposed parts of the steel with the coating and apply according to manufacturer's recommendations.

### 3.04 EPOXY CRACK REPAIR:

- A. Cracks on horizontal surfaces: When permitted by the Engineer repair existing cracks by gravity feeding an epoxy crack repair binder into the prepared crack.
  - 1. Rout concrete surface at the crack to form a minimum 1/4-inch wide by 1/4-inch deep V-notch and clean to remove all loose and foreign particles. Fill crack with clean, dry sand and pour epoxy crack repair binder into V-notch, completely filling crack.
  - 2. As binder penetrates into crack, apply additional binder to the V-notch.
- B. Cracks on vertical or horizontal surfaces: Repair cracks by pressure injecting an epoxy crack repair binder into the prepared crack. Seal cracked surfaces and install injection ports per manufacturer's recommendations.
  - 1. Do not damage reinforcement steel when drilling holes for injection ports. If rebar is encountered during drilling, abandon the hole and relocate. Patch the abandoned hole immediately with epoxy mortar flush with the surface of the existing concrete.
  - 2. Inject crack with epoxy crack repair binder once the surface sealing material has cured as directed by the manufacturer.
  - 3. Remove injection ports upon satisfactory completion of crack injection and patch with epoxy mortar.

### 3.05 RIGID POLYURETHANE CRACK REPAIR:

- A. Repair leaking cracks by pressure injecting with a waterproof hydrophobic injection grout as directed by the Structural Engineer of Record. Seal crack surfaces and install injection ports per manufacturer's recommendations.

- B. Do not damage rebar when drilling holes for injection ports. If rebar is encountered during drilling, abandon the hole and patch immediately with epoxy mortar flush with the surface of the existing concrete.
- C. Inject crack with hydrophobic injection grout as directed once the surface sealing material has cured, as directed by the manufacturer.

3.06 SPALL REPAIR:

- A. Saw cut the perimeter of the repair area to a minimum depth of 1/4-inch below the surface of the concrete. Chip all loose concrete in the repair area to remove loose and degraded concrete to a minimum of 1/4-inch or until a sound substrate is reached. Clean the area to be repaired and restore to the original dimensions with spall repair patching material according to the manufacturer's recommendations.
- B. Make final finished surface of patches flat, level and even with the existing concrete surface. Do not feather repair mortar to meet existing concrete surface.
- C. Finish final patches on horizontal surfaces consistent with the finish on the existing structure.

3.07 CURING:

- A. Cure repair materials in accordance with manufacturer's printed instructions.

3.08 CLEANING:

- A. Mechanically remove excess material from walls, floors, etc. after material has cured.
- B. Clean excess materials caused by work under this Section from existing surfaces by the use of power sanders. Vacuum surfaces to receive final cleaning and finishing specified under other sections of the specifications. Sand cracks flush to adjacent surfaces.
- C. Remove misplaced sealants using methods and materials recommended by the manufacturers. Leave finished work and work area in a neat and clean condition.

3.09 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01700.

END OF SECTION

DIVISION 5

METALS

(Filed Sub-bid Required)

SECTION 05500 - MISCELLANEOUS METAL

PART 1 - GENERAL

1.00 FILED SUB-BID REQUIREMENTS:

- A. A sub-bid submitted for the Work of Division 5 – Metals shall include the complete Work specified in all of the following Sections:
  - 1. 05500 – MISCELLANEOUS METAL
  - 2. 05510 – ALUMINUM STAIRS AND PLATFORMS
  - 3. 05519 – POST-INSTALLED CONCRETE ANCHORS
  - 4. 05520 – METAL RAILINGS
- B. Sub-bids shall comply with the requirements of M.G.L. c.149, §44F, and shall be filed on the form furnished in Section 00302 – Form for Sub-Bid, in a sealed envelope, at the location and time specified in Invitation to Bid, and shall be accompanied by a bid deposit complying with the requirements of M.G.L. c.149, §44B (2). The following shall appear on the outside of the envelope:

Name of Bidder: \_\_\_\_\_

Sub-bid for Division 5, Metals

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

\_\_\_\_\_

- C. The Work of Division 5 – Metals is indicated on Drawings numbered: 10 C-105, 10 C-106, 10 C-107, 10 C-108, 00 S-001, 10 S-301, 10 S-302, 10 S-303, 10 S-304, 99 S-501.

1.01 DESCRIPTION:

- A. Provide, erect, set and fasten miscellaneous metal items as indicated and specified including surface preparation and shop prime/painting, except as noted below.

B. Items to be cast in concrete which are to be furnished under this Section for installation under Division 3:

1. Sleeves and inserts.
2. Aluminum Grating and frames.
3. Anchor bolts with layout templates (except anchor bolts for structural steel and anchor bolts for equipment).

1.02 REFERENCES:

A. Aluminum Association (AA):

1. AA M12C22A41.
  - a. M12: Mechanical Finish, Non-Specular.
  - b. C22: Chemical Finish, Medium Matte.
  - c. A41: Clear Anodic Coating, Class I.
2. AAM12C22A42:
  - a. M12: Mechanical Finish, Non-Specular.
  - b. C22: Chemical Finish, Medium Matte.
  - c. A42: Dark Bronze Anodic Coating, Class 1.

B. American Institute of Steel Construction (AISC):

1. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

C. American Welding Society (AWS):

1. D1.1: Structural Welding Code Steel.

D. Aluminum Association Standard Anodic Finish (AASAF).

E. ASTM International (ASTM):

1. A167: Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

2. A269: Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
3. A276: Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
4. A312: Specification for Seamless and Welded Austenitic Stainless Steel Pipe.
5. B26: Specification for Aluminum-Alloy Sand Castings.
6. B209: Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
7. B211: Specification for Aluminum-Alloy Bars, Rods, and Wire.
8. B221: Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
9. B241: Specification for Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
10. B247: Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings and Rolled Ring Forgings.
11. B308: Specification for Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.
12. B429: Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

#### 1.03 DESIGN REQUIREMENTS:

##### A. Railings and Guardrails:

1. Railings and guardrails shall be designed for a live load of 100 plf vertical plus 50 plf horizontal applied concurrently or a concentrated load of 200 pounds applied in any direction at any point along the rail, whichever produces the most extreme condition.
2. Intermediate rails, balusters and panels or fillers shall be designed for a uniform load of 25 psf over the gross area of the guard of which they are a part. This loading need not be added to the loading of the main members prescribed above.
3. Handrails shall be designed for a live load of 50 plf applied in any direction or a concentrated load of 200 pounds applied in any direction at any point along the handrail, whichever produces the most extreme condition.

##### B. Aluminum grating design shall be based upon the following criteria:



1. Design Live Loads:
  - a. Uniform Live Load: 200 psf
  - b. Concentrated @ Center Span: 500 plf
2. Maximum bending stress = 12,000 psi
3. Maximum shear stress = 8,000 psi
4. Modulus of Elasticity = 10,000 ksi
5. Maximum deflection under 100 psf uniform live load =  $\frac{\text{Span}}{300}$

#### 1.04 SUBMITTALS:

##### A. Shop Drawings: Submit the following in accordance with Section 01300:

1. Manufacturer's literature describing standard items.
2. Shop drawings showing materials, sizes, finishes, locations, attached hardware and fittings, and details for manufactured items and fabricated metalwork, including field erection details showing cuts, copes, miter connections, holes, thread fasteners and welds. Indicate welds, both shop and field, by symbols conforming to AWS standards. Indicate coatings or other protection against corrosion.
3. Setting diagrams, erection plans, templates and directions for installation of backing plates, anchors, and other similar items.
4. Manufacturer's specifications, load tables, anchor details, installation details for grating.
5. Material, product data and specifications with standards designated.
6. One sample of finished railing proposed for use. Submit with shop drawing submittal.

#### 1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Obtain field measurements prior to preparation of shop drawings and fabrication.
- C. Welding Qualification and Certification:

1. Furnish written welding procedure for all welds in conformance with AWS Structural Welding Code.
2. Each welder, tacker and welding operator shall be certified by test within the past six months to perform type of work required in conformance with AWS Structural Welding Code. Testing shall be conducted, and witnessed by an independent testing laboratory.
3. Maintain duplicate qualification and certification records at the job site readily available for examination.

#### 1.06 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Section 01610 and as specified.
- B. Identify and match-mark, materials, items and fabrications, for installation and field assembly.
- C. Deliver items to jobsite as complete units, wherever practicable, ready for installation or erection, with anchors, hangers, fasteners and miscellaneous metal items required for installation.
- D. Carefully handle and store materials, protected from weather, rusting and other damage.
- E. Store structural shapes, pipes, tubes and sheets off the ground on suitable supports, with webs of flanged shapes vertical.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS:

- A. Stainless Steel:
  1. Type 304 unless otherwise indicated or specified.
  2. Type 316 unless otherwise indicated or specified.
  3. General: Type (or Grade) 304L for welding, otherwise Type (or Grade) 304.
  4. Shapes and Bars: ASTM A276
  5. Plate, Sheet, and Strip: ASTM A167
  6. Tubing: ASTM A269
  7. Pipe: ASTM A312, Schedule 40S

B. Aluminum:

1. Plates, rolled or extruded shapes, sheets or castings conforming (unless otherwise permitted or indicated) to the following Aluminum Association alloy and temper designations:
  - a. Rolled structural sheets and plates: ASTM B209-6061-T6
  - b. Rolled Structural Shapes: ASTM B308-6061
  - c. Extruded structural shapes, bars and tubes: ASTM B221 Alloy 6061-T6
  - d. Extruded structural tube or pipe: ASTM B429 Alloy 6061 T-6
  - e. Gratings (bearing bars): ASTM B211-6061-T6  
(crimp bars): ASTM B211-6061-T5
  - f. Castings: ASTM B26-214
  - g. Sheets: ASTM B209-Alclad 3003-H14 and 3003
  - h. Bolts and nuts: Type 316 stainless steel
  - i. Pipe railings: ASTM B241-6061-T6
  - j. Handrail posts: ASTM B241-6061-T6
  - k. Die and hand forgings: ASTM B247 Alloy 6061-T6
  - l. Welding filler rods: ASTM B241-6061-T6
  - m. Plank: ASTM B211-6061-T6 or ASTM B221-6063-T6

C. Bolts, washers and nuts: Type 316 stainless steel

D. Welding:

1. Provide filler materials appropriate and compatible for the alloys and tempers in accordance with the AWS Structural Welding Code.
2. Provide Class 5356 electrodes.

