City of Marlborough

DEPARTMENT OF PUBLIC WORKS

135 Neil Street, Marlborough, MA 01752

Contract Documents and Specifications for Artemas Ward Park Improvements

Contract ED 2015-08

August 2014

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COMMONWEALTH OF MASSACHUSETTS
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8.12.2014

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8.12.2014

CDM SMITH
CAMBRIDGE, MASSACHUSETTS
WATER ENVIRONMENT TRANSPORTATION ENERGY FACILITIES

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BIDDING AND CONTRACT REQUIREMENTS

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CITY OF MARLBOROUGH, MASSACHUSETTS
ARTEMAS WARD PARK IMPROVEMENTS

NOTICE TO BIDDERS

The City of Marlborough, the Awarding Authority, invites sealed bids from General Contractors for the construction of Artemas Ward Park Improvements Project ("Ward Park") for the Department of Public Works, Engineering Division in Marlborough, Massachusetts, CONTRACT NO. **ED 2015-08,** in accordance with the documents prepared by CDM Smith. Estimated Project Value = $3,000,000.00. All bids for this project are subject to M.G.L., Ch. 30, §39M, Ch. 149, §44A-44J, as applicable, and to minimum Prevailing Wage Rates issued by the Commonwealth of Massachusetts, Department of Labor Standards (DLS) as required by c.149 §§26 to 27H inclusive. The City of Marlborough is subject to the rules and regulations of the Architectural Access Board, 521 CMR, as applicable to the project.

The Project Description: All work required to construct the Ward Park including all work required for site preparation and removals including removals and disposals or grinding of existing bituminous concrete pavements, removals of stone retaining walls and concrete foundations, chain link fences, and other miscellaneous items; clearing and grubbing; furnishing and installing and maintenance of erosion controls; rough and fine grading of all areas identified within the limit of work; installing new sub drainage and loaming and seeding new athletic field; preparation of the base and furnishing and installing new bituminous concrete pavement including incidental drainage, curbing and pavement markings; furnishing and installing new chain link fencing and gates; installation of a new basketball court, new tennis court, new volley ball court and new skateboard area; furnishing and installing new play area; furnishing and installing picnic tables and waste containers furnishing and installing all site utility work; new electrical service and lighting system and other miscellaneous work to provide all improvements as described in the contract documents.

Bidders are invited to a non-mandatory Pre-Bid Conference at the City's Department of Public Works, 135 Neil Street Marlborough, MA on **August 19, 2014 at 11:00 A.M.** to discuss the work. Each bidder is advised to visit the site of the proposed work, become fully acquainted with the site conditions as they exist, and thoroughly examine the Contract Documents. Further questions can be discussed by contacting the Engineering Division at (508) 624-6910 Extension 7200.

Sealed bids will be received at the Office of the City Engineer, Department of Public Works, Administration Offices-2nd Floor, 135 Neil Street, Marlborough, MA 01752 Tel. No. (508) 624-6910, Extension 7200 until **9:00 A.M. on Wednesday, August 27, 2014** at which time they will be publicly opened forthwith and read aloud. Timely delivery of a bid to the location designated shall be the full responsibility of the bidder. Bids submitted after the time and date specified will not be accepted. Envelopes containing bids must be plainly marked on the lower left corner as **CONTRACT ED 2015-08 BID** with the date and time of the bid opening. The City of Marlborough is not responsible for the premature opening of any sealed bid not properly identified. If, at the time of the scheduled bid opening, the designated location for receipt of bids is closed due to uncontrolled events, such as fire, snow, ice, wind, or building evacuation, the bid opening will be postponed until the time specified in the advertisement for delivery of bids on the next normal business day. Bids will be accepted until that date and time.

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Bid Forms, Specifications, Plans and copies of the Contract Documents to be used may be examined at, but not removed from, the Engineering Division of the Department of Public Works, Administration Office-2nd Floor, 135 Neil Street, Marlborough, MA as of **Wednesday August 13, 2014** and may be obtained at no charge through the DPW procurement website at: http://www.marlborough-ma.gov/Gen/MarlboroughMA_PublicWrks/DPWProcurement/index.
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 City of Marlborough in the amount of not less than five percent (5%) of the greatest possible bid amount (considering all alternates, if any).

Pursuant to M.G.L. Chapter 149, §29, a Performance and a Labor and Materials Payment Bond issued by a surety licensed by the Commonwealth's Division of Insurance and listed in the most recent United States Treasury Department Circular 570, each in the amount of 100% of the contract price, will be required of the successful bidder within ten (10) days of notification of contract award by the City of Marlborough. Insurance certificate(s), including the City of Marlborough as an additional insured, indicating coverage in accordance with the contract requirements must be filed with the City of Marlborough by the successful bidder at the time of contract execution. Statement of Management on Internal Accounting Controls and a Statement prepared by a CPA expressing an opinion to the state of Management Controls, as required by MGL c.30, §39R, applies to all contracts of $100,000 or more.

The successful bidder shall comply with equal opportunity and affirmative action requirements and not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age, handicap, sex, veteran's status or in employment practices in the selection or retention of subcontractors, or in the procurement of materials and rentals of equipment. The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion or transfer; recruitment advertising; recruitment layoff; termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship. In accordance with the provisions of Equal Employment Opportunity (EEO) and Affirmative Action (AA) requirements included in the contract documents, the successful bidder, must agree to a contract obligation that affirms its willingness to maintain on the project not less than five percent (5%) ratio of minority employee work hours in each job category for all on-site work and shall prepare a report after each week of activity, reflecting the actual working hours of all personnel identified as minority or non-minority.

The City of Marlborough is an affirmative action/equal opportunity employer and encourages participation from certified minority and women-owned business. All qualified contractors will receive consideration without regard to race, age, color, religious creed, gender, handicap, sexual orientation, veteran's status or national origin. The City of Marlborough, as the Awarding Authority, reserves the right to reject any and all bids or parts thereof, waive any informality in any or all bids and to omit any item or items deemed advisable, if it is deemed to be in the best interest of the public to do so.

CITY OF MARLBOROUGH
DEPT. OF PUBLIC WORKS
BY: Evan Pilachowski, P.E.
City Engineer

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CITY OF MARLBOROUGH, MASSACHUSETTS
WARD PARK

INSTRUCTIONS TO BIDDERS

ARTICLE 1. QUALIFICATIONS OF BIDDERS

1.1 Bidders may be investigated by OWNER to determine if they are qualified to perform the Work. All Bidders shall be prepared to submit within five days of OWNER's or ENGINEER's request, written evidence of such information and data necessary to make this determination. Bidders must be experienced and qualified to complete all aspects of work associated with the construction and all work described herein. At a minimum, Bidders shall submit documentation and references establishing those qualifications as represented in Section 003000 – Bid Form.

1.2 The investigation of a Bidder will seek to determine whether the organization is adequate in size, is authorized to do business in the jurisdiction where the project is located, has had previous experience and whether available equipment and financial resources are adequate to assure OWNER that the Work will be completed in accordance with the terms of the Agreement. The amount of other work to which the Bidder is committed may also be considered.

1.3 In evaluating Bids, OWNER will consider the qualifications of only those Bidders whose Bids are in compliance with the prescribed requirements.

1.4 OWNER reserves the right to reject any Bid if the evidence submitted by, or the investigation of, such Bidder fails to satisfy OWNER that such Bidder is properly qualified to carry out the obligations of the Contract Documents and to complete the Work contemplated therein.

ARTICLE 2. COPIES OF CONTRACT DOCUMENTS

2.1 Complete sets of Contract Documents shall be used in preparing Bids; neither OWNER nor ENGINEER assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.

2.2 OWNER and ENGINEER in making copies of Contract Documents available do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

ARTICLE 3. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

3.1 Before submitting a Bid, each Bidder must (a) examine the Contract Documents thoroughly, (b) visit the site to become familiar with local conditions that may in any manner affect cost, progress or performance of the Work, (c) become familiar with Federal, State and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the Work; and (d) study and carefully correlate Bidder's observations with the requirements of the Contract Documents.

3.2 Before submitting a Bid, Bidders may, at their own expense, make such investigations and tests as they may deem necessary to determine their Bid for performance of the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

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3.3 On request, OWNER will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for the submission of a Bid.

3.4 The lands upon which the Work is to be performed, rights-of-way for access thereto and other lands designated for use by CONTRACTOR in performing the Work are identified in the Supplementary Conditions, General Requirements or on the Drawings.

3.5 The submission of a Bid will constitute an incontrovertible representation that the Bidder has complied with every requirement of this Article 3 and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

ARTICLE 4. INTERPRETATIONS

4.1 Any prospective bidder requesting a change in or interpretation of existing plans and specifications must do so by **11:00 AM on August 20, 2014**. Such requests must be received by the Engineering Division, City of Marlborough 135 Neil Street, Marlborough MA 01752. All requests are to be in writing and delivered or faxed to the Engineering Division (Fax: 508-624-7699).

4.2 Written clarifications or interpretations will be issued by Addenda. Only questions answered by formal written Addenda will be binding. Oral and other clarifications or interpretations will not have any binding legal effect. Written addenda will be faxed or e-mailed to all parties recorded as having received the Contract Documents.

ARTICLE 5. PRE-BID CONFERENCE

5.1 Bidders are invited to a non-mandatory Pre-Bid Conference at the City's Engineering Division on **Tuesday, August 19, 2014 at 11:00 A.M.** to discuss the work. Further questions can be discussed by contacting the Engineering Division at (508) 624-6910 Extension 7200.

ARTICLE 6. BID SECURITY

6.1 Each Bid must be accompanied by bid bond or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company, payable to OWNER. The Bid Security shall be in the amount stated in the Invitation To Bid. Bid Security shall be sealed in a separate envelope from the Bid and then attached to the envelope containing the Bid. All Bid Securities except those of the three lowest responsible and eligible Bidders will be returned within five days, Saturdays, Sundays, and legal holidays excluded, after opening of the Bids. All Bid Securities will be returned on the execution of the Agreement or if no award is made, within thirty days, excluding Saturdays, Sundays and legal holidays after the actual date of opening of the Bids, unless forfeited under the conditions herein stipulated.

6.2 In case a party to whom a Contract is awarded shall fail or neglect to execute the Agreement and furnish the satisfactory bonds within the time specified, OWNER may determine that the Bidder has abandoned the Contract, and thereupon the Bid Forms and acceptance shall be null and void and the Bid Security accompanying the Bid Form shall be forfeited to OWNER as liquidated damages for such failure or neglect and to indemnify said OWNER for any loss which may be sustained by failure of the Bidder to execute the Agreement and furnish the bonds as aforesaid, provided that the amount forfeited to OWNER shall not exceed the difference between the Bid Price of said Bidder and that of the next lowest responsible and eligible bidder and provided further that, in case of death, disability, or other unforeseen circumstances affecting the Bidder, such Bid Security may be returned to the Bidder. After execution of the Agreement

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and acceptance of the bonds by OWNER, the Bid Security accompanying the Bid Form of the Successful Bidder will be returned.