2.02 FABRICATION:

A. General:

1. Fabricate true to shape, size and tolerances as indicated and specified with straight lines, square corners or smooth bends; free from twists, kinks, warps, dents, and other imperfections. Straighten work bent by shearing or punching.
2. Dress exposed edges and ends of metal smooth, with no sharp edges and with corners slightly rounded. Construct connections and joints exposed to weather to exclude water.
3. Provide sufficient quantity and size of anchors for the proper fastening of work.
4. Fabricate details and connection assemblies in accordance with drawings and with projecting corners clipped and filler pieces welded flush.
5. Weld shop connections, bolt or weld field connections, unless otherwise noted or specified.
6. Provide clips, lugs, brackets, straps, plates, bolts, nuts, washers, and similar items, as required for fabrication and erection.
7. Use connections of type and design required by forces to be resisted, and to provide secure fastening.
8. Welding:
  - a. Grind exposed edges of welds to a 1/8-inch minimum radius. Grind burrs, jagged edges and surface defects smooth.
  - b. Prepare welds and adjacent areas such that there is (1) no undercutting or reverse ridges on weld bead, (2) no weld spatter on or adjacent to weld or any other area to be painted, and (3) no sharp peaks or ridges along weld bead. Grind embedded pieces of electrode or wire flush with adjacent surface of weld bead.
9. Bolting:
  - a. Provide Type 316 stainless steel stud bolts and nuts with heavy aluminum washer for fastening of aluminum material.
  - b. Draw up bolts or nuts tight, and deform threads where possible. Use bolts of lengths required so that bolts do not project more than 1/4-inch beyond face of nut. Do not use washers unless specified. Provide hexagonal head bolts with hexagonal nuts.

- c. Provide holes required for the connection of adjacent or adjoining work wherever noted on drawings. Locate holes for bolting equipment to supports to a tolerance of + 1/16-inch of exact dimensions indicated.
  - d. Provide plastic protection caps.
- B. Fit work together in fabrication shop and deliver complete, or in parts, ready to be set in place.
- C. Fabricated Products:
- 1. Pipe Sleeves in Concrete Construction: Weld standard weight, black steel pipe, with anchors to exterior to accommodate passage of conduits, pipes ducts and similar items.

### 2.03 ALUMINUM PIPE RAILS:

- A. Provisions: All-welded assembly fabricated from 1-1/2-in. IPS, schedule 80 aluminum pipe, alloy 6061-T6 for posts, top rails and intermediate rails. Provide mitered connections at the intersections of posts and railings. Provide radius connections as indicated. Alloy of welding filler rods shall be compatible with alloy of posts and railings. Grind exposed welds smooth. Reinforce pipe rail posts with 14-inch long solid aluminum rod inserts at bottom of stanchions.
- 1. Complete railing, including anchorage and framing, and post spacing at a maximum of 4 feet on centers to withstand specified loading. Provide 1/4-inch thick aluminum kick plates as indicated.
  - 2. Provide cast aluminum brackets for wall-mounted handrails.
  - 3. Weld posts, to be mounted on top of stair stringers, to aluminum angle brackets. Fasten brackets to stringers with 1/2-inch diameter stainless steel bolts.
  - 4. Side mount guard rail posts, to concrete. Weld to extruded aluminum brackets. Secure brackets to concrete with four 1/2-inch diameter stainless steel expansion bolts.
  - 5. Set posts into concrete curbs, and into preformed holes. Secure in place with nonshrinking non-metallic grout. Provide holes at least 1 inch greater in diameter than outside diameter of posts and minimum of 6 inches deep.
  - 6. Fabricate removable pipe railings in same manner as fixed railings.
  - 7. Provide panels as large as practicable with joints between panels made neat and inconspicuous with exposed welds ground smooth.

## 2.04 ALUMINUM BAR GRATINGS:

### A. Manufacturers:

1. Type B as manufactured by Harsco Industrial IKG.
2. Type SG Series as manufactured by Ohio Gratings, Inc.
3. Type GW as manufactured by McNichols Co.
4. Or acceptable equivalent product.

### B. Provide as indicated and specified.

1. 3/16-inch thick bearing bars by depth indicated on drawings, 1-3/16 inches center to center with cross bars pressure locked on 4-inch centers.
2. Fabricate in standard size sections, secure in place with four (minimum), stainless steel acceptable removable-type fasteners per panel.
3. Apply bearing bar banding at ends of grating sections and at fixture or pipe openings where two or more bearing bars are cut. Cutout for obstructions shall provide 1-inch [25 mm] clearance of the obstruction.
4. Provide serrated top surfaces.
5. Provide angle frame for gratings in concrete surrounds: Miter and weld corners, weld on anchors, grind exposed welds smooth.
6. Provide hinged gratings with 180 degree double-acting Type 316 stainless steel hinges where indicated. Fasten to bearing bars with Type 316 stainless steel bolts.
7. Before coating application, clean contact surfaces, remove dirt, grease, oil, foreign substances, followed by immersing in, or wipe thoroughly with, an acceptable solvent. Rinse with clean hot water and dry thoroughly.
8. Stainless steel saddle clips, z-clips or other approved fasteners for grating.

## 2.05 ALUMINUM FINISHES:

- A. After fabrication, provide exterior aluminum pipe railing assemblies, kick plates and posts with Aluminum Association Standard clear anodized finish, Designation C22A41.

## 2.06 ALUMINUM PROTECTION:

A. Protect aluminum against electrolysis from all sources as specified in Section 01063. Under no circumstances shall aluminum contact a dissimilar metal.

1. Members Encased in Concrete: Zinc chromate primer.
2. Members in Contact with Concrete: Coal tar epoxy.

B. Manufacturers:

1. 46H-413 Hi-Build Tneme Tar by Tnemec Co., Inc.
2. Bitumastic 300M by Carboline Co.
3. Targuard by Sherwin Williams.
4. Or acceptable equivalent product.

## 2.07 GUARD POSTS:

A. 8-inch diameter ASTM A53 Schedule 80 seamless, galvanized steel pipe filled solidly with Class A concrete, slope top 15 degrees as indicated.

## 2.08 BOLLARDS:

A. 6-inch diameter ASTM A53, Schedule 80 seamless, galvanized steel pipe filled solidly with Class A concrete, slope top 15 degrees as indicated.

B. Weld 1-inch thick galvanized steel plate to pipe bottom and provide four (4) holes for galvanized steel expansion bolts and washers as indicated.

## 2.09 MISCELLANEOUS ITEMS:

A. Provide items of miscellaneous metalwork not particularly specified, of the shape, size, material and detail indicated and suitable for the purpose intended.

## PART 3 - EXECUTION

### 3.01 GENERAL:

A. Accurately set and properly secure in place as indicated and specified. Where bolted connections are used, draw closely together and draw nuts tightly. Use bolts of lengths so that they do not project more than 1/4-inch beyond face of nut. Do not use washers unless specified. Provide hexagonal head bolts with hexagonal nuts.

- B. Locate anchors and anchor bolts and build into connecting work. Insert expansion bolts into drilled holes.
- C. After erection, clean aluminum with mild soap and water, followed by clear water rinse, after erection.
- D. Furnish all embedded items to General Contractor for installation into concrete formwork.
- E. Miscellaneous metal items specified shall be installed as indicated, specified and in accordance with accepted shop drawings.

### 3.02 ALUMINUM PROTECTIVE COATING:

- A. Protect aluminum from contact with dissimilar metals, concrete, masonry, mortar or grout.
- B. Coat surfaces of aluminum with heavy coat of bitumastic paint.
- C. Before coating application, clean contact surfaces, remove dirt, grease, oil, foreign substances, followed by immersing in, or wipe thoroughly with, an acceptable solvent. Rinse with clean hot water and dry thoroughly.

### 3.03 ALUMINUM PIPE RAILINGS:

- A. Set posts plumb and align railings horizontal or parallel to rake of stairs to within 1/4 inch in 10 feet unless otherwise indicated.
- B. Side mount posts to concrete with aluminum brackets as indicated.
- C. Set top mounted posts in concrete curbs into preformed holes.
  - 1. Provide holes at least 1 inch greater in diameter than outside diameter of posts and a minimum of 6 inches deep.
  - 2. Moisten interior of holes and surrounding surfaces.
  - 3. Set railing in position and brace until grout sets.
  - 4. Secure in place with non-metallic, non-shrink grout. Provide 1/8-inch build up of grout around base of posts, sloped away from posts.
- D. Provide butt splice joints with internal sleeves bonded with adhesive.
- E. Provide expansion joints at intervals of not more than 32 feet.



1. Locate joints within 6 inches of posts.
2. Provide slip joint with internal sleeve extending 2 inches beyond joint on each side.
3. Fasten internal sleeve securely to one side only.
4. Provide gap of 0.002 inch per foot per degree Fahrenheit.

3.04 ALUMINUM HANDRAILS:

- A. Install aluminum handrail brackets spaced at a maximum of 4 feet on center.

3.05 ALUMINUM GRATINGS AND FRAMES:

- A. Accurately set and properly secure frames and gratings in place. Where bolted connections are used, draw closely together and draw nuts tightly.
- B. Provide standard panel widths.
- C. Perform cutting and fitting as required for installation.
- D. Place grating panels such that cross bars align.
- E. Cutouts for pipes or circular obstructions shall be 2 inch larger in diameter than the diameter of the obstruction.
- F. Provide saddle clips, z-clips or other approved fasteners to secure grating at every four square feet. Provide a minimum of four fasteners per grating section.
- G. Attachments shall permit removal of the grating panels.

3.06 GUARD POSTS:

- A. Install guard posts as indicated and in accordance with accepted shop drawings.

3.07 BOLLARDS:

- A. Install bollards as indicated and in accordance with accepted shop drawings.

3.08 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

DIVISION 5

METALS

(Filed Sub-bid Required)

SECTION 05510 – ALUMINUM STAIRS AND PLATFORMS

PART 1 - GENERAL

1.00 FILED SUB-BID REQUIREMENTS:

- A. This section of the Specification is a part of the filed sub-bid for Division 5 – Metals. See Section 05500 – MISCELLANEOUS METAL.

1.01 DESCRIPTION:

- A. Provide, erect, set and fasten aluminum stairs and platforms as indicated and specified.

1.02 REFERENCES:

- A. American Welding Society (AWS):
  - 1. D1.1: Structural Welding Code - Aluminum.
- B. Aluminum Association Standard Anodic Finishes (AASAF).
- C. ASTM International (ASTM):
  - 1. B 26: Specification for Aluminum-Alloy Sand Castings.
  - 2. B 209: Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 3. B 211: Specification for Aluminum-Alloy Bars, Rods, Profiles and Tubes.
  - 4. B 221: Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
  - 5. B 247: Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings and Rolled Ring Forgings.
  - 6. B 429: Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

1.03 DESIGN CRITERIA:

- A. Stairs shall be designed to withstand a minimum uniform live load of 100 psf or a concentrated live load of 300 pounds applied on an area of 4 square inches at any point along the element.
- B. Platforms shall be designed to withstand the live loads indicated. If the design live load does not appear on the drawings, platforms shall be designed for a minimum uniform live load of 100 psf or a concentrated live load of 300 pounds applied on an area of 4 square inches at any point along the element.

1.04 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Obtain field measurements prior to preparation of shop drawings and fabrication.
- C. Welding Qualification and Certification:
  - 1. Furnish written welding procedure for all welds in conformance with AWS Structural Welding Code.
  - 2. Each welder, tacker and welding operator shall be certified by test within the past six months to perform type of work required in conformance with AWS Structural Welding Code. Testing shall be conducted, and witnessed by an independent testing laboratory.
  - 3. Maintain duplicate qualification and certification records at the job site readily available for examination.

1.05 SUBMITTALS:

- A. Shop Drawings: Submit the following in accordance with Section 01300:
  - 1. Manufacturer's specifications, load tables, anchor details and installation details.
  - 2. Shop drawings showing materials, sizes, finishes, locations, attached hardware and fittings, and details for grating and frames.
  - 3. Setting diagrams, erection plans, templates including field erection details showing cuts, copes, connections, holes, threaded fasteners and welds. Indicate welds, both shop and field, by symbols conforming to AWS standards.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Section 01610 and as specified.
- B. Identify and match-mark, materials, items and fabrications, for installation and field assembly.
- C. Deliver items to job site as complete units, wherever practicable, ready for installation or erection, with anchors, hangers, fasteners and miscellaneous metal items required for installation.
- D. Carefully handle and store materials, protected from weather, rusting and other damage.
- E. Store material off the ground on suitable supports.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Aluminum plates, shapes, pipe and castings shall conform to the following ASTM specifications, alloy and temper designations.
  - 1. Extruded structural shapes, bars and tubes: ASTM B 221 Alloy 6061-T6
  - 2. Extruded structural tube or pipe: ASTM B 429 Alloy 6061-T6
  - 3. Sheet and plate: ASTM B 209 Alloy 6061-T6
  - 4. Die and hand forgings: ASTM B 247 Alloy 6061-T6
  - 5. Castings: ASTM B 26-214
  - 6. Bolts, washers and nuts: Type 304 stainless steel
  - 7. Gratings (bearing bars): ASTM B 211 Alloy 6061-T6  
(connecting bars): ASTM B 211 Alloy 6061-T5
- B. Welding:
  - 1. Provide filler materials appropriate for the alloys and tempers in accordance with the AWS Structural Welding Code.
  - 2. Provide Class 4043 electrodes.

## 2.02 FABRICATION:

### A. General:

1. Fabricate true to shape, size and tolerances as indicated and specified.
2. Straighten work bent by shearing or punching.
3. Dress exposed edges and ends of metal smooth, with no sharp edges and with corners slightly rounded.
4. Provide sufficient quantity and size of anchors for the proper fastening of the work.
5. Fabricate details and connection assemblies in accordance with drawings, with projecting corners clipped and filler pieces welded flush.
6. Provide clips, lugs, brackets, straps, plates, bolts, nuts, washers, and similar items, as required for fabrication and erection.
7. Use connections of type and design required by forces to be resisted, and to provide secure fastening.
8. Fit work together in fabrication shop and deliver complete, or in parts, ready to be set in place.

### B. Welding:

1. Grind exposed edges of welds to a 1/8 inch minimum radius. Grind burrs, jagged edges and surface defects smooth.
2. Prepare welds and adjacent areas such that there is no undercutting or reverse ridges on the weld bead and no sharp peaks or ridges along the weld bead.
3. Grind embedded pieces of electrode or wire flush with adjacent surface of weld bead.

### C. Bolting:

1. Provide holes required for the connection of adjacent or adjoining work wherever noted on drawings. Locate holes for bolting to supports to a tolerance of + 1/16 inch of exact dimensions indicated.
2. Provide stainless steel stud bolts and nuts with heavy aluminum washer for fastening aluminum material.

### 2.03 ALUMINUM STAIRS:

- A. Provide aluminum stairs fabricated from structural aluminum channel stringers, aluminum pipe rails and aluminum treads.
- B. Bar Grating Treads:
  - 1. Provide stair treads of the same type and bar spacing as grating specified.
  - 2. Provide serrated top surface of bearing bars.
  - 3. Provide 3" x 3/16" carrier end plates welded to stair treads and punched for bolting to stringers.
  - 4. Provide 1-1/4 inch abrasive nosings.
  - 5. Manufacturers:
    - a. Type B as manufactured by IKG Borden Metal Products Co.
    - b. Type SG Series as manufactured by Ohio Gratings, Inc.
    - c. Type A as manufactured by McNichols Co.
    - d. Or acceptable equivalent product.

### 2.04 ALUMINUM PLATFORMS:

- A. Provide aluminum platforms fabricated from structural aluminum shapes, grating, plates, pipes and tubes as indicated.
- B. Provide aluminum rectangular bar grating as specified in Section 05500.

### 2.05 RAILINGS AND HANDRAILS:

- A. Provide aluminum pipe railing as specified in Section 05500 with flush welded joints ground smooth and secured to stringers as indicated.

### 2.06 FINISHES:

- A. Aluminum:
  - 1. Provide aluminum channel stringers, supports, angle hangers, struts, rod hangers, closure plates, brackets, sheet risers and tread plates with a natural mill finish.

2. After fabrication, provide exterior aluminum pipe railing assemblies, kick plates, posts and chains, with Aluminum Association Standard clear anodized finish, Designation C22A31.

### PART 3 - EXECUTION

#### 3.01 GENERAL:

- A. Set and secure in place as indicated. Where bolted connections are used, draw together and draw nuts tightly. Use bolts of lengths required so that they do not project more than 1/4-inch beyond face of nut. Do not use washers unless specified. Provide hexagonal head bolts with hexagonal nuts.
- B. Locate anchors and anchor bolts and build into connecting work. Insert expansion bolts into drilled holes.
- C. After erection, clean aluminum with mild soap and water, followed by clear water rinse.

#### 3.02 PROTECTION:

- A. Protect aluminum from contact with dissimilar metals or concrete.
- B. Apply one coat of one of the following products:
  1. 46H-413 Hi-Build Tneme Tar by Tnemec Co.
  2. Bitumastic 300 M by Carboline Co.
  3. Targuard by Sherwin Williams Co.
  4. Or acceptable equivalent product.
- C. Before coating application, clean contact surfaces, remove dirt, grease, oil, foreign substances, followed by immersing in, or wipe thoroughly with, an acceptable solvent. Rinse with clean hot water and dry thoroughly.

#### 3.03 STAIRS:

- A. Provide structural aluminum angle hangers, struts, rod hangers, closure plates and brackets indicated.