ARTICLE 7. PERFORMANCE, PAYMENT AND OTHER BONDS

7.1 Performance, Payment and other Bonds shall be provided in accordance with Article 5 of the Conditions of the Contract.

7.2 All Bonds required as Contract Security shall be furnished with the executed Agreement.

ARTICLE 8. BID FORM

8.1 Each Bid shall be submitted on the Bid Form on the perforated pages appended to the Project Manual. The Bid Form shall be removed and submitted separately. All blank spaces for Bid prices must be filled in with the unit price for the item or the lump sum for which the Bid is made.

8.2 Bid Forms shall be completed in permanent ink, by handwriting, or by means of a typewriter. Bid Forms completed in pencil or erasable ink may be rejected. The Bid price of each item on the form shall be stated in words, and figures. If unit prices are required on the Bid Form, discrepancies between unit prices and their respective total amounts will be resolved in favor of the unit prices. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

8.3 Bids by corporations shall be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

8.4 Bids by Limited Liability Companies shall be executed in the Limited Liability name by the Manager (or other Limited Liability Company officer/representative accompanied by evidence of authority to sign.) The Limited Liability Company address and state where the Limited Liability Company was formed shall be shown below the signature.

8.5 Bids by partnerships shall be executed in the partnership name and signed by a partner, whose title shall appear under the signature. The official address of the partnership shall be shown below the signature.

8.6 All names shall be typed or printed below the signature.

8.7 The Bid shall contain an acknowledgement of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form).

8.8 The address to which communications regarding the Bid are to be directed shall be shown.

8.9 One copy of each Bid shall be submitted in a sealed opaque envelope bearing on the outside the Bidder's name, address, and the Project Title for which the Bid is submitted. (If forwarded by mail, Bid and sealed envelope marked as described above shall be enclosed in another envelope with the notation "BID ENCLOSED" on the face and addressed as indicated in the Invitation to Bid.) The Bid Security shall be submitted in a separate envelope from the Bid and attached to the envelope containing the Bid.

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ARTICLE 9. RECEIPT OF BIDS

9.1 Sealed Bids for the work of this Contract will be received at the time and place indicated in the Invitation to Bid.

9.2 OWNER may consider informal any Bid not prepared and submitted in accordance with the provisions hereof.

9.3 Bidders are cautioned that it is the responsibility of each individual bidder to assure that their bid is in the possession of the responsible official or the designated alternate prior to the stated time and at the place of the Bid Opening. Owner is not responsible for bids delayed by mail and/or delivery services, of any nature.

ARTICLE 10. MODIFICATION AND WITHDRAWAL OF BIDS

10.1 Bids may be modified only by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

10.2 Bids may be withdrawn prior to the scheduled time (or authorized postponement thereof) for the opening of Bids.

10.3 Any Bid received after the time and date specified shall not be considered. No Bid may be withdrawn for a period of thirty days, excluding Saturdays, Sundays, and legal holidays after the actual date of the opening of the Bids.

ARTICLE 11. AWARD OF CONTRACT

11.1 The Contract will be awarded to the lowest responsible and eligible Bidder (Successful Bidder). Such a Bidder shall possess the skill, ability, and integrity necessary for the faithful performance of the work. The term "lowest responsible and eligible Bidder" as used herein shall mean the Bidder whose Bid is the lowest of those Bidders possessing the skill, ability and integrity necessary to the faithful performance of the Work.

11.2 OWNER reserves the right to reject any and all Bids, to waive any and all informalities if it is in Owner's best interest to do so, and the right to disregard all nonconforming, non-responsive or conditional Bids.

11.3 A Bid which includes for any item a Bid Price that is abnormally low or high may be rejected as unbalanced.

11.4 OWNER also reserves the right to reject the Bid of any Bidder that OWNER considers to be unqualified relative to Article 1 above.

11.5 If the Contract is to be awarded, OWNER will give the Successful Bidder a Notice of Award within thirty days, excluding Saturdays, Sundays, and legal holidays after the actual date of the opening of the Bids. All bids shall remain open for thirty days, excluding Saturdays, Sundays, and legal holidays after the actual date of the opening of the Bids but OWNER may, at OWNER's sole discretion, release any Bid and return the Bid Security prior to that date.

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ARTICLE 12. EXECUTION OF AGREEMENT

12.1 When OWNER gives a Notice of Award to the Successful Bidder, it will be accompanied by at least six unsigned copies of the Agreement and all other applicable Contract Documents. Within five days, excluding Saturdays, Sundays and legal holidays, after the date of receipt of such notification CONTRACTOR shall execute and return all copies of the Agreement and all other applicable Contract Documents to OWNER. Within ten days thereafter OWNER will deliver one fully signed copy to CONTRACTOR.

ARTICLE 13. SAFETY AND HEALTH REGULATIONS

13.1 The Contractor must comply with all Federal, State, and Local safety laws and regulations of the applicable to work performed under this Contract.

13.2 If the Contractor uses or stores toxic or hazardous substances it is subject to M.G.L. c.111F §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, 441CMR 21; and must post a Workplace Notice obtainable from the Department of Labor and Workforce Development.

13.3 The Contractor must comply with Dig-Safe Laws. Dig-Safe is the Utility Underground Plant Damage Prevention System, 331 Montvale Ave., Woburn, MA 01801, 1.888.344.7233. The Contractor must notify Dig-Safe of contemplated excavation, demolition, or explosive work in public or private ways, in any utility company right of way or easement or public or privately owned land or way, by certified mail, with a copy to Department of Environmental Protection (DEP). This notice must be given at least seventy-two (72) hours prior to the work, but not more than sixty (60) 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 an accurate description of the location and nature of the proposed work. Dig-Safe is required to respond to the notice within seventy-two (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 §40. Any costs related to the services performed by Dig-Safe shall be borne by the Contractor.

13.4 This project is subject to compliance 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. The Contractor shall furnish documentation for all employees to be employed at the worksite that they have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least ten (10) hours in duration at the time the employee begins work and shall furnish said documentation of successful completion of said course with the first certified payroll report for each employee as required by M.G.L. c30 §39S, as amended.

13.5 The Successful Bidder shall have a competent person or persons, as required under the Occupational Safety and Health Act on the Site to inspect the Work and to supervise the conformance of the Work with the regulations of the Act.

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ARTICLE 14. MANUFACTURER'S EXPERIENCE

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

ARTICLE 15. ACCESS TO WORK

15.1 Representatives of the Commonwealth and any local agencies having a direct interest in the Work shall have access to the Work under this contract wherever it is in preparation or progress and the Contractor shall provide proper facilities for such access and inspection.

ARTICLE 16. CHANGE ORDERS

16.1 Change orders will be processed in accordance with the "Change Order Forms" which are included in Part II of the Supplementary Conditions.

ARTICLE 17. COMMONWEALTH OF MASSACHUSETTS - SUPPLEMENTAL PROGRAM

17.1 The Contractor and all Subcontractors shall comply with all of the requirements of The Commonwealth of Massachusetts Modified Supplemental Equal Employment Opportunity, Anti-Discrimination and Affirmative Action Program including the certifications attached thereto. A copy of these requirements and the certification forms are included in Part II of the Supplementary Conditions.

ARTICLE 18. SALES TAX

18.1 The material and supplies to be used in the Work will be subject to the requirements of Paragraph 6.10 of the Conditions of the Contract.

ARTICLE 19. UTILITY UNDERGROUND PLANT DAMAGE PREVENTION SYSTEM

19.1 All excavations within public or private ways are subject to the requirements of Massachusetts General Law, Chapter 82, Section 40 included in PART II of the Supplementary Conditions.

ARTICLE 20. WAGE RATES

20.1 Minimum Wage Rates as determined by the Commissioner of Department of Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Section 26 to 27H, as amended, apply to this project. It is the responsibility of the Contractor, before bid opening, to request if necessary, any additional information on Minimum Wage Rates for those tradespeople who may be employed for the proposed work under this Contract.

20.2 The State schedule of minimum wage rates is included in Section 00860, Massachusetts Prevailing Wage rates.

ARTICLE 21. COMPETITIVE BIDDING

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21.1 The bidding and award of the Contract shall be in full compliance with Section 39 M inclusive of Chapter 30 of the General Laws of the Commonwealth of Massachusetts as last revised.

ARTICLE 22. GUARANTEE

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

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

22.3 Upon project completion, the Contractor shall provide the City with a binder or warranties provided by the manufacturer or any material or equipment installed as part of the work that will extend beyond the one-year guarantee period.

ARTICLE 23. MASSACHUSETTS GENERAL LAWS AND REGULATIONS

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

ARTICLE 24: EQUAL OPPORTUNITY AND AFFIRMATIVE ACTION IN EMPLOYMENT

24.1 The successful bidder shall comply with equal opportunity and affirmative action requirements and not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age, handicap, sex, veteran's status or in employment practices in the selection or retention of subcontractors, or in the procurement of materials and rentals of equipment. The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion or transfer; recruitment advertising; recruitment layoff; termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship. In accordance with the provisions of Equal Employment Opportunity (EEO) and Affirmative Action (AA) requirements included in the contract documents, the successful bidder, must agree to a contract obligation that affirms its willingness to maintain on the project not less than five percent (5%) ratio of minority employee work hours in each job category for all on-site work and shall prepare a report after each week of activity, reflecting the actual working hours of all personnel identified as minority or non-minority.

ARTICLE 25: MBE/ WBE REQUIREMENTS

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25.1 The City of Marlborough is an affirmative action/equal opportunity employer and encourages participation from certified minority and women-owned business. All qualified contractors will receive consideration without regard to race, age, color, religious creed, gender, handicap, sexual orientation, veteran's status or national origin. The City of Marlborough, as the Awarding Authority, reserves the right to reject any and all bids or parts thereof, waive any informality in any or all bids and to omit any item or items deemed advisable, if it is deemed to be in the best interest of the public to do so.

CITY OF MARLBOROUGH
DEPT. OF PUBLIC WORKS
BY: Evan Pilachowski, P.E.
City Engineer

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SECTION 00300
BID FORM
CITY OF MARLBOROUGH, MASSACHUSETTS
WARD PARK

The undersigned declares that the only persons or parties interested in this Bid as principals are as stated; that the Bid is made without any collusion with other persons, firms, or corporations; that all the Contract Documents as prepared by CDM Smith, 50 Hampshire Street, Cambridge, MA 02139, dated August 2014 have been carefully examined; that the undersigned is fully informed in regard to all conditions pertaining to the Work and the place where it is to be done, and from them the undersigned makes this Bid. These prices shall cover all expenses incurred in performing the Work required under the Contract Documents, of which this Bid Form is a part.

The Low Bidder will be determined based on the total of Part I-Base Bid Prices and any Part II-Add Alternate Prices that are added at the option of the Owner.

If a Notice of Award accompanied by at least six unsigned copies of the Agreement and all other applicable Contract Documents is delivered to the undersigned within ten days, excluding Saturdays, Sundays, and legal holidays, of the actual date of the opening of the Bids, the undersigned will within five days, excluding Saturdays, Sundays, and legal holidays, after the date of receipt of such notification, execute and return all copies of the Agreement and all other applicable Contract Documents to OWNER. The premiums for all Bonds required shall be paid by CONTRACTOR and shall be included in the Contract Price. The undersigned Bidder further agrees that the Bid Security accompanying this Bid shall become the property of OWNER if the Bidder fails to execute the Agreement as stated above.

The Bid Security in the amount of 5% of the Base Bid shall be included with the Bid.

The undersigned hereby agrees that the Contract Time shall commence no later than **September 15, 2014,** unless extended in writing by the City's Contract Manager, and to fully complete the project for use by the owner by **May 29, 2015,** unless extended in writing by the City's Contract Manager, from contract authorization and in accordance with the terms as stated in the Agreement.

The undersigned further agrees to pay OWNER, as liquidated damages, $500.00 per day for each calendar day beyond the date for completion of project completion or the Contract Time Limit or extension thereof that the Work remains incomplete, in accordance with the terms of the Agreement.

The undersigned acknowledges receipt of addenda numbered:

_____

In accordance with the above understanding, the undersigned proposes to perform the Work, furnish all materials and complete the Work in its entirety in the manner and under the conditions required at the prices listed as follows:

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SECTION 00300
BID FORM
CITY OF MARLBOROUGH, MASSACHUSETTS
WARD PARK

PART I - BASE BID:

Item No.	Estimated Quantity	Brief Description of Items with Price in Words
Bid item # 1	L.S.	All work required to construct the Ward Park Improvements including all work required for site preparation and removals including removals and disposals or grinding of existing bituminous concrete pavements, removals of stone retaining walls and concrete foundations, chain link fences, and other miscellaneous items; clearing and grubbing; furnishing and installing and maintenance of erosion controls; rough and fine grading of all areas identified within the limit of work; installing new sub drainage and loaming and seeding new athletic field including furnishing and installing a new field irrigation system for the athletic field; preparation of the base and furnishing and installing new bituminous concrete pavement including, granite curbing and pavement markings and including pavement in the area shown on the plan for the new rest room/ concession building; furnishing and installing new chain link fencing and gates; installation of a new basketball court, new tennis court, new volley ball court and new skateboard area; furnishing and installing new play area; furnishing and installing picnic tables and waste containers furnishing and installing all site utility work; new electrical service and lighting system described as "BaseBid" on Sheet E-4; furnishing and installing loam and seed in the area on the plan identified as the horseshoe/ bocce court area; preparation of the base and furnishing and installing new bituminous concrete pavement in the area of the concrete pavers shown at the north entrance of the park; and other miscellaneous work to provide all improvements as described in the contract documents; and other miscellaneous work to provide all improvements as described in the contract documents, with the exception of items priced separately under ADD ALTERNATE pricing below.

$ _____
Lump Sum (Amount in Words)

$ _____
Lump Sum (Amount in Figures)

Bid item # 2a 40 cu. yds. Rock and boulder excavation as specified in 02200.

Eighty dollars per cubic yard _____
Unit Price/Total Price (Amount in Words)

$ 80.00/ cubic yard/ $3,200.00 total _____
Unit Price/Total Price (Amount in Figures)

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Bid item # 2b 40 cu. yds.	Additional payment for rock and boulder excavation over the established price.

_____
Unit Price/Total Price (Amount in Words)

_____
Unit Price/Total Price (Amount in Figures)

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SECTION 00300
BID FORM
CITY OF MARLBOROUGH, MASSACHUSETTS
WARD PARK

PART II – ADD ALTERNATE PRICES:

The Bidder is required to provide a bid for each Add Alternate listed below. In certain cases, the Alternate(s) presented below require that items described in Part I - BASE BID be replaced with the Alternate(s) described herein. In such cases, the Contractor shall base his/her Bid for the Alternate(s) in excess of the amount stated in Part I - BASE BID.

The Owner, at its option, may select Alternates in the order listed, or none of the Alternates. The Owner reserves the right to select the low bid from the Total Cost of Bid Items # 1 through Item # X, or the Total Cost of Bid Items # 1 through Item # X with the Lump Sum for each Add Alternate selected at the option of the Owner according to Part II Add Alternate Prices (e.g. Total Base Bid with Alternate A-1, or Total Base Bid with Alternates A-1 and A-2, or Total Base Bid with Alternates A-1, A-2 and A-3, etc.)

Item No.	Estimated Quantity	Brief Description of Items with Price in Words
A-1	1 L.S.	Furnish and install the Bocce Court and Horseshoe pit area, complete and in place. Add Alternate price includes deletion of loaming and seeding included in the base bid above, and includes all courts, bituminous concrete pavement, fencing, granite curbing, benches, landscaping, and other miscellaneous work to provide these improvements as described in the contract

$ _____
Lump Sum (Amount in Words)

$ _____
Lump Sum (Amount in Figures)

A-2	1 L.S.	Furnish and install the concrete pavers at north park entrance of the park. Add Alternate price includes deletion of bituminous concrete pavement and subbase included in the base bid above, and all subbbase materials, granite edging, concrete pavers, landscaping, and other miscellaneous work to provide these improvements as described in the contract documents,

$ _____
Lump Sum (Amount in Words)

$ _____
Lump Sum (Amount in Figures)

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A-3 1 L.S. Furnish and install the landscape irrigation system as defined by the limits of irrigation on the planting plan, and other miscellaneous work to provide these improvements as described in the contract documents.

$ _____
Lump Sum (Amount in Words)

$ _____
Lump Sum (Amount in Figures)

A-4 1 L.S. Furnish and install the Field Lighting System as described as "A3" on sheet E-4, and other miscellaneous work to provide these improvements as described in the contract documents.

$ _____
Lump Sum (Amount in Words)

A-5 1 L.S. Furnish and install the Parking Lot and Walkway Lighting as described as "A4" on sheet E-4, and other miscellaneous work to provide these improvements as described in the contract documents.

$ _____
Lump Sum (Amount in Words)

$ _____
Lump Sum (Amount in Figures)

A-6 1 L.S. Furnish and install the pre-manufactured concrete rest room/ concession facility, complete and in place as specified, including foundation system, including connection to water and sewer utility connections, electrical system as described as "A2" on sheet E-4; and other miscellaneous work to provide these improvements as described in the contract documents.

$ _____
Lump Sum (Amount in Words)

$ _____
Lump Sum (Amount in Figures)

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SECTION 00300
BID FORM
CITY OF MARLBOROUGH, MASSACHUSETTS
WARD PARK

PART III - SUPPLEMENTAL UNIT PRICES

Should certain additional work be required, or should the quantities of certain classes of work be increased or decreased from those on which the Contract Sum is based, by order or approval of the Owner, the undersigned agrees that the following supplemental unit prices may be used as the basis of payment to him/her or credit to the Owner for such addition, increase, or decrease in the work as determined solely by the Owner.
Supplemental unit prices shall cover all costs, complete in place, and the prices given shall represent the exact amount per unit to be paid to the Contractor (in the case of additions or increases) or to be deducted from payments to the Contractor (in the case of deductions or decreases). No additional adjustments will be allowed for overhead, profit, insurance or other direct or indirect expenses of the Contractor or Subcontractor beyond the prices as listed.

Section No.	Unit	Price (Add or Deduct)
02575	Furnish and install bituminous concrete pathway pavement with stone base complete and in place.	$_____/sy
02575	Furnish and install 6x18 granite curb complete and in place.	$_____/lf
02830	Furnish and install 10' high chain link fence as specified, complete and in place.	$_____/lf
02830	Furnish and install 8' high chain link fence as specified, complete and in place.	$_____/lf
02830	Furnish and install 6' high chain link fence as specified, complete and in place.	$_____/lf
02830	Furnish and install 4' high chain link fence as specified, complete and in place.	$_____/lf
02900	Furnish and install 2 ½ cal shade tree complete and in place.	$_____/ea

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The Owner reserves the right to reject any or all supplemental unit prices. The undersigned agrees that extra work, if any, will be performed in accordance with Article 10 of the Conditions of the Contract and will be paid for in accordance with Article 11 of the Conditions of the Contract.

The bidding and award of this Contract will be in accordance with M.G.L. Chapter 30, Section 39M.

The undersigned must furnish a 100 percent Construction Performance Bond and a 100 percent Construction Payment Bond with a surety company acceptable to OWNER.

Amounts shall be shown in both words and figures, where indicated. In case of discrepancy, the amount shown in words will govern.

The above prices shall include all labor, materials, removal, overhead, profit, insurance and incidentals required to complete the Work as specified herein.

The names and residences of all persons and parties interested in the foregoing Bid as principals are as follows:

(Give first and last names in full. In the case of a corporation, see Article 8.3 of the Instructions to Bidders, in the case of a partnership; see Article 8.4 of the Instructions to Bidders.)

_____

_____

_____

_____

Pursuant to Chapter 62C, Section 49A of the Massachusetts General Laws, I _____,

whose principal place of business is at _____ do hereby certify under penalties of perjury that I have complied with all state laws pertaining to reporting of all employees and contractors and withholding and remitting child support and I have filed all state tax returns and paid all taxes required under law.

Signed under the penalties of perjury the _____ day of _____, 20XX.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.

The undersigned hereby certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this section, the word "person" shall mean any natural person, joint venture, partnership, corporation, or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of

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Section Twenty-nine F of Chapter Twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or requisition promulgated hereunder.

_____	_____
Social Security Number or Federal Identification Number	Signature of Individual or Corporate Name

By: _____
Corporate Officer (if applicable)

Notice of acceptance should be mailed, telegraphed, or delivered to the following:

_____
(Name)

By: _____
(Title)

_____
(Business Address)

_____
(City and State)

Date _____

Note: If the Bidder is a corporation, indicate State of incorporation under signature, and affix corporate seal; if a partnership, give full names and residential addresses, if different from business address.

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SECTION 00300
BID FORM
CITY OF MARLBOROUGH, MASSACHUSETTS
WARD PARK

1. Minimum qualifications of general contractor:

List a minimum of five similar municipal park projects completed by the General Contractor**.**

Project	Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

2. Provide five (5) references for similar projects by the General Contractor:

Project	Completion Date	Contact Name	Phone
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

3. Has any project, with which your firm was associated, been completed late, or beyond the originally project completion date? If so, please identify that project and explain. Attach additional information if necessary.