3.04 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION



DIVISION 5

METALS

(Filed Sub-bid Required)

SECTION 05519 – POST-INSTALLED CONCRETE ANCHORS

PART 1 - GENERAL

1.00 FILED SUB-BID REQUIREMENTS:

- A. This section of the Specification is a part of the filed sub-bid for Division 5 – Metals. See Section 05500 – MISCELLANEOUS METAL.

1.01 DESCRIPTION:

- A. Provide open drilled in concrete anchors and concrete as indicated and specified.

1.02 REFERENCES:

- A. ASTM International (ASTM):

1. ASTM A307: Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
2. ASTM A449: Specification for Quenched and Tempered Steel Bolts and
3. ASTM A563: Specification for Carbon and Alloy Steel Nuts
4. ASTM F436: Standard Specification for Hardened Steel Washers
5. ASTM A36: Specification for Carbon Structural Steel
6. ASTM A193: Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
7. ASTM A510: Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel
8. ASTM A108: Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
9. ASTM F593: Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
10. ASTM F594: Standard Specification for Stainless Steel Nuts

11. ASTM B633: Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
12. ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
13. Reinforcing Dowels: ASTM A615

1.03 SUBMITTALS:

A. Submit the following after award.

1. Product specifications with recommended design values and physical characteristics for epoxy dowels, expansion and undercut anchors.
2. Quality Assurance Submittals:
  - a. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
  - b. Certificates: ICC ES Evaluation Reports.
3. Manufacturer's installation instructions.
4. Installer Qualifications & Procedures: Submit installer qualifications as stated in Section 1.03.B. Submit a letter of procedure stating method of drilling, the product proposed for use, the complete installation procedure, manufacturer training date, and a list of the personnel to be trained on anchor installation.

B. ICC ESR document for each type and size of anchor to be installed in the work.

1.04 QUALITY ASSURANCE:

A. Comply with the requirements specified in Section 01400.

1. Installer Qualifications:
  - a. Drilled-in anchors shall be installed by an installer with at least five years of experience performing similar installations.
2. Installer Training: Conduct a thorough training with the manufacturer or the manufacturer's representative for the installer on the project. Training to consist of a review of the complete installation process for drilled-in anchors, to include but not limited to:
  - a. hole drilling procedure
  - b. hole preparation & cleaning technique

- c. adhesive injection technique & dispenser training / maintenance
  - d. rebar dowel preparation and installation
  - e. proof loading/torqueing
3. Certifications: Unless otherwise authorized by the Engineer, anchors shall have one of the following certifications:
- a. ICC ES Evaluation Report indicating conformance with current applicable ICC ES Acceptance Criteria.

1.05 DELIVERY STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01610.
- B. Store anchors in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS:

2.01 FASTENERS AND ANCHORS:

- A. Bolts and Studs: ASTM A307; ASTM A449 where "high strength" is indicated on the Drawings.
- B. Carbon and Alloy Steel Nuts: ASTM A563.
- C. Carbon Steel Washers: ASTM F436.
- D. Carbon Steel Threaded Rod: ASTM A36; or ASTM A193 Grade B7; or ISO 898 Class 5.8.
- E. Wedge Anchors: ASTM A510; or ASTM A108.
- F. Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593.
- G. Stainless Steel Nuts: ASTM F594.
- H. Zinc Plating: ASTM B633.
- I. Hot-Dip Galvanizing: ASTM A153.
- J. Reinforcing Dowels: ASTM A615

2.02 DRILLED-IN ANCHORS

- A. Wedge Anchors: Wedge type, torque-controlled, with impact section to prevent thread damage complete with required nuts and washers. Provide anchors with length

identification markings conforming to ICC ES AC01 or ICC ES AC193. Type and size as indicated on Drawings. The use of drop-in type anchors is prohibited.

1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1).
  2. Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 316 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. Stainless steel nuts shall conform to ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
  3. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:
    - a. Hilti Kwik Bolt TZ, ICC ESR-1917 (carbon steel and AISI Type 304 Stainless Steel).
    - b. Or equal
- B. Screw Anchors: Screw type. Pre-drilling of the hole requires a standard ANSI drill bit with the same diameter as the anchor and installing the anchor will be done with an impact wrench. Provide anchors with a diameter and anchor length marking on the head. Type and size as indicated on Drawings.
1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating equivalent to DIN EN ISO 4042 (8 $\mu$ m min.).
  2. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:
    - a. Hilti Kwik-HUS-EZ, ICC-ESR 3027.
    - b. Hilti Kwik-HUS EZ-I, ICC-ESR 3027.
    - c. Or equal
- C. Cartridge Injection Adhesive Anchors: Threaded steel rod, inserts or reinforcing dowels, complete with nuts, washers, polymer or hybrid mortar adhesive injection system, and manufacturer's installation instructions. Type and size as indicated on Drawings.
1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel threaded rods conforming to ASTM A36, ASTM A 193 Type B7 or ISO 898 Class 5.8 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1) [or

carbon steel HIT TZ rods conforming to ASTM A510 with chemical composition of AISI 1038].

2. Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 316 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform to ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
3. Reinforcing dowels shall be A615 Grade 60.
4. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:
  - a. Hilti HAS threaded rods with HIT-HY 200 Safe Set System using Hilti Hollow Drill Bit System for anchorage to concrete, ICC ESR-3187.
  - b. Hilti HIT-Z anchor rods with HIT-HY 200 Safe Set System for anchorage to concrete, ICC ESR-3187.
  - c. Hilti HAS threaded rods with RE 500 SD Injection Adhesive Anchoring System for anchorage to concrete, ICC ESR-2322.
  - d. Hilti HAS threaded rods with RE 500 Injection Adhesive Anchoring System for anchorage to concrete.
  - e. Or equal
5. Reinforcing dowels shall be A615 Grade 60.

### PART 3 - EXECUTION

#### 3.01 DRILLED-IN ANCHORS:

- A. Drill holes with rotary impact hammer drills using carbide-tipped bits or hollow drill bit system. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.
  1. Cored Holes: Where anchors are permitted to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer. Properly clean cored hole per manufacturer's instructions.
  2. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid

damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.

3. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

B. Perform anchor installation in accordance with manufacturer instructions.

C. Wedge Anchors, Heavy-Duty Sleeve Anchors, and Undercut Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in part to be fastened. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Engineer.

D. Cartridge Injection Adhesive Anchors: Clean all holes per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

E. Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.

### 3.02 REPAIR OF DEFECTIVE WORK

A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

### 3.03 FIELD QUALITY CONTROL

A. Testing: 10% of each type and size of drilled-in anchor shall be proof loaded by the independent testing laboratory. Adhesive anchors and capsule anchors shall not be torque tested unless otherwise directed by the Engineer. If any of the tested anchors fail to achieve the specified torque or proof load within the limits as defined on the Drawings, all anchors of the same diameter and type as the failed anchor shall be tested, unless otherwise instructed by the Engineer.

1. Tension testing should be performed in accordance with ASTM E488.
  2. Torque shall be applied with a calibrated torque wrench.
  3. Proof loads shall be applied with a calibrated hydraulic ram. Displacement of adhesive and capsule anchors at proof load shall not exceed  $D/10$ , where  $D$  is the nominal anchor diameter.
- B. Minimum anchor embedment, proof loads and torques shall be as recommended by the manufacturer.
- 3.04 CLOSEOUT ACTIVITIES:
- A. Provide in accordance with Section 01700.

END OF SECTION

DIVISION 5

METALS

(Filed Sub-bid Required)

SECTION 05520 – METAL RAILINGS

PART 1 - GENERAL

1.00 FILED SUB-BID REQUIREMENTS:

- A. This section of the Specification is a part of the filed sub-bid for Division 5 – Metals. See Section 05500 – MISCELLANEOUS METAL.

1.01 DESCRIPTION:

- A. Design, furnish and install handrails, guardrails and railing systems, including connectors, fasteners, and system required accessories as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

A. Aluminum Association (AA):

1. Aluminum Association Designation System for Aluminum Finishes
2. AAMA 607.1: Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum

B. American Society of Civil Engineers (ASCE):

1. 7: Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM):

1. A36/A36M: Standard Specification for Carbon Structural Steel
2. A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
3. A123/A123M: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
4. A500: Cold Formed Welded and Seamless Carbon Steel Structural Tubing.
5. A501: Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing



6. A780: Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
7. B210: Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
8. B221/B221M: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
9. B241: Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
10. B429: Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
11. C1107: Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
12. E935: Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings
13. E985: Standard Specification for Permanent Metal Railing Systems and Rails for Buildings

D. American Welding Society (AWS):

1. C5.6: Recommended Practices for Gas Metal Arc Welding
2. D1.1-1.17: Structural Welding Code.

E. International Code Council:

1. IBC: International Building Code.

F. National Ornamental & Miscellaneous Metals Association (NOMMA):

1. Guideline 1: Joint Finishes.
2. Metal Rail Manual.

1.03 PERFORMANCE/ DESIGN CRITERIA:

- A. Design and provide handrail and guardrail system to meet IBC, OSHA and the criteria specified herein. Railing shall be capable of withstanding the loads specified in Section 05500 without exceeding design allowable stress of materials for handrails, railing anchors and connections.
- B. Thermal movements: Provide adequate expansion within the system to allow for thermal expansion and contraction caused by a temperature change of 120 degrees F to -20

degrees F without buckling or warping, opening of joints, overstressing of components, failure of connections and other detrimental effects.

- C. Control of corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

#### 1.04 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01300.
  - 1. Show fabrication and installation of handrails and railings assembled from standard components. Include plans, elevations, component details, materials, finishes, connection and joining methods, and mounting details to adjoining work.
  - 2. Identify location and type indicated.
- B. Product Data:
  - 1. Manufacture's literature.
  - 2. Assembly and installation instructions.
- C. Certificates:
  - 1. Welders' Certificates: Certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.
  - 2. Submit certification that the railing system is in compliance with IBC and OSHA
- D. Operation and Maintenance Data:
  - 1. Manufacturer's instructions describing procedures for maintaining including cleaning materials, application methods, and precautions as to use of materials which may be detrimental to finish when improperly used.

#### 1.05 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01600.
- B. Obtain field measurements prior to preparation of shop drawings and fabrication.
- C. Handrails provided shall be end products of one manufacturer to achieve standardization for appearance, maintenance and replacement.
- D. Manufacturer shall have minimum five years experience specializing in manufacturing products specified in the section.
- E. Welding Qualification and Certification:

1. Furnish written welding procedure for all welds in conformance with AWS Structural Welding Code.
2. Each welder, tacker and welding operator shall be certified by test to perform type of work required in conformance with AWS Structural Welding Code. Testing shall be conducted, and witnessed by an independent testing laboratory.
3. Maintain duplicate qualification and certification records at the job site readily available for examination.

1.06 DELIVERY STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01610.
- B. Deliver, store and handle materials in manner preventing damage to finished surfaces.
- C. Store materials in a dry, well ventilated, weather tight place away from uncured concrete or masonry.

1.07 SITE CONDITIONS.

- A. Field verify measurements prior to fabrication and indicate measurements in shop drawings.

PART 2 - PRODUCTS

2.01 ALUMINUM RAILING SYSTEM AND COMPONENTS:

- A. Material: ASTM B429, alloy 6063-T6, Schedule 40, 1-1/2 inch diameter minimum extruded structural pipe or tube rails and schedule 80 posts.
- B. Railings at open-side construction shall consist of two members with posts. Locate intermediate rails between top rail and finish floor as indicated on Drawings.
- C. Provide 1/4-inch thick by 4 inch high or "S" type toe plate except on stairs and where concrete curb provided. Provide 1/4-inch clearance above floor level. Expansion joint location to match railing joint location.
- D. Fabrication:
  1. Angles, offsets, other changes in alignment, and joining of posts and rails shall be made with welded connections. Miter and weld joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Run top rails continuously over post.
  2. Rail splices shall be butted and reinforced by tight fitting interior sleeve not less than 6 inch long.

3. Fabricate wall railings with wall brackets for intermediate support and wall return fittings at ends. Brackets and end fittings shall be of cast or formed metal of same material and finish as supported rails and shall be of proper size to provide 3 inch clear space between wall and railing. Provide wall brackets not more than 4 feet on center.
  4. Provide expansion joint splices at 30 feet maximum spacing, with slip joint internal sleeve extending minimum of 4 inch beyond each side of joint. Weld to one side only. Locate within 12 inch of posts.
  5. Space posts as shown on Drawings. Where spacing is not shown, space posts not more than 4 feet on center. Erect posts plumb in each direction.
  6. Fabricate joints which will be exposed to weather so as to exclude water. Provide weep holes at the lowest possible point on all railing system posts.
- E. Railings at walls shall be single member.
1. Support wall rails on brackets spaced not more than 4 feet on center and at each end of rail. Cantilevered extensions not allowed.
- F. Anchorage;
1. Interior Railings: Provide concrete anchorage for posts by means of pipe sleeves set into concrete. Sleeves shall be pipe of inside diameter of approximately 1/2-inch more than outside diameter of post, not less than 6 inches long, and having closure plate secured to bottom of sleeve. Wedge posts into sleeves as required. Fill space between post and sleeve solid with nonshrink nonmetallic grout. Slightly taper top of grout away from posts.
  1. Interior Railings: Provide concrete anchorage for posts by means of base flange welded to post and anchored to concrete with minimum of with minimum of 4 concrete anchors.
  2. Masonry Anchorage for Rail Ends and wall Railings: Cast or formed metal of same material and finish as supported rails welded, bolted or threaded to rail ends and anchored into wall with minimum of two concrete anchors.
  3. For posts set on stair or platform stringers, provide base flange welded to post and bolted to stringer with minimum of two 1/2-inch bolts, or weld post to stringer.
- G. Finishes:
1. Aluminum Association Finish Designation: AA-M12A41 (Mechanical finish, nonspecular, anodic coating, architectural Class I, clear coating 0.7 mil complying with AAMA 607.1 on exposed surfaces.
    - a. Extruded Components: 0.7 mil anodized.

b. Cast Components: 0.4 mil anodized.

2.02 DISSIMILAR METAL:

1. Keep surfaces of dissimilar metal from direct contact by coating the dissimilar metal with a heavy coat of asphalt paint.
2. Keep surfaces of aluminum components from direct contact with cement or mortar by coating with a heavy coat of asphalt paint.

2.03 GROUT AND ANCHORING CEMENT:

- A. Nonshrink, nonmetallic, nonstaining and noncorrosive grout premixed and factory packaged. Provide grout conforming to requirements of ASTM C 1107.

2.04 GATES:

- A. Fabricate gates as shown on drawings.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install as shown on Drawings and accepted Shop Drawings.
- B. Set posts plumb and aligned in each direction to within 1/4-inch in 12 feet.
- C. Set rails horizontal or parallel to rake of steps to within 1/4 inch in 12 feet.
- D. Fit exposed connections together to form tight, hairline joints.
- E. Provide anchorage devices and fasteners for securing handrails and railings and for transferring loads structures.
- F. Provide mechanical joints for permanently connecting railing components at nonwelded connections.

3.02 CLEANING:

- A. Wash thoroughly using clean water and soap, rinse with clean water.
- B. Do not use acid solution, steel wool or other harsh abrasive.
- C. When stain remains after washing, remove finish and restore in accordance with manufacturer's instructions.

3.03 PROTECTION:

- A. Protect surfaces of completed installations to prevent damage during construction activities.

3.04 REPAIR OF DEFECTIVE WORK:

- A. Remove stained or otherwise defective work and replace with no additional cost to Owner.

3.05 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 09940

SHOP PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide labor, materials, equipment and incidentals required for the surface preparation and application of shop primers and finish coats, as specified herein.

1.02 RELATED WORK:

- A. Section 09941: Field Painting for painting of shop painted surfaces.
- B. Factory prefinished items as specified.

1.03 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
  - 1. Manufacturer's specifications and data on the proposed primers and detailed surface preparation, application procedures and dry mil thicknesses, including list of items and surfaces to receive shop painting.

1.04 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Section 01610 and as specified.
- B. Deliver materials to application area in original, unbroken containers, plainly marked with name and analysis of product, manufacturer's name, and shelf life date. Do not store or use contaminated, outdated, prematurely opened, or diluted materials.
- C. Store coated items to prevent damage or dirtying of coatings. Avoid need for special cleaning, and store coated items out of contact with ground or pavement. Place suitable blocking under coated items during storage.
- D. Do not expose surfaces to weather for more than six months before being topcoated, or less time if recommended by coating manufacturer.
- E. Protect surfaces not to receive paint coatings during surface preparation, cleaning, and painting.
- F. Protect coatings from damage during shipment and handling by padding, blocking, use canvas or nylon slings, and use care when handling.

- G. At time of delivery of shop painted items to job site, ensure coatings are undamaged and in good condition.

#### 1.05 JOB CONDITIONS:

##### A. Environmental Requirements:

1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
2. Do not apply coatings when dust is being generated.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS:

##### A. Coatings are divided into the following service types, as determined by conditions:

###### 1. Non-Potable Water:

- a. All ferrous metals not subject to potable water provide one coat with a dry film thickness of 2.5 to 3.0 mils with one of the following or equal:
  - (1) Series 1 Omnithane by Tnemec Co.
  - (2) Carbozinc 859 by Carboline Co.
  - (3) Multiprime EFD Epoxy Fast Day Inhibitive Primer 94-109 made by PPG Protective & Marine Coatings (4.0 – 6.0 DFT).
  - (4) Or acceptable equivalent product.

###### 2. Potable Water:

- a. Ferrous metals submerged or which are subject to splash action in contact with potable water, provide one coat with a dry mil thickness of 3.0 to 3.5 mils of a certified NSF Standard 61 product by one of the following or equal:
  - (1) 91 H20 Urethane Zinc Rich Primer made by Tnemec Co.
  - (2) Carboguard 561 made by Carboline Co.
  - (3) Aquapon High Build Potable Water Epoxy 95-132 Series made by PPG Protective & Marine Coatings (4.0 – 6.0 DFT).



(4) Or acceptable equivalent product.

- B. Shop prime with primers guaranteed by the manufacturer to be compatible with their corresponding primers and finish coats specified in Section 09941 for use in the field and which are recommended for use together.

### PART 3 - EXECUTION

#### 3.01 APPLICATION:

##### A. Surface Preparation and Priming:

1. Sandblast clean in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming non-submerged components scheduled for priming, as defined above.
2. Sandblast clean in accordance with SSPC-SP-10, Near White, immediately prior to priming submerged components scheduled for priming, as defined above.
3. Before priming, provide surfaces dry and free of dust, oil, grease and other foreign material.
4. Shop prime in accordance with approved manufacturer's printed recommendations.

- B. Non-primed Surfaces: Apply approved coating in accordance with manufacturer's printed recommendation.