_____

_____

4. Please provide evidence of company size and of financial stability. This information may be submitted in a separate, sealed envelope, clearly marked "Company Information: Bid for CITY OF MARLBOROUGH – WARD PARK." It is understood that such material will be kept strictly confidential. Provide financial references such as banks or concerns from which substantial quantities of material have been purchased, including the contact for each reference.

5. List all current projects which your firm is currently under contract to perform and associated project schedules. Attach list hereto.

6. What is the total value of the largest single contract which your company has entered into?

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7. Has the **General Contractor** ever declared bankruptcy? _____If yes, please provide additional information hereto.

8. Has the **General Contractor** ever been sued or is company currently under legal action for previous work? _____If yes, please provide additional information hereto.

CITY OF MARLBOROUGH, MASSACHUSETTS
WARD PARK

AGREEMENT

THIS AGREEMENT made as of the _____ day of _____ in the year 2014 by and between the City of Marlborough, Massachusetts, hereinafter called OWNER and
_____
with legal address and principal place of business at _____
_____ hereinafter called CONTRACTOR. OWNER and CONTRACTOR in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1. WORK.

1.1 CONTRACTOR shall perform the Work as specified or indicated in the Contract Documents. The Work is as described in Section 01010.

ARTICLE 2. ENGINEER.

2.1 The Project has been designed by CDM Smith Inc.,50 Hampshire St., Cambridge, MA 02139 who will act as ENGINEER in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE 3. CONTRACT TIME.

3.1 The Contract Time shall commence **September 15, 2014**, unless extended by the City and the completion of the project shall be for use by the OWNER by **May 29, 2015**.

3.2 CONTRACTOR agrees that the Work shall be prosecuted regularly, diligently and uninterruptedly and at such rate of progress as will insure full completion thereof within the Contract Time stated above. It is expressly understood and agreed, by and between CONTRACTOR and OWNER that the Contract Time is reasonable for the completion of the Work, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

ARTICLE 4. CONTRACT PRICE.

4.1 OWNER will pay CONTRACTOR for performance of the Work in accordance with the Contract Documents in current funds at the lump sum agreed upon in the CONTRACTOR's Bid Form attached to this Agreement.

ARTICLE 5. APPLICATIONS FOR PAYMENT

5.1 CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the Conditions of the Contract. Applications for Payment will be processed by ENGINEER as provided in the Conditions of the Contract.

ARTICLE 6. PROGRESS AND FINAL PAYMENTS

6.1 OWNER will make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER, monthly during construction as provided below. All progress payments will be on the basis of the progress of the Work measured by the schedule of values provided for in Paragraph 14.01 of the Conditions of the Contract.

6.2 OWNER will make progress and final payments as provided in Article 14 of the Conditions of the Contract and in accordance with the applicable Massachusetts General Law.

ARTICLE 7. LIQUIDATED DAMAGES

7.1 OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the Contract Time specified in Article 3 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay OWNER $500 per day for each calendar day of delay until the Work is complete.

7.2 Provided, that CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the Work is for reasons included in Paragraph 12.03 of the General Conditions.

7.3 Provided, further, that CONTRACTOR shall, furnish OWNER the required notification of such delays in accordance with Paragraph 12.02 of the General Conditions.

ARTICLE 8. ASSURANCE

8.1 CONTRACTOR has familiarized himself with the nature and extent of the Contract Documents, Work, locality, and with all local conditions and Federal, State and local laws, ordinances, rules and regulations that in any manner may affect cost, progress or performance of the Work.

8.2 CONTRACTOR has studied carefully all reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work which were relied upon by ENGINEER in the preparation of the Drawings and Specifications and which have been identified in Article 4 of the Supplementary Conditions.

8.3 CONTRACTOR has made or caused to be made examinations, investigations and tests and studies of such reports and related data [in addition to those referred to in the above paragraph] as CONTRACTOR deems necessary for the performance of the Work at the Contract Price within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations, tests, reports or similar data are or will be required for such purposes.

8.4 CONTRACTOR has correlated the results of all such observations, examinations, investigations, tests, reports and data with the terms and conditions of the Contract Documents.

8.5 CONTRACTOR has given ENGINEER written notice of any conflict, error or discrepancy that CONTRACTOR has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

8.6 CONTRACTOR agrees that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

ARTICLE 9. CONTRACT DOCUMENTS.

9.1 The Contract Documents which comprise the Contract between OWNER and CONTRACTOR are attached hereto and made a part hereof and consist of the following:

9.1.1 Invitation To Bid.

9.1.2 Instructions To Bidders.

9.1.3 Bid Form.

9.1.4 This Agreement.

9.1.5 Performance Bond, EJCDC Document C-610, 2007 edition, Payment Bond, EJCDC Document C-615(A), 2008 edition, and other required Bonds.

9.1.6 General Conditions, EJCDC Document No. C-700, 2007 edition.

9.1.7 Supplementary Conditions Parts I and II.

9.1.8 Specifications (as listed in Table of Contents).

9.1.9 Drawings, numbered 1438-79088 through 1438-80014, inclusive and dated August 2014.

9.1.10 Addenda numbers _____ to _____, inclusive.

9.1.11 Any modification, including Change Orders, duly delivered after execution of Agreement.

ARTICLE 10. MISCELLANEOUS

10.1 Terms used in this Agreement which are defined in Article 1 of the Conditions of the Contract shall have the meanings assigned in the Conditions of the Contract.

10.2 Neither OWNER nor CONTRACTOR shall, without the prior written consent of the other, assign or sublet in whole or in part any interest under any of the Contract Documents; and, specifically but without limitation, CONTRACTOR shall not assign any monies due or to become due without the prior written consent of OWNER. In case CONTRACTOR assigns all or any part of any monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to CONTRACTOR shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for the performance of the Work called for in this Contract.

10.3 OWNER and CONTRACTOR each binds himself, his partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

10.4 The Contract Documents constitute the entire agreement between OWNER and CONTRACTOR and may only be altered, amended or repealed by a Modification.

IN WITNESS WHEREOF, the Contractor and the City have caused this instrument to be executed under seal on the day and year first above written.

FOR THE CONTRACTOR
BY:

_____

By: _____
Title: _____
Date: _____

[This name for the contractor must match the name on the Certificate of Vote form, if corporation.]

ATTEST:

_____

By: _____
Title: _____

FOR THE CITY OF MARLBOROUGH
BY:

_____

By: Arthur G. Vigeant
Title: Mayor
Date: _____

ATTEST:

_____

By: Lisa M. Thomas /Steven W. Kerrigan
Title: City Clerk/Asst. City Clerk

DEPARTMENT HEAD:

_____

By: John L. Ghiloni
Title: Commissioner of Public Works

CERTIFICATION PURSUANT TO CHAPTER 44, § 31C AS TO SUFFICIENCY OF FUNDS AND AUTHORIZATION FOR MAYOR TO EXECUTE CONTRACT:

_____

By: Diane Smith
Title: City Auditor
Purchase Req./P.O.#:_____

APPROVED AS TO FORM BY LEGAL COUNSEL:

_____

Donald V. Rider, Jr.
Title: City Solicitor
OR

_____

Cynthia Panagore Griffin
Title: Assistant City Solicitor

CERTIFICATION AS TO PROCUREMENT LAW:

_____

By: Beverly J. Sleeper, MCPPO
Title: Chief Procurement Officer
Or Designated Procurement Officer

_____

Procurement Law: _____
Contract/File #:_____

CERTIFICATE OF VOTE OF AUTHORIZATION

I,_____ , Clerk of _____hereby certify that, at a

meeting of the Board of Directors of said Corporation duly held on _____ which date is earlier than the contract to which this certificate is incorporated by reference, at which a quorum was present and voting throughout, the following vote was duly passed and is now in full force and effect:

"Voted: That _____ be and hereby is authorized, directed and (Name of Officer authorized to sign for Corporation)
empowered for, in the name of and on behalf of this corporation, to sign, seal with the corporate seal, execute, acknowledge and deliver other obligations of this Corporation; the execution of any such contract, bond or obligation

by such (Name of Officer) _____ to be valid and binding upon this Corporation for all purposes, and that a certificate of the Clerk of this Corporation setting forth this vote shall be delivered to the Awarding Authority; and that this vote shall remain in full force and effect unless and until the same has been altered, amended or revoked by a subsequent vote of such directors and a certificate of such later vote attested by the Clerk of this Corporation is delivered to the Awarding Authority."

I, further certify that (NAME OF OFFICER)_____

is the duly-elected (TITLE) _____ of said corporation.

►**Signed:**_____
CLERK-SECRETARY

Place of Business:_____

Date of Contract:_____

AFFIX CORPORATE SEAL

►**Countersignature:**_____
(Name and Title of Officer)

In the event that the Clerk or Secretary is the same person as the Officer authorized to sign that contract or other instrument for the Corporation, this Certificate must be counter signed by another officer of the Corporation.

REQUIRED FOR CONTRACTS WITH A VALUE OF $100,000 OR MORE

SAMPLE

TO BE SUBMITTED ON CONTRACTOR'S LETTERHEAD

SAMPLE LETTER FROM CONTRACTOR REGARDING ACCOUNTING CONTROLS

DATE:

City of Marlborough – Department of Public Works
Evan Pilachowski., P.E., City Engineer
135 Neil Street
Marlborough MA 01752

RE: Contract ED 2013-12

Dear Mr. Pilachowski,

This letter is being submitted pursuant to M.G.L. Ch. 30 §39R(c). Please be advised that our firm has a system of internal accounting controls which assure that:

(1) transactions are executed in accordance with management's general and specific authorization

(2) transactions are recorded as necessary, to permit preparation of financial statements in conformity with generally accepted accounting principles, and to maintain accountability for assets

(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.

Sincerely,

(General Contractor)
REQUIRED FOR CONTRACTS WITH A VALUE OF $100,000 OR MORE

SAMPLE

TO BE SUBMITTED ON C.P.A.'S LETTERHEAD

SAMPLE LETTER FROM CPA REGARDING CONTRACTOR ACCOUNTING CONTROLS

DATE:

City of Marlborough – Department of Public Works
Evan Pilachowski., P.E., City Engineer
135 Neil Street
Marlborough MA 01752

RE: Contract ED 2013-12

Dear Mr. Pilachowski,

Please be advised that we have reviewed the Statement of Internal Accounting Controls prepared by the general contractor, NAME OF GENERAL CONTRACTOR, in connection with the above-captioned project. This statement is required under M.G.L. Ch. 30, § 39R. In our opinion, representations of management are consistent with our evolutions of the system of internal accounting controls. In addition, we believe that they are reasonable with respect to transactions as assets in the amount which would be material when measured in relation to the firm's financial statements.

Sincerely,

(C.P.A.)

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

CONTRACT
Effective Date of Agreement:
Amount:
Description (*Name and Location*):

BOND
Bond Number:
Date (*Not earlier than Effective Date of Agreement*):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

_____ (Seal)
Contractor's Name and Corporate Seal

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature (Attach Power of Attorney)

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

CONTRACT
Effective Date of Agreement:
Amount:
Description *(Name and Location)*:

BOND
Bond Number:
Date (*Not earlier than Effective Date of Agreement*):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

_____ (Seal)
Contractor's Name and Corporate Seal

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature (Attach Power of Attorney)

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by

AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by

CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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STANDARD GENERAL CONDITIONS OF THE
CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*—The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*—See Paragraph 11.01 for definition.

17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be

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performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *Engineer*—The individual or entity named as such in the Agreement.

20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*—Sections of Division 1 of the Specifications.

22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.

23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*—Polychlorinated biphenyls.

31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.

37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work

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and which establish the standards by which such portion of the Work will be judged.

38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.

46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.

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

48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

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

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

51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its

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effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

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

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional

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insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

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

2.04 *Starting the Work*

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

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a

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workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation , (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

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1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

   a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or

   b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

   1. A Field Order;

   2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

   3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

   1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or

   2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to

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use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

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

1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

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C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

   a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

   b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

   a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

   b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

   c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

   1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and

   2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

      a. reviewing and checking all such information and data;

      b. locating all Underground Facilities shown or indicated in the Contract Documents;

      c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

      d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

   1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the

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extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action,

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if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by

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an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.

E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

   a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

   b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

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B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

6. include completed operations coverage:

a. Such insurance shall remain in effect for two years after final payment.

b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.

3. include expenses incurred in the repair or replacement of any insured property

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(including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

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B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

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ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

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

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be

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submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

    a. in the exercise of reasonable judgment Engineer determines that:

        1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

        2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and

        3) it has a proven record of performance and availability of responsive service.

    b. Contractor certifies that, if approved and incorporated into the Work:

        1) there will be no increase in cost to the Owner or increase in Contract Times; and

        2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

    a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

    b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

    c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

    d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

        1) shall certify that the proposed substitute item will:

            a) perform adequately the functions and achieve the results called for by the general design,

            b) be similar in substance to that specified, and

            c) be suited to the same use as that specified;

        2) will state:

            a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,

            b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

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c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services; and

4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement,

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shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses,

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and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

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

6.11 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

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B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

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

6.12 *Record Documents*

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

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or

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entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

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

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials offered with respect to the

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indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other

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individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or

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certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

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B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.

C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

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

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

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ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

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

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a

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delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

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

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

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

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

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

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9.10 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

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

10.05 *Claims*

A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional

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or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part;

2. approve the Claim; or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from

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subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

   a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

   b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

   c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

   d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

   e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

   f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

   g. The cost of utilities, fuel, and sanitary facilities at the Site.

   h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.

   i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

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

   1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for

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general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances:*

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

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C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

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f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

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

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13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop

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the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to

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Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to

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protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

   a. to supervise, direct, or control the Work, or

   b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

   c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

   d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

   e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the

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representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

c. there are other items entitling Owner to a set-off against the amount recommended; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to

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make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

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

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14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;

   b. consent of the surety, if any, to final payment;

   c. a list of all Claims against Owner that Contractor believes are unsettled; and

   d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and

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accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's repeated disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

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D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

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B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. agrees with the other party to submit the Claim to another dispute resolution process; or

3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

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

17.03 *Cumulative Remedies*

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

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

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

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SUPPLEMENTARY CONDITIONS

PART I - AMENDMENTS TO GENERAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC Document No. C-700, 2007 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

SC-1.01A.42.

Delete paragraph 1.01A.42. of the General Conditions in its entirety and replace with the following:

42. Specifications - Sections included under Division 1 through Division 16 of the Project Manual.

SC-1.01A.45.

Insert the following at the beginning of the definition before the words “The time at…...”

The Work required by the Contract has been completed except for work having a Contract Price of less than one per cent of the then adjusted total contract price, or

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.01.A

Delete and replace with “When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds, insurance certificates, insurance endorsements, and other documents as Contractor may be required to furnish under the Contract Documents.”

SC-2.01B.

Delete paragraph 2.01B. of the General Conditions in its entirety and replace with the following:

B. Before any Work at the site is started, Contractor shall deliver to Owner, with copies to Engineer and each additional insured identified in Article 5 of the Supplementary Conditions, certificates of insurance (and other evidence requested by Owner) which Contractor is required to purchase and maintain in accordance with the requirements of Article 5.

SC-2.03A.

Delete paragraph 2.03A of the General Conditions in its entirety and replace with the following:

A. The Contract Time will commence to run on the twentieth day following the Effective Date of the Agreement.

SC-2.05A

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Delete and replace with “Within ten (10) days after the effective date of the agreement (unless otherwise specified in the General Requirements) before starting any work at the site, Contractor shall submit to Engineer for review.”

SC-2.05A.3

Add to end of paragraph “The total of the schedule of values prepared for the Work, as required by the General Conditions, shall not exceed the Bid submitted for the Work, unless such amount is adjusted as provided in the Contract Documents.”

SC-2.07.A

Add to last sentence “and Owner.”

SC-207.A.4

Add “4. The Construction/Progress Schedule shall be prepared as provided in Paragraph 6.04.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

SC-3.01C.

Add the following new paragraph immediately after Paragraph 3.01C. of the General Conditions which is to read as follows:

D. Each and every provision of law and clause required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be physically amended to make such insertion.

Add SC - 3.02A.3

“Supplemental Specifications: Refer in precedent order to the Supplementary General Conditions and the General Conditions as contained in these Contract Documents.”

Add SC - 3.02A.4

“Work under these Contract Documents shall be governed by all applicable federal, state, and local laws, regulations, codes and ordinances, and the Contract Documents which are as follows: General Conditions, Supplementary General Conditions, Addenda, Bid Proposal, Contract Documents, and Technical Specifications.”

Add SC -3.02A.5

“Should the Contract Documents conflict with any of the regulations and standards mentioned in the preceding paragraphs of these Supplementary General Conditions, the regulations and standards shall take precedence. This shall not, however, be construed to relieve the Contractor from complying with the requirements of the Contract Documents which are in excess of, but not contrary to, the regulations and standards.

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Add SC -.3.03A.5

"4. In addition to its obligations under the Instructions to Bidders, if Contractor proceeds with work that Contractor had actual knowledge or should have known that a conflict, error, ambiguity, or discrepancy existed as indicated above, correction of work constructed without such notification to Engineer shall be at Contractor's expense, (except in an emergency as authorized by Paragraph 6.16.A.).

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

SC-4.01A.

Add the following new paragraph immediately after paragraph 4.01A. of the General Conditions which is to read as follows:

1. If all lands and rights-of-way are not obtained as herein contemplated before construction begins, Contractor shall begin the Work upon such land and rights-of-way as Owner has previously acquired.

SC-4.02A.1.

Delete 4.02 A.1 of the General Conditions in its entirety and replace it with the following:

1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents. Engineer has relied upon the data obtained from subsurface investigations made at the site in the form of test borings. Such data is in the form of boring logs which are included in the Appendix to the Project Manual and soil samples which may be examined upon request during regular business hours. The locations of the test borings are indicated on the Drawings. Such logs and samples are not part of the Contract Documents; and

SC-4.02A.2.

Add the following new paragraph immediately after paragraph 4.02A.2 of the General Conditions which is to read as follows:

a. In the preparation of Drawings and Specifications, the Engineer has relied upon the following reports and tests of subsurface physical conditions at the site. Copies of these reports are included in the appendix to the Project Manual. Soil samples may be examined upon request during regular business hours. Such reports are not part of the Contract Documents.

b. Geotechnical Recommendations

c. If the Contractor believes that there has been delay in Owner's furnishing these permits, lands, rights-of-way or easements, Contractor's sole remedy shall be an extension of contract time, for which the Contractor may make a claim therefore as provided in 10.05."

SC-4.03C.3.

Add the following new paragraph immediately after paragraph 4.03C.3. of the General Conditions which is to read as follows:

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D. Adjustments resulting from subsurface or latent physical conditions will be in accordance with Massachusetts General Law Chapter 30, Section 39N included in PART II of the Supplementary Conditions.

SC-4.05A.

Add the following new paragraph immediately after paragraph 4.05A of the General Conditions which is to read as follows:

B. Engineer may check the lines, elevations, reference marks, batter boards, etc., set by Contractor, and Contractor shall correct any errors disclosed by such check. Such a check shall not be considered as approval of Contractor's work and shall not relieve Contractor of the responsibility for accurate construction of the entire Work. Contractor shall furnish personnel to assist Engineer in checking lines and grades.

ARTICLE 5 - BONDS AND INSURANCE

SC-5.01A.

Delete the third sentence in paragraph 5.01A of the General Conditions and replace with the following.

Contractor shall also furnish Efficiency Guarantee Bonds in accordance with Article entitled MANUFACTURER'S EXPERIENCE in the Instructions to Bidders and executed on forms approved by the Owner.

SC-5.03E

Add 2 new paragraphs immediately after paragraph 5.03E of the General Conditions which are to read as follows:

F. Contractor shall provide evidence of its insurance coverage on the ACORD certificate of insurance form and shall include the following statement in its entirety in the section of the form entitled “Description of Operations/Locations/Vehicles/Special Items”.

The City of Marlborough, Massachusetts and CDM Smith Inc., and their officers, directors, partners, employees and other consultants and subcontractors are named as additional insureds with respect to the insured’s Commercial General Liability and Automobile Liability Insurance Policies. All insurers waive all rights of subrogation against the City of Marlborough, Massachusetts and CDM Smith Inc., their officers, directors, partners, employees and other consultants and subcontractors. All insurance is primary for all claims covered thereby. Commercial General Liability Insurance includes contractual liability coverage.

SC-5.03F.

Add the new paragraph immediately after paragraph 5.03F of the General Conditions which are to be read as follows:

G. Full disclosure of any non-standard exclusion is required for all required coverages. Any exclusion added by endorsement and/or special provisions must be clearly identified on the Certificate of Insurance provided to City. Coverage shall be for the full insurable value (completed value) of the portion of the building under construction.

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SC-5.04A.