#### 3.02 TOUCH-UP:

- A. Repair or replace damaged or defective coated areas. Resultant shop painting: Paint items as specified.
- B. Remove damaged or defective coatings by specified blast cleaning to meet surface cleaning requirements, just before recoating. When small areas of coating need touch up, surface preparation may be done with suitable power needle gun to match specified blast cleaning.

3.03 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 15103

### STAINLESS STEEL SLIDE GATES AND APPURTENANCES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Provide and test stainless steel slide gates and appurtenances as indicated and in compliance with Contract Documents.

##### 1.02 REFERENCES:

- A. ASTM International (ASTM):

1. A240: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
2. A276: Standard Specifications for Stainless Steel Bars and Shapes.
3. B584: Standard Specification for Copper Alloy Sand Castings for General Applications.
4. D2000: Standard Classification System for Rubber Products in Automotive Applications.
5. D4020: Standard Specification for Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials.

- B. American Welding Society Code.

- C. American Water Works Association (AWWA):

1. C561: Fabricated Stainless Steel Slide Gates.

##### 1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01300:

1. Certified shop and erection drawings. Contractor shall submit electronic files of the proposed equipment in the capacity, size, and arrangement as indicated and specified.
2. Data for gate and actuator characteristics and performance.
3. Complete description of all materials, material thicknesses of all components.

4. Maximum bending stress and deflection of the slide under design head specified and indicated.
  5. Installation drawings showing the details required for installation, dimensions, clearances and anchor bolt locations
  6. Shop drawing data for accessory items.
  7. Certified setting plans, with tolerances, for anchor bolts.
  8. Manufacturer's literature as needed to supplement certified data.
  9. Operating and maintenance instructions and parts lists.
  10. For manufacturers not named provide a listing of reference installations as specified with contact names and telephone numbers.
  11. Certified results of gate shop testing, including shop leakage test results of each gate at the design unseating head specified and indicated
  12. Certified results of actuator shop testing from the actuator manufacturer.
  13. List of recommended spare parts other than those specified.
  14. Shop and field inspection reports.
  15. Qualifications of field service engineer.
  16. Recommendations for short and long-term storage.
  17. Shop and field testing procedures and set up
  18. Special tools.
  19. Manufacturer's product data, specifications and color charts for shop painting.
  20. Motor shop test results.
  21. The latest ISO 9001 series certification or quality system plan.
- B. A copy of the contract mechanical process and structural drawings, with addenda that are applicable to the equipment specified in this section, marked to show all changes necessary for the equipment proposed for this specification section. If no changes are required, mark all drawings with "No changes required" or provide a statement that no changes are required.

1. Failure to include all drawings or a statement applicable to the equipment specified in this section will result in submittal return without review until a complete package is submitted.
- C. A copy of this specification section with addenda and all referenced specification sections with addenda, with each paragraph check-marked to indicate specification compliance or marked and indexed to indicate requested deviations and clarifications from the specified requirements.
1. If deviations and clarifications from the specifications are indicated, therefore requested by the Contractor, provide a detailed written justification for each deviation and clarification.
  2. Failure to include a copy of the marked-up specification sections and or the detailed justifications for any requested deviation or clarification will result in submittal return without review until marked up specifications and justifications are submitted in a complete package.
- 1.04 SPARE PARTS:
- A. Comply with the requirements specified in Section 01600.
1. One set of all special tools.
- 1.05 QUALITY ASSURANCE:
- A. Comply with the requirements specified in Section 01400.
- B. The Contractor to obtain the gates, actuators, and specified appurtenances from a single gate manufacturer as a complete and integrated package.
- C. Gates to be the manufacturer's standard cataloged product and modified to provide compliance with the drawings, specifications and the service conditions specified and indicated.
- D. Slide gates and appurtenances to be fabricated, assembled, and tested in the United States of America.
- E. Welding: In accordance with latest applicable American Welding Society Code, ASME Welding Code, or equivalent.
- F. Shop tests as specified, including shop leakage testing of each gate at the design unseating head to confirm compliance with the leakage rate specified and indicated.
- G. Services of Manufacturer's Representative as stated in Section 01400 and as specified herein.

H. Provide services of factory-trained field service technician, specifically trained on type of equipment specified:

1. Service technician to be present on site for all items listed below. Person-day requirements listed are exclusive of travel time, and do not relieve Contractor of the obligation to place equipment in operation as specified.
2. Installation: Inspect grouting, location of anchor bolts; setting, leveling, alignment, field erection; coordination of electrical connection:
  - a. 1/2 person-day.
3. Functional Testing: Calibrate, check alignment and perform a functional test. Tests to include all items specified.
  - a. 1/2 person-day.
4. Field Performance Testing: Field performance test equipment specified.
  - a. 1/2 person-day.
5. Vendor Training: Provide classroom and field operation and maintenance instruction including all materials, slides, videos, handouts and preparation to lead and teach classroom sessions.
  - a. 1/2 person-day.
6. Credit to the Owner, all unused service person-days specified above, at the manufacturer's published field service rate.
7. Any additional time required of the factory trained service technician to assist in placing the equipment in operation, or testing or to correct deficiencies in installation, equipment or material shall be provided at no additional cost to the Owner.

I. Manufacturer of gates to have a minimum of (5) operating installations with gates of the size specified and in the same service as specified operating for not less than (5) years or manufacturer of gates shall utilize a Project Manager that is experienced in stainless steel gate design and construction. The Project Manager to be an employee of the gate manufacturer and to have designed a minimum of (5) operating installations with gates of the size specified and in the same service as specified operating for not less than (5) years.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Comply with the requirements specified in Section 01610.

## PART 2 - PRODUCTS

### 2.01 SYSTEM DESCRIPTION:

- A. Gate sizes and operating data are indicated in the Slide Gate Schedule.

### 2.02 MANUFACTURERS:

- A. Stainless Steel Slide Gates:
  - 1. Whipps.
  - 2. RW Gate Co.
  - 3. Acceptable equivalent product with unitized single piece frame.
- B. Provide in accordance with Section 01250.

### 2.03 SEISMIC DESIGN REQUIREMENTS:

- A. Conform to the requirements indicated on the structural drawings and as specified in Section 01900.
- B. The Contractor to conform to the seismic design requirements for this project and for the work of this specification section.
- C. Provide all equipment bases, anchorage, supports and foundations designed in accordance with the seismic requirements indicated and specified.
- D. Additionally, provide with the Certificate of Unit Responsibility, certification for all equipment signed by a registered structural engineer stating that computations were performed and that all components have been sized for the seismic forces specified and indicated.

### 2.04 SLIDE GATE CONSTRUCTION:

- A. Provide all gates produced by a single manufacturer and designed for installation in the channels and structures as specified and indicated.
- B. Gate configuration: As indicated in the Slide Gate Schedule.
- C. Provide all gates in conformance with AWWA C561 and as specified.
- D. Self-contained, rising stem, flush bottom type with self-adjusting seals.
- E. Gates with adjustable wedges or wedging devices are not acceptable.
- F. Provide all structural components with minimum 1/4-inch thickness.

- G. Gate assemblies to be media blasted or passivated in accordance with ASTM A380 prior to shipment to remove all mill scale, weld splatter, discoloration, or other surface imperfections.
- H. Leakage rate:
1. Seating head and unseating head conditions: Leakage not to exceed 0.05 gpm per foot of seating perimeter.
- I. Assembly to consist of the following:
1. Frame.
  2. Slide.
  3. Stem.
  4. Seals.
  5. Stem guides and wall brackets.
  6. Floorstand with operator type as indicated in the Slide Gate Schedule.
- J. Materials:
1. Frame assembly and retainers: ASTM A240 Type 316L stainless steel.
  2. Slides and stiffeners: ASTM A240 Type 316L stainless steel.
    - a. 1/4-inch minimum thickness.
  3. Seat, seals, and facing: ASTM D4020 UHMW (Ultra-High Molecular Weight) polyethylene.
  4. Invert seal for upward acting gates only: ASTM D2000 Neoprene or EPDM.
  5. Stems: ASTM A276 Type 316 stainless steel, minimum 1-1/2-inch diameter.
  6. Lift nuts: ASTM B584 Bronze.
  7. Floorstand and wall brackets: ASTM A276 Type 316L stainless steel.
  8. Gear operator housing: Ductile iron.
  9. Hardware, studs, and nuts: ASTM A276 Type 316 stainless steel.
  10. Anchor bolts: Type 316 stainless steel, minimum 1/2-inch diameter.
- K. Slide:



1. Slide and reinforcing stiffeners welded to the slide.
  - a. Stainless steel plate, minimum 1/4-inch.
  - b. Reinforcement: Provide a minimum of two horizontal stiffeners welded to the slide and two vertical stiffeners welded to outside of the horizontal stiffeners.
  - c. Provide slide to engage the guide a minimum of 1 inch on each side and have a minimum material thickness of a 1/4 inch.
    - (1) Gates with the width of the gate opening x maximum design head is 80 ft<sup>2</sup> or greater, provide the portion of the slide that engages the guide members 1/2 inch thick edge design where it engages the guide.
    - (2) Gates with the width of the gate opening x maximum design head is 120 ft<sup>2</sup> or greater, provide the portion of the slide that engages the guide members 3 inch thick edge design where it engages the guide.
  - d. Provide the stem connector constructed of two angles or plates welded to the slide. Provide a minimum of two bolts connecting the stem to the stem connector.
2. Deflection: Maximum of 1/720 of the span or 1/16 inch whichever is smaller, under design head specified.