The limits of liability for the insurance required by paragraph 5.04A. of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law:

5.04.A.1 and 5.04.A.2 Workers' Compensation

(1)	Worker's Compensation	in accordance with M.G.L. c.149, Sect. 34A.
(2)	Employer's Liability	$500,000 each accident $500,000 disease per employee

5.04A.3., 5.04A.4., and 5.04A.5. Commercial General Liability including Bodily injury (including death and personal injury), Premise/Operations; Explosion, Collapse and Underground Property Damage; Products/Completed Operations, Broad Form Contractual, Independent Contractors; Broad Form Property Damage; and Personal/Advertising Injury with Employment Exclusion deleted:

(1)	Bodily Injury:	$1,000,000 $3,000,000	Each Occurrence Annual Aggregate
(2)	Property Damage:	$1,000,000 $3,000,000	Each Occurrence Annual Aggregate
(3)	Personal Injury:	$3,000,000	Annual Aggregate

5.04A.6. Comprehensive Automobile Liability covering all owned (private and others), non-owned, and hired vehicles used in connection with the Work: Bodily injury (including death and personal injury) and property damage with a combined single limit of $1,000,000 per person and $1,000,000 each accident.

(1)	Bodily Injury	$1,000,000 $1,000,000	Each Person Each Accident
(2)	Property Damage	$1,000,000	Each Occurrence

SC 5.04B.1.

Delete paragraph 5.04B.1. of the General Conditions in its entirety and replace with the following:

1. The insurance required by paragraph 5.04A.3 through 5.04A.6 inclusive will provide primary coverage for all claims covered thereby. With respect to insurance required by Paragraph 5.04.A.6 include as additional insured Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds

SC-5.04B.6.

Add two new paragraphs immediately after paragraph 5.04.B.6.b. of the General Conditions which is to read as follows:

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7. Contractor may purchase and maintain excess liability insurance in the umbrella form in order to satisfy the minimum amounts required for the insurance to be purchased and maintained in accordance with paragraph 5.04. Evidence of such excess liability insurance shall be delivered to Owner in accordance with paragraph 2.01B. in the form of a certificate indicating the policy numbers and minimum coverage amounts of all underlying insurance. The umbrella liability insurance shall have a combined single limit of not less than $5,000,000.00.

8. All polices required by this paragraph 5.04 shall contain provisions to the effect that the insurer(s) waive all right of subrogation against the Owner, Engineer and their officers, directors, partners, employees and other consultants and subcontractors of each and any of them.

SC-5.05A.

Delete paragraph 5.05A. of the General Conditions in its entirety and replace with the following:

A. Contractor shall purchase and maintain a separate Owner's Protective Liability policy, issued to Owner at the expense of Contractor, including Owner and Engineer as named insured. This insurance shall provide coverage for not less than the following amounts:

5.05A.1.	Bodily Injury	$1,000,000	Each Occurrence
5.05A.2.	Property Damage	$1,000,000	Each Occurrence
		$3,000,000	Annual Aggregate

SC-5.05A

Add the following new paragraph immediately after paragraph 5.05.A.2 of the General Conditions which is to read as follows:

B. All polices required by this paragraph 5.05 shall contain provisions to the effect that the insurer(s) waive all rights of subrogation against the Owner, Engineer and their officers, directors, partners, employees and other consultants and subcontractors of each and any of them.

SC-5.06A.

Delete the first sentence of Paragraph 5.06A. of the General Conditions and replace with the following:

Contractor shall purchase and maintain property insurance upon the Work at the site, written on the completed value form, in an amount equal to the total bid price for the completed construction.

SC-5.06A.7.

Delete Sub-Paragraph 5.06A.7. in its entirety and replace it with the following:

7. be maintained in effect from commencement of the project until the Certificate of Substantial Completion is issued unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued. The Contractor’s insurer shall provide 45 days prior written notice of cancellation or termination of such insurance to the certificate holder:

City of Marlborough

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Attn: Chief Procurement Officer
140 Main Street
Marlborough, MA 01752

SC-5.06B.

Delete paragraph 5.06B. of the General Conditions in its entirety.

SC-5.06C.

Delete Paragraph 5.06C. of the General Conditions in its entirety and replace with the following:

C. All the policies of insurance (or the certificates or other evidence thereof) required to be purchased and maintained by Contractor in accordance with paragraph 5.06A. (1) shall contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least thirty days' prior written notice has been given to Owner, Engineer and each other loss payee by certified mail, (2) shall contain provisions to the effect that the insurer(s) waiver all rights of subrogation against the Owner, Engineer and their officers, directors, partners, employees and other consultants and subcontractors of each and any of them.

SC-5.06E

Delete Paragraph 5.06E of the General Conditions in its entirety.

SC-5.07A.

Delete paragraph 5.07A. of the General Conditions in its entirety and replace with the following.

A. The Contractor’s insurance is primary. All insurance policies provided by the Contractor shall contain provisions to the effect that the insurer waives all rights of subrogation against any of the insured, loss payee, (and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them) Owner and the Engineer.

SC-5.07B.

Delete paragraph 5.07B of the General Conditions in its entirety and replace it with the following. Sub-Paragraphs 5.07B.1. & 5.07B.2. shall remain.

B. Owner waives all rights against Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors for:

SC-5.07C.

Delete paragraph 5.07C of the General Conditions in its entirety and replace it with the following.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Engineer, and its officers, directors, members, partners, employees, agents, consultants and subcontractors.

SC-5.07D.

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Add the following new paragraph immediately after paragraph 5.07C. of the General Conditions which is to read as follows:

D. Waiver of Subrogation: The City of Marlborough will not approve or sign any contract that contains waiver of subrogation language within the contract documents unless the waiver of subrogation is in favor of the City of Marlborough as the owner, including but not limited to, the General Conditions, Supplementary Conditions or in a Contract Addendum.

SC-5.08A.

Delete paragraph 5.08A. of the General Conditions in its entirety.

SC-5.08B.

Delete paragraph 5.08B. of the General Conditions in its entirety.

SC-5.09A.

Delete paragraph 5.09A. of the General Conditions in its entirety and replace with the following:

A. If Owner has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by Contractor in accordance with this Article 5 on the basis of its not complying with the Contract Documents, Owner will notify Contractor in writing thereof within ten days of the date of delivery of such certificates to Owner in accordance with paragraph 2.01. Contractor will provide such additional information in respect of insurance provided by Contractor as Owner may reasonably request.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

SC-6.20A

Insert the words after “performance of the Work” “or any breach of the Contractor’s obligations under the Contract,”

Add SC 6.20A.3

The existence of insurance shall in no way limit the scope of this indemnification.

SC-6.02B.

Add the following new paragraphs immediately after paragraph 6.02B. of the General Conditions which are to read as follows:

C. This Agreement is subject to the applicable provisions of the Contract Work Hours and Safety Standards Act, Public Law 87-581, 87th Congress. No Contractor or Subcontractor contracting for any part of the Work shall require or permit any laborer or mechanic to be employed on the Work in excess of forty hours in any work week unless such laborer or mechanic receives compensation at a rate not less than one and one-half times that person's basic rate of pay for all hours worked in excess of forty hours in such work week.

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D. Contractor shall employ only competent persons to do the work and whenever Owner shall notify Contractor, in writing, that any person on the Work appears to be incompetent, disorderly, or otherwise unsatisfactory, such person shall be removed from the Project and shall not again be employed on it except with the consent of Owner.

E. Contractor and Subcontractors shall, insofar as practicable, give preference in the hiring of workers for the Project to qualified local residents with first preference being given to citizens of the United States who have served in the armed forces of the United States and have been honorably discharged therefrom or released from active duty therein.

F. Contractor and all Subcontractors shall pay to all laborers and mechanics employed for the construction covered by this Contract the minimum rates of pay as determined by the Secretary of Labor in accordance with the Act of March 3, 1931, as amended, known as the Davis-Bacon Act (40 U.S.C. 276a through 276a-7). Furthermore, Contractor and Subcontractors shall adhere to the stipulations and provisions published by the Secretary of Health, Education, and Welfare in "Labor Standards (Federal Water Pollution Control Act)." The Wage Rate Schedule as prepared by the Secretary of Labor and the "Labor Standards" are part of this Contract and are included in PART II of these Supplementary Conditions.

G. Except as may be otherwise required by law, all claims and disputes pertaining to the classification of labor employed on the project under this Contract shall be decided by the governing body having jurisdiction.

H. Contractor and all Subcontractors shall comply with the Regulations of the Secretary of Labor made pursuant to the Anti-Kickback Act of June 30, 1940 (40 U.S.C. 276c) and all amendments or modifications thereto. Contractor and all Subcontractors shall furnish Owner with weekly Statements of Compliance. In case of Subcontracts, Contractor shall cause appropriate provision to be inserted in all subcontracts for the Work which Contractor may let to ensure compliance with said Anti-Kickback Act by all Subcontractors subject thereto, and Contractor shall be responsible for the submission of all Statements of Compliance required of Subcontractors by said Anti-Kickback Act except as the Secretary of Labor may specifically provide for reasonable limitations, variations, and exemptions from the requirements thereof. These Regulations are part of this Contract and are included in PART II of these Supplementary Conditions.

I. Contractor and all subcontractors shall also comply with the Massachusetts Prevailing Wage law as contained in M.G.L. chapter 149 sections 26-27 which are included in Part II of these Supplementary Conditions.

J. Contractor warrants that all materials and equipment are suitable and fit for the intended use of such materials and equipment and are free from defects in material, workmanship or design. The foregoing applies whether the materials or equipment are specified in the Contract Documents.

SC-6.04A.

3. The Contractor’s obligation to furnish requested scheduling information is a material term of the Contract. If the Contractor fails to furnish requested scheduling information in writing within five (5) days of a request for such information from the Engineer, the Contractor shall pay and the Owner may withhold from the Contractor Liquidated Damages at the rate of Fifty Dollars ($50.00) a day for each calendar day thereafter that the Contractor fails to furnish the requested information.” (Include if the scheduling should be considered a material term)

SC-6.04B.

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The periods of time in the project construction schedule are of the essence to the Contract. The Contractor shall prosecute its work in accordance with the current project construction schedule.
1. Notice of Delays. As a condition precedent to any increase in the Contract Price and/or Contract Times, the Contractor shall give the Owner and the Engineer verbal notice of any delay affecting its Work within two (2) business days of the commencement of the delay. In addition and also as a condition precedent to any increase in the Contract Price and/or Contract Times, the Contractor shall give the Owner and Engineer written notice of the delay within ten (10) business days of the commencement of the delay with specific recommendations about how to minimize the effect of the delay. The written notice of the delay shall conspicuously state that it is a "NOTICE OF DELAY." A notice of a delay shall not constitute the submission of a Claim. Contract Times shall only be changed as provided in the Agreement. The Contractor acknowledges and agrees that these notice provisions are material terms of the Contract Documents and give the Owner the opportunity to take action to minimize the cost and/or effect of delays.

SC-6.06A.

Delete Paragraphs 6.06A. and 6.06B. of the General Conditions in their entirety and replace with the following:

A. Contractor shall not employ any Subcontractor, Supplier or other person or organization, (including those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom Owner may have reasonable objection. Acceptance of any Subcontractor, other person or organization by Owner shall not constitute a waiver of any right of Owner to reject defective Work. Contractor shall not be required to employ any Subcontractor, other person or organization against whom Contractor has reasonable objection.

B. Not Used.

SC-6.06C.

Add the following new sentence at the end of paragraph 6.06C. of the General Conditions to read as follows:

Contractor shall make payments to Subcontractors in accordance with Massachusetts General Law Chapter 30, Section 39F which is included in PART II of these Supplementary Conditions.

SC-6.06E.

Add the following new sentence at the end of paragraph 6.06E of the General Conditions to read as follows:
Owner or Engineer may furnish to any such Subcontractor, Supplier or other person or organization, to the extent practicable, information about amounts paid on their behalf to Contractor in accordance with Contractor's Applications for Payment.

SC-6.07B

Delete paragraph 6.07B of the General Conditions in its entirety.

SC-6.06F.

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Add the following new phrase at the beginning of Paragraph 6.06F of the General Conditions to read as follows:

Except as required otherwise by Massachusetts General Law Chapter 149, Section 44F,

SC-6.08A

Delete the first and second sentences of Paragraph 6.08A of the General Conditions in their entirety and replace with the following:

Contractor shall comply with the guidelines established in the Division of Municipal Services (DMS) Construction Grants Policy Memorandum No. CG-2 (Permits) included in Part II of the Supplementary Conditions.

SC-6.10A

Add the following new sentences at the end of paragraph 6.10A of the General Conditions to read as follows:

The materials and supplies to be used in the Work of this Contract are exempt from the Sales and Use Tax of the Commonwealth of Massachusetts. Contractor shall obtain the proper certificates, maintain the necessary records and otherwise comply with the requirements of Chapter 14 of the Acts of 1966 and any amendments thereto. Owner will furnish the required certificates of tax exemption to the Contractor for use in the purchase of supplies and materials to be incorporated into the Work. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by the Contractor, or to supplies or materials not incorporated into the Work.

SC-6.12

Delete "Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner." Replace with "The Contractor shall deliver these record documents, samples, and shop drawings to the Engineer, no later than the date for Substantial Completion for the Engineer's review and transmittal to Owner.

SC-6.14

Add B. Contractor shall keep at the Site at all times during the progress of the Work a competent person to comply with OSHA trenching and excavation requirements. The competent person shall be one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them."

SC-6.16A.

Delete the last sentence in paragraph 6.16A. of the General Conditions in its entirety and replace with the following:

If Engineer determines that the incident giving rise to the emergency action was not the responsibility of the Contractor and that a change in the Contract Document is required because of the action taken by the Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

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SC-6.17D.1.

Add the following new sentence at the end of paragraph 6.17.D.1 of the General Conditions to read as follows:

Approval of Shop Drawings for equipment requiring Efficiency Guarantee Bonds will be withheld until the receipt of such Bonds.

SC-6.19A.

Add the following new paragraph immediately after paragraph 6.19A. of the General Conditions which is to read as follow:

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

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

2. The Contractor's guarantee under this clause, 6.19B, is in addition to the Contractor's express or implied warranties under this Agreement and State law and in no way diminish any other rights that the Owner may have against the Contractor.

SC-16.19C. and D.

Renumber 6.19B. and 6.19C. of the General Conditions to read 6.19C. and 6.19D.

SC-6.19D.

Add the following new paragraph immediately after paragraph 6.19D. of the General Conditions which is to read as follows:

E. Manufacturer's Guaranty/Warranty

1. The Contractor shall obtain the following guaranty/warranty from the manufacturer of all major pieces of equipment furnished and installed on this Project. Such guaranty/warranty shall be for the benefit of Owner and be furnished in writing by the manufacturer. The Contractor's and manufacturer's obligations under this provision are in addition to other express or implied warranties under the Contract Documents and under the law and in no way diminish any other right that the Owner may have against the

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Contractor or manufacturer for faulty material, equipment or work. The warranty period shall not be interpreted as a limitation on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

2. The manufacturer warrants and guarantees for a period of one year from the date of Substantial Completion, or such longer period that may be specified in the Contract Documents, that all materials and equipment furnished and installed shall be free from flaws, defects in material and workmanship and shall be in conformance with the Contract Documents.

SC-6.20A.

Delete paragraph 6.20A of the General Conditions in its entirety and replace with the following:

A. To the fullest extent permitted by Laws and Regulations, Contractor shall defend, indemnify and hold harmless Owner, Engineer and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost or loss or damage:

1. is attributable to bodily injury, sickness, disease or death or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly of indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such indemnified party unless caused by the sole negligence of a party indemnified hereunder. If through the acts of neglect on the part of Contractor, any other contractor or any Subcontractor shall suffer loss or damage on the Work, Contractor shall settle with such other contractor or Subcontractor by agreement or arbitration if such other contractor or Subcontractor will so settle. If such other contractor or Subcontractor shall assert any claim against Owner and/or Engineer, or the officers, directors, members, partners, employees, agents, consultants and subcontractors of each on account of any damage alleged to have been sustained, Owner shall notify Contractor, who shall defend, indemnify and save harmless Owner, Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each against any such claims.

SC-6.20C.

Delete paragraphs 6.20C, C.1 and C.2 of the General Conditions in their entirety.

SC-6.21E

Delete paragraph 6.21E of the General Conditions in its entirety and replace with the following:

E. Contractor shall not be responsible for the adequacy of the performance criteria or design criteria contained in the Contract Documents.

SC-6.21E.

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Add the following new paragraph immediately after paragraph 6.21E. of the General Conditions which is to read as follows:

SC-6.22 Definitions; Contract Provisions; Management and Financial Statements; Enforcement

A. Contractor shall comply with all applicable provisions of Chapter 30, Section 39R of the Massachusetts General Laws regarding Contractor's records which is included in Part II of the Supplementary Conditions.

ARTICLE 8. OWNER'S RESPONSIBILITIES

SC-8.06

Delete paragraph 8.06 of the General Conditions in its entirety.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

SC-9.03A.

Add the following new paragraph immediately after paragraph 9.03A of the General Conditions which is to read as follows:

B. Engineer will furnish a Resident Project Representative and assistants to assist Engineer in observing the performance of the Work. The duties and responsibilities of the Resident Project Representative will be as enumerated in a document entitled "Duties, Responsibilities and Limitations of the Authority of Resident Project Representative" and will be made available to Contractor at the start of the Work.

ARTICLE 10 – CHANGES IN THE WORK: CLAIMS

Under 10.05B – Insert the following words in the first sentence Written notice of each such claim, dispute or other matter,

ARTICLE 11 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC-11.01A.1.

Delete the second sentence in paragraph 11.01A.1. of the General Conditions in its entirety and replace with the following:

Such employees shall include foremen at the site.

SC-11.01A.1.

Add the following new paragraph immediately after paragraph 11.01A.1. of the General Conditions which is to read as follows:

a. Contractor shall establish, in the Agreement, the Direct Labor Cost percentage. This percentage, where approved by Owner, will be used in the determination of the Direct Labor Cost listed in the Change Order Form included in Part II of the Supplementary Conditions. The Direct Labor Costs are defined to include

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social security contributions, unemployment, excise and payroll taxes, workers' and workmen's compensation, health and retirement benefits, sick leave, vacation and holiday pay, and cost of premiums for all additional insurance required because of changes in the Work.

SC-11.02A.

Delete paragraphs 11.02A. thru D. of the General Conditions in their entirety.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIME

SC-12.01C.1.

Delete paragraph 12.01C.1 of the General Conditions in its entirety.

SC-12.01C.2.b.

In the second line of paragraph 12.01C.2.b, before the semicolon add the following words "based on subcontractor's Cost of the Work";

Delete "five percent" in paragraph 12.01C.2.b of the General Conditions and replace with "seven and one-half percent."

Delete "15 percent" in the seventh line of paragraph 12.01C.2.c, of the General Conditions and replace with "twenty percent" and delete "five percent" in the tenth line and replace with "seven and one-half percent."

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

SC-13.05A.

Add the following new paragraph immediately after paragraph 13.05A. of the General Conditions to read as follows:

B. If Owner stops Work under Paragraph 13.05A. Contractor shall not be entitled to any extension of Contract Time or increase in Contract Price.

SC - 13.07.A –

Amend the first sentence as follows Replace the words Substantial Completion” with “Final acceptance of the project by the Owner.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

SC-14.02A.3.

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Add the following new paragraph immediately after paragraph 14.02A.3 of the General Conditions which is to read as follows:

4. Contractor shall furnish evidence that payment received on the basis of materials and equipment not incorporated and suitably stored, has in fact been paid to the respective supplier(s) within sixty days of payment by Owner. Failure to provide such evidence of payment may result in the withdrawal of previous approval(s) and removal of the cost of related materials and equipment from the next submitted Application for Payment.

SC-14.02B.1.

Delete paragraph 14.02B.1 of the General Conditions in its entirety and replace with the following:

1. Progress Payments will be made in accordance with Massachusetts General Law Chapter 30, Section 39K, which is included in PART II of these Supplementary Conditions.

SC-14.03A.

Add the following new paragraphs immediately after paragraph 14.03A of the General Conditions which are to read as follows:

B. No materials or supplies for the Work shall be purchased by Contractor or Subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. Contractor warrants that Contractor has good title to all materials and supplies used by Contractor in the Work, free from all liens, claims or encumbrances.

C. Contractor shall defend, indemnify and save Owner and Engineer harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. Contractor shall at Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If Contractor fails to do so, then Owner may, after having served written notice on the said Contractor either pay unpaid bills, of which Owner has written notice, direct, or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to Contractor shall be resumed, in accordance with the terms of this Contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon Owner to either Contractor or Contractor's Surety. In paying any unpaid bills of the Contractor, Owner shall be deemed the agent of Contractor and any payment so made by Owner shall be considered as payment made under the Contract by Owner to Contractor and Owner shall not be liable to Contractor for any such payment made in good faith.

SC-14.07B.1.

Delete paragraph 14.07B.1. of the General Conditions in its entirety and replace with the following:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation - all as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will indicate in writing Engineer's recommendation of payment and present the Application to Owner for payment. Thereupon Engineer will

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give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of paragraph 14.09. Otherwise, Engineer will return the Application to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application. If the Application and accompanying documentation are appropriate as to form and substance, Owner shall in accordance with the applicable Massachusetts General Law, pay Contractor the amount recommended by Engineer.

SC-14.07C.1.

Add the following new paragraph immediately after paragraph 14.07C.1. of the General Conditions which is to read as follows:

D. Final payment will be reduced by the amount of excessive costs of plant inspection of pipe. Excessive costs are defined as the inspection costs incurred by Owner for that amount of pipe which exceeds 125 percent of the aggregate length of each type installed.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

SC-15.01A.

Delete paragraph 15.01A. of the General Conditions in its entirety and replace with the following:

A. Owner may order, at any time and without cause, suspension of the Work in accordance with Massachusetts General Law Chapter 30, Section 39O, which is included in Part II of the Supplementary Conditions.