L. Seals:

1. Provide a self-adjusting seal system suitable for the leakage, frequent cycling and velocities specified herein, and mounted such that there is no obstruction to the specified gate opening size.
2. Provide gates equipped with UHMW polyethylene seat/seals to restrict leakage and to prevent metal to metal contact between the frame and slide.
3. Extend the seat/seals to accommodate the 1.50 x the slide height with the gate in the fully open or fully closed position.
4. Provide all upward opening gates with a resilient flush bottom seal for sealing the invert of the gate.
5. Provide all downward opening weir gates with self-adjusting UHMW seat/seals across the invert member.
6. Provide all seals mechanically fastened to the frame or slide, force fit seals or seals attached with adhesive are not acceptable.

7. Provide all seats and seals to be field replaceable without the need to remove grout or concrete and without the need to remove the frame from the wall or wall thimble.
8. Gates using “J” or “P” seals are not acceptable.

M. Frames:

1. Provide frame assembly including guide members, invert members and yoke members constructed of formed stainless steel plate with a minimum thickness of 1/4-inch.
2. Provide gussets to support the guide members for unseating gates as required by the design head specified and indicated.
  - a. Provide gussets extended to support the outer portion of the guide assembly and positioned to transfer the load to the anchor bolts or the wall thimble studs.
3. Provide frames for mounting type as indicated in the Slide Gate Schedule:
  - a. Embedded.
  - b. Channel mounted.
  - c. Wall mounted with stainless steel anchor bolts and non-shrink, non-metallic grout, or EPDM gasket
  - d. Thimble mounted with stainless steel mounting studs and mastic gasket
4. Provide all wall mounted and thimble mounted gates with a flanged frame. Flat frame gates are not acceptable.
5. Provide all wall mounted and wall thimble mounted frames with a minimum guide weight of 11 lbs/ft and a minimum guide extension weight of 6.5 lbs/ft.
6. Provide guide extensions constructed of C-channel shape or similar. Angles are not acceptable guide extensions.
7. Frame Guides and Invert Members: Provide frames as a unitized one-piece, fully welded assembly.
  - a. Bolt together two-piece guide frames are not acceptable and will not be approved.
  - b. Bolt-on yokes are acceptable when necessary to facilitate slide removal.

- c. Frames that require field assembly are not acceptable unless the overall frame size exceeds a size suitable for shipment on a standard flatbed truck.
8. Provide the frame guides extending to accommodate the entire height of the slide when the slide is in the fully opened position on upward opening slide gates or downward opening weir gates.
9. For self-contained gates, provide a yoke across the top of the frame guides with the yoke formed by two structural members fixed to the top of the guides to provide a one-piece rigid frame.
  - a. Provide the yoke designed to allow removal of the slide.
10. Provide a rigid stainless steel invert member across the bottom of the opening.
  - a. Invert member: Flush bottom type on upward opening gates with a minimum weight as specified
11. Provide a rigid stainless steel top seal member across the top of the opening on gates designed to cover submerged openings.
12. Provide a rigid stainless steel member across the invert of the opening on downward opening weir gates.

N. Stems:

1. Provide a threaded operating stem to connect the operating mechanism to the slide.
2. For rising stem gates provide the threaded portion engaging the operating nut in the manual operator or motor actuator.
3. For non-rising stem gates provide the threaded portion engaging the nut on the slide.
4. Minimum stem outside diameter of 1-1/2 inches.
5. Stem extension pipes are not acceptable.
6. Provide the stem constructed of solid stainless steel bar for the entire length
7. Tensile strength: Not less than 60,000 psi for stems.
8. Provide the stem threaded to allow full travel of the slide unless otherwise specified or indicated.
9. L/R: Not to exceed 200.

10. Provide the stem, in tension, designed to withstand a load caused by a 40 pound effort on the crank or handwheel without exceeding 1/5 of the ultimate tensile strength of the stem material.
11. Provide the threaded portion of the stem machined rolled or cut full depth ACME type threads with 16 micro-inch or better finish. Stub threads are not acceptable.
12. Provide stems of more than one piece joined by bronze or stainless steel couplings with the coupling bolted to the stem.
13. Provide dual stems for upward opening gates wider than 60-inch when the opening width is 2 x greater or more than the height of the slide. Provide dual stems for downward opening gates wider than 48 inch when the opening width is 2 x greater or more than the height of the slide.
14. Provide stems on manually operated gates with an adjustable stop collar to prevent over closing of the gate.
15. For rising stem gates, provide clear plastic covers with 1-inch graduations. Provide vent holes to prevent condensation.

#### 2.05 STEM GUIDES:

- A. Provide stem guides where required to maintain L/R of 200 or less for the unsupported length of the stem
- B. Provide stem guides and brackets of Type 316L stainless steel.
  1. Adjustable in two directions.
  2. Minimum thickness: 1/4-inch.
  3. Bushings: UHMW or bronze.

#### 2.06 MANUAL OPERATORS:

- A. Floorstands and Wall Brackets:
  1. Provide a manually operated Type 316 stainless steel floorstand with removable crank, mounted on a wall bracket that is fastened to the operating platform.
  2. Provide Type 316 stainless steel floorstands of a height such that the crank operated pinion shaft is located 36 inches above the operating level.
    - a. Provide pinion shaft of sufficient length so the crank extends beyond the hand railing.
  3. Provide Type 316 stainless steel wall brackets to support floorstands.

- a. Provide wall brackets reinforced to withstand in compression a minimum of 2 x rated output of the operator with an 80 pound effort on the crank.
- B. Provide a gearbox with 316 stainless steel or CF8M housing, suitable for use with a portable operator.
- C. Provide a threaded cast bronze lift nut to engage operating stem.
- D. Provide roller bearings above and below a flange on the operating nut to support both opening and closing thrusts.
- E. Operate gates under the operating head and design head, as specified and indicated, with no greater than a 40 pound effort on the crank.
- F. Gears, where required, steel with machined cut teeth designed for smooth operation.
- G. Provide Type 304 or 400 Series stainless steel pinion shafts on crank operated floorstands supported on tapered roller bearing or ball bearings with all components totally enclosed in a weatherproof housing with a removable cover.
  - 1. Design bearing arrangement for use with portable operators specified herein.
- H. Provide mechanical seals on the operating nut and the pinion shafts to exclude moisture and dirt and prevent leakage of lubricant out of the hoist mechanism.
- I. Provide lubricating fittings for the lubrication of all gears and bearings.
- J. Floorstands: Provide a Type 316L stainless steel pedestal, constructed of minimum Schedule 40 tube and 3/8-inch thick base plates.
- K. Permanently attach or cast an arrow with the word "OPEN" on the floorstand, indicating the direction of rotation to open the gate.
- L. Cranks: Cast aluminum or stainless steel with revolving nylon grip and removable.

#### 2.07 SHOP PAINTING:

- A. Primer and Finish Paint: Shop apply to all exterior ferrous surfaces, (2) coats of high solids epoxy in accordance with Section 09940. Do not paint stainless steel.
- B. Ferrous surfaces which are not to be painted to be given a shop applied coat of grease or rust resistant coating.

#### 2.08 SHOP TESTING:

- A. Assemble each gate and inspect for proper seating.
  - 1. Check clearance between frame and disc seating surfaces.

- B. Fully open and close each gate in guide system to insure gates operate freely as recommended by the gate manufacturer.
- C. Conduct a shop leakage test at the design unseating head on each gate to confirm leakage as specified and indicated for Field Testing.
- D. Operate floorstand to insure proper assembly and operation.
- E. Repeat tests until specified results are obtained.
- F. Correct or replace promptly all defects or defective equipment revealed by or noted during tests at no additional cost to the Owner.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Install items in accordance with shop drawings, manufacturer's printed instructions and as indicated.
- B. Clean debris, dirt, and gravel, from inside of gates and channels before placing gates.
- C. Install slide gates in completely assembled condition.
- D. Erect and support slide gates in positions free from distortion and strain on appurtenances during handling and installation.
- E. Inspect material for defects in workmanship and material.
- F. Clean out debris and foreign material from gate opening and seats, test operating mechanisms to check proper functioning, and check nuts and bolts for tightness. Repair gates and other equipment which do not operate easily or are otherwise defective.
- G. Set floorstand operators and stem guides so stems run smoothly in true alignment. Anchor guides firmly to walls. Check distances from centerlines of gates to operating level or base of floorstand and adjust if necessary to suit actual conditions of installation.

#### 3.02 FIELD TESTING:

- A. Field testing will not be conducted without a procedure accepted by the Engineer.
- B. After installation of gates, and after inspection, operation, testing and adjustment have been completed by the manufacturer's field service technician, conduct operating and leakage test for each gate in presence of the Engineer to determine its ability to operate as specified, and to operate smoothly without jamming under specified conditions.
- C. Test all operators.

- D. Leakage Test: Leakage not to exceed 0.05 gpm per foot of seal perimeter.
  - 1. Conduct tests at design heads shown in the slide gate schedule.
- E. Immediately correct or replace all defects or defective equipment revealed by or noted during tests at no additional cost to the Owner.
- F. Repeat tests until specified results are obtained.
- G. Contractor to provide all water labor, piping, testing equipment for conducting tests.
- H. Make all adjustments necessary to place equipment in specified working order at time of above tests.
- I. Remove and replace equipment at no additional cost to the Owner with equipment that will meet all requirements specified and indicated if unable to demonstrate to the satisfaction of the Engineer that equipment will perform the service specified, indicated and as submitted.

3.03 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

## SECTION 15112

### STOP LOGS AND APPURTENANCES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Provide stainless steel stop logs and appurtenances as indicated and in compliance with Contract Documents.

##### 1.02 REFERENCES:

- A. ASTM International (ASTM):
  1. A240: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  2. A276: Standard Specifications for Stainless Steel Bars and Shapes.
  3. D2000: Standard Classification System for Rubber Products in Automotive Applications.
  4. D4020: Standard Specification for Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials.
- B. American Welding Society Code (AWS):
  1. D1.6: Structural Welding Code – Stainless Steel.

##### 1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01300:
  1. Detailed scope of supply.
  2. 11x17 certified to-scale drawings with title block specific to this job. Include plan, section, and details with dimensions in US customary units. Key all components to a short description with materials. Identify all connections with name, type, and size. Show anchor details and equipment weight.
  3. Product brochures for all components, annotated so it is clear which models, options, materials, and accessories are being provided. Cross out information that does not apply.
  4. Data for stop log characteristics and performance.
  5. Complete description of all materials, material thicknesses of all components.



6. Maximum bending stress and deflection of the stop logs under design head specified and indicated.
  7. Installation drawings showing the details required for installation, dimensions, clearances, and anchor bolt locations.
  8. Shop drawing data for accessory items.
  9. Certified setting plans, with tolerances, for anchor bolts.
  10. Manufacturer's literature as needed to supplement certified data.
  11. Operating and maintenance instructions and parts lists.
  12. Shop and field inspection reports.
  13. Qualifications of field service engineer.
  14. Recommendations for short and long-term storage.
  15. Field testing procedures and set up
  16. Special tools.
  17. The latest ISO 9001 series certification or quality system plan.
- B. A copy of the contract mechanical process and structural drawings, with addenda that are applicable to the equipment specified in this section, marked to show all changes necessary for the equipment proposed for this specification section. If no changes are required, mark all drawings with "No changes required" or provide a statement that no changes are required.
1. Failure to include all drawings or a statement applicable to the equipment specified in this section will result in submittal return without review until a complete package is submitted.
- C. A copy of this specification section with addenda and all referenced specification sections with addenda, with each paragraph check-marked to indicate specification compliance or marked and indexed to indicate requested deviations and clarifications from the specified requirements.
1. If deviations and clarifications from the specifications are indicated, therefore requested by the Contractor, provide a detailed written justification for each deviation and clarification.
  2. Failure to include a copy of the marked-up specification sections and or the detailed justifications for any requested deviation or clarification will result in submittal return without review until marked up specifications and justifications are submitted in a complete package.

1.04 SPARE PARTS:

- A. Comply with the requirements specified in Section 01600.
  - 1. One set of all special tools is required.

1.05 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01400.
- B. The Contractor to obtain stop logs, guide frames (grooves), and specified appurtenances from a single manufacturer.
- C. Stop logs to be the manufacturer's standard cataloged product and modified to provide compliance with the drawings and specifications.
- D. Stop logs and appurtenances to be fabricated, assembled, and tested in the United States of America.
- E. All welding to be accordance with latest applicable American Welding Society Code, ASME Welding Code or equivalent.
- F. Provide all welds performed by welders with AWS D1.2 certification for aluminum and AWS D1.6 or ASME Section IX certification for stainless steel.
- G. Finish: Mill finish on aluminum and stainless steel.
  - 1. Provide welds on aluminum cleaned to provide a uniform finish.
  - 2. Provide weld on stainless steel passivated in accordance with ASTM A380 to remove weld burn and scale.
- H. Provide the services of a factory-trained field service technician, specifically trained on type of equipment specified:
  - 1. Service technician to be present on site for all items listed below. Person-day requirements listed are exclusive of travel time, and do not relieve Contractor of the obligation to place equipment in operation as specified.
  - 2. Installation: Inspect grouting, location of anchor bolts; setting, leveling, alignment and field erection:
    - a. 1/2 person-day.
  - 3. Functional Testing: Check alignment and perform a functional test. Tests to include all items specified.
    - a. 1/2 person-day.

4. Testing: Field performance test equipment specified.
    - a. 1/2 person-day.
  5. Vendor Training: Provide classroom and field operation and maintenance instruction including all materials, slides, videos, handouts and preparation to lead and teach classroom sessions.
    - a. 1/2 person-day.
  6. Credit to the Owner, all unused service person-days specified above, at the manufacturer's published field service rate.
  7. Any additional time required of the factory trained field service technician to assist in placing the equipment in operation, or testing or to correct deficiencies in installation, equipment or material shall be provided at no additional cost to the Owner.
- I. Manufacturer of stop logs to have a minimum of (10) operating installations with stop logs of the size specified or larger and in the same service and head as specified operating for not less than (5) years or manufacturer of stop logs to utilize a Project Manager that is experienced in stop log design and construction. The Project Manager to be an employee of the gate manufacturer and to have designed a minimum of (10) operating installations with stop logs of the size specified or larger and in the same service and head as specified operating for not less than (5) years.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01610.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION:

- A. Stop log sizes and operating data are indicated in the Stop Log Schedule.

2.02 MANUFACTURERS:

- A. Stop Logs:
  1. Whipps.
  2. RW Gate Co.
  3. Or an acceptable equipment product.
- B. Provide in accordance with Section 01250.

2.03 DESIGN CRITERIA:

- A. Stop log quantity, dimensions, and design head: As indicated in the Stop Log Schedule.
- B. Leakage rate: Maximum 0.05 gpm per foot of wetted seal perimeter.
- C. Provide all structural components of stop logs with strength to prevent distortion during normal handling, installation, and while in service as specified and indicated.

2.04 FRAMES GUIDES (GROOVES) AND INVERT MEMBERS:

- A. ASTM A240, Type 316L stainless steel plate with minimum 1/4-in thickness.
- B. Provide frame design to allow for embedded mounting or mounting directly to a wall with stainless steel anchor bolts and grout.
- C. Provide mounting style as indicated in the Stop Log Schedule.
- D. Provide a flush bottom invert member across the bottom of the guides.
- E. Frame mounted seals are not acceptable.

2.05 STOP LOGS:

- A. ASTM B308, 6061-T6 extruded aluminum with minimum 5/16-in thickness.
- B. Maximum bending stress at maximum operating head: 7,600 psi.
- C. Log design to prevent buoyancy and be self-draining.
- D. Stop logs to be capable of being stacked in any order and placed into grooves under their own weight without applying a downward force.
- E. Provide two slots in the top of each log for removal by stop log lifting device or hooked pike poles. Stop logs with protruding hooks or pins are not acceptable.
- F. Each stop log to have a welded nameplate indicating manufacturer, model number, opening width, design head, and seal material.
- G. Each stop log to have welded tags indicating dry and wet sides.
- H. Provide stop logs designed to prevent buoyance and to allow drainage.

2.06 SEALS:

- A. Lip seals: Urethane ASTM D4020, Neoprene ASTM D2000, or EPDM.
- B. Provide stop logs with a continuous resilient seal along the bottom and both sides to restrict leakage to the specified rate.

- C. All seals to be replaceable and mechanically retained to the stop logs.
- D. Stop logs using rubber “J” or “P” seals are not acceptable.

2.07 ANCHOR BOLTS:

- A. Type 316 stainless steel.
- B. Manufacturer to provide the necessary anchor studs, bolts, and nuts.
- C. Manufacturer to determine quantity and location.
- D. Minimum 1/2-in diameter.

2.08 LIFTING DEVICE:

- A. Manufacturer to provide (6x) 15-ft long pike poles with hand holds and hooks compatible with the lifting slots in the logs.

2.09 STORAGE RACKS:

- A. Not required.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install items in accordance with shop drawings, manufacturer's printed instructions and as indicated.
- B. Clean debris, dirt, and gravel, from inside of stop logs, guide frames and channels before placing stop logs.
- C. Install guide frames in a true vertical position and grout all voids between guide frames and walls.
- D. Inspect material for defects in workmanship and material.

3.02 FIELD TESTING:

- A. Field testing will not be conducted without a procedure and/or checklist accepted by the Engineer.
- B. After installation of guide frames, and after inspection, operation, testing and adjustment has been completed by the manufacturer’s field service technician, conduct an operating and leakage test for each stop log in the presence of the Engineer to determine its ability to operate as specified, and to operate smoothly without jamming under specified conditions.

- C. Test installation and removal of each stop log location with the number of stop logs as indicated.
  - D. Leakage Test: Leakage not to exceed 0.05 gpm per foot of seal perimeter.
    - 1. Conduct tests at design heads shown in the Stop Log Schedule.
  - E. Immediately correct or replace all defects or defective equipment revealed by or noted during tests at no additional cost to the Owner.
  - F. Repeat tests until specified results are obtained.
  - G. Contractor to provide all water labor, piping, testing equipment for conducting tests.
  - H. Make all adjustments necessary to place equipment in specified working order at time of above tests.
  - I. Remove all replace equipment at no additional cost to the Owner with equipment that will meet all requirements specified and indicated if unable to demonstrate to the satisfaction of the Engineer that equipment will perform the service specified, indicated and as submitted.
- 3.03 CONTRACT CLOSEOUT:
- A. Provide in accordance with Section 01700.

END OF SECTION