SC-15.02A.4.

Add the following new paragraph immediately after paragraph 15.02.A.4 of the General Conditions which is to read as follows:

5. If Contractor abandons the Work, or sublets this Contract or any part thereof, without the previous written consent of Owner, or if the Contract or any claim thereunder shall be assigned by Contractor otherwise than as herein specified;

SC -15.02A

Add after 15.02B.3 “Such termination shall be effective as of the date stated in the termination notice provided to the Contractor.”

SC - P15.03.A

Add after the first sentence the following “Such termination shall be effective as of the date stated in the written notice.”

ARTICLE 16 - DISPUTE RESOLUTION

SC-16.01A

Delete the paragraph 16.01A of the General Conditions in its entirety and replace with the following:

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A. Settlement, Methods and Procedures
1. In the event that Contractor files a Claim or files an action against Owner, Owner shall be entitled to make an offer of settlement of the Claim to Contractor at any time up to the date of trial. Such offer of settlement shall not be admissible into evidence at the litigation except on the issue of entitlement to recovery of attorneys' fees, costs and expenses. If at any stage of the litigation, including any appeals, Contractor's claim is dismissed or found to be without merit, or if the damages awarded to Contractor on its claim do not exceed Owner's offer of settlement, Contractor shall be liable to Owner and shall reimburse Owner for all attorney's fees, costs and expenses incurred by Owner from the date of the offer of settlement until the date of the final adjudication and resolution of Contractor's claim.
2. The laws of the Commonwealth of Massachusetts ("Commonwealth") shall govern all rights and duties under this Agreement, including without limitation the validity of this Agreement. The City may agree to voluntary mediation or arbitration of any contract dispute and will share the costs of such mediation or arbitration. Any actions arising out of this Contract, including any dispute, claim or other matter not settled by negotiation or other means as mutually agreed upon by Owner, Contractor, and surety where applicable, shall be brought and maintained in a State or Federal Court in Massachusetts which shall have exclusive jurisdiction thereof. No legal or equitable rights of the parties shall be limited by this paragraph.

SC-16.01C.3.

Add a new paragraph immediately after paragraph 16.01C.3. of the General Conditions which is to read as follows:

D. Contractor shall carry on the Work and maintain the progress schedule during the dispute resolution proceedings, unless otherwise agreed by Contractor and Owner in writing.

ARTICLE 17 - MISCELLANEOUS

SC 17.05.A

Delete and replace with the following "This Contract shall be governed by the laws of the Commonwealth of Massachusetts."

SC-17.06

Add the following new paragraphs immediately after paragraph 17.06 of the General Conditions which are to read as follows:

17.07 Addresses

A. Both the address given in the Bid Form upon which this Agreement is founded, and Contractor's office at or near the site of the Work are hereby designated as places to either of which notices, letters, and other communications to Contractor shall be certified, mailed, or delivered. The delivering at the above named place, or depositing in a postpaid wrapper directed to the first-named place, in any post office box regularly maintained by the post office department, of any notice, letter or other communication to Contractor shall be deemed sufficient service thereof upon Contractor; and the date of said service shall be the date of such delivery or mailing. The first-named address may be changed at any time by an instrument in writing, executed and acknowledged by Contractor, and delivered to Owner and Engineer. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter, or other communication upon Contractor personally.

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17.08 Wage Rates

A. The requirements and provisions of all applicable laws and any amendments thereof or additions thereto as to the employment of labor, and to the schedule of minimum wage rates established in compliance with laws shall be a part of these Contract Documents. Copies of the wage schedules are included in PART II of these Supplementary Conditions. If, after the Notice of Award, it becomes necessary to employ any person in a trade or occupation not classified in the wage determinations, such person shall be paid at not less than such rates as shall be determined by the officials administrating the laws mentioned above. Such approved minimum rate shall be retroactive to the time of the initial employment of such person in such trade or occupation. Contractor shall notify Owner of Contractor's intention to employ persons in trades or occupations not classified in sufficient time for Owner to obtain approved rates for such trades or occupations.

B. The schedules of wages referred to above are minimum rates only, and Owner will not consider any claims for additional compensation made by Contractor because of payment by Contractor of any wage rate in excess of the applicable rate contained in these Contract Documents. All disputes between Contractor and employees of Contractor in regard to the payment of wages in excess of these specified in the schedules shall be resolved by Contractor.

C. The said schedules of wages shall continue to be the minimum rates to be paid during the life of this Agreement and a legible copy of said schedules shall be kept posted in a conspicuous place at the site of the work.

D. State schedules of minimum wage rates are included in PART II of these Supplementary Conditions.

PART II - STATE GOVERNMENT PROVISIONS

State Government Provisions included herein, have been selected from those to which specific references have been made elsewhere in the Contract Documents. Each and every other provision of law or clause required by law to be inserted in this Contract shall be deemed to be also inserted herein in accordance with paragraph 3.01D of the Supplementary Conditions.

1.0. COMMONWEALTH OF MASSACHUSETTS PROVISIONS

2.1. Owner and Contractor agree that the following Commonwealth of Massachusetts Provisions apply to the work to be performed under this Contract and that these provisions supersede any conflicting provisions of this Contract.

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

2.3. Special Provisions for Disadvantaged Business Enterprises - The Department of Environmental Protection, Division of Municipal Services.

2.4. Commonwealth of Massachusetts Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program.

2.5. Massachusetts General Laws

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2.5.1. Chapter 30, Section 39F (3 Pages)

2.5.2. Chapter 30, Section 39I (1 Page)

2.5.3. Chapter 30, Section 39J (1 Page)

2.5.4. Chapter 30, Section 39K (2 Pages)

2.5.5. Chapter 30, Section 39L (1 Page)

2.5.6. Chapter 30, Section 39M (2 Pages)

2.5.7. Chapter 30, Section 39N (1 Page)

2.5.8. Chapter 30, Section 39O (1 Page)

2.5.9. Chapter 30, Section 39P (1 Page)

2.5.10. Chapter 30, Section 39Q (2 Pages)

2.5.11. Chapter 30, Section 39R (3 Pages)

2.5.12. Chapter 30, Section 39S (1 Page)

2.5.13. Chapter 82, Sections 40 and 40A through 40E (7 Pages)

2.5.14. Chapter 82A, Section 1 (1 Page)

2.5.15. Chapter 149, Section 34 (1 Page)

2.5.16. Chapter 149, Section 44F (8 Pages)

2.5.17. Chapter 149, Section 44G (1 Pages)

2.5.18. Chapter 149, Section 44J (2 Pages)

2.6. State Wage Rates

2.7. Diesel Retrofit Requirements

2.8. Massachusetts Construction Grants Policy Memoranda (Currently 16 Memoranda).

2.9. Department of Environmental Protection Policy for Review of Sewer Line/Water Supply Protection.

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CONTRACT SUPPLEMENT

Chapter 30 Section 39M
STATUTORY PROVISIONS FOR MASSACHUSETTS
PUBLIC CONSTRUCTION CONTRACTS

The following provisions are required by or are intended to be consistent with requirements of Massachusetts statutes governing public works construction contracts in the Commonwealth of Massachusetts. Any other provisions required by statute to be included herein shall be deemed to be so included, and are incorporated herein by reference as if set forth herein in full. In addition, the parties recognize that the other rights, duties and obligations with respect to public construction contracts are provided for by statute, notwithstanding the fact that they are not provided for in the Contract Documents. In the case of conflict between the provisions in the Contract Documents, the provisions of this Contract Supplement shall govern. In the case of conflict between the provisions of this Contract Supplement and the provisions of any applicable statute, the statutory provisions shall govern.

Each of the Owner and the Contractor agree, notwithstanding any other term or provision of the Contract Documents, as follows:

1. Definitions. Pursuant to the provisions added to the Contract Documents by this Contract Supplement as required by applicable provisions of the Massachusetts General Laws the terms "awarding authority" and "contracting authority" shall mean the Owner, the term "Commonwealth" shall mean the "Commonwealth of Massachusetts, the terms "contract" and "contract documents" shall mean the Contract Documents, the term "contractor" and "general contractor" shall mean the Contractor, the term "contract amount", "contract sum" and "contract price" all mean the same and shall mean Contract Amount, Contract Sum or Contract Price as used in the Contract Documents, the term "Commissioner", "Commissioner of Labor and Industries" and "Department of Labor and Industries" shall mean said Commissioner and said Department and their successors from time to time including the Massachusetts Attorney General's Office as successor thereto pursuant to Chapter 110 of the Massachusetts Acts of 1993, the term "subcontractor" shall mean any and all Subcontractors and the term "work" shall mean the Work on the Project.

2. Representations and Certifications of the Contractor. By executing the Contract Documents, the Contractor represents and certifies that:

(a) The Contractor has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Work.

(b) The Contractor either (i) is not a foreign corporation pursuant to Chapter 30, Section 39L of the Massachusetts General Laws/or (ii) is a foreign corporation in compliance with Massachusetts General Laws Chapter 30, Section 39L and Chapter 181, Sections 3 and 5 and shall maintain such compliance throughout Work on the Project.

(c) The Contractor is a qualified contractor, has complied with the bidding process for the Work, has complied with the provisions of Chapter 30, Section 39M of the Massachusetts General Law, and is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in connection with the

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Work.

(d) The Contractor has filed a statement of management on internal accounting controls in compliance with Chapter 30, Section 39R(8)(b)(4) of the Massachusetts General Laws.

3. Compliance with Tax Laws. By executing the Contract Documents, the Contractor certifies under the pains and penalties of perjury pursuant to Chapter 62C, Section 49A(b) of the Massachusetts General Laws that the Contractor has complied with all of the laws of the Commonwealth of Massachusetts relating to taxes.

4. Compliance with Accounting and Record Keeping Requirements. The Contractor will comply with all accounting and record keeping requirements of Chapter 30, Section 39R of the Massachusetts General Laws.

5. Contract Administration.

5.1. "Or Equal" Clause. In accordance with Massachusetts General Laws Chapter 30, Section 39M:

Where products or materials are prescribed by manufacturer name, trade name, or catalog reference, the word "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 awarding authority:

(a) it is at least equal in quality, durability, appearance, strength and design;

(b) it performs at least equally the function imposed by 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 substituted equipment under this paragraph shall be at the expense of the Contractor or Subcontractor responsible for the work item. See other paragraphs of General and Supplementary Conditions for procedures to be used in determining compliance with the standards of this paragraph.

5.2. Interruptions and Delays. In accordance with Massachusetts General Laws Chapter 30, Section 39O:

(a) The awarding authority may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the 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 Contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under these provisions for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides

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for an equitable adjustment of the contract price under any other contract provisions.

(b) The Contractor must submit the amount of a claim under provision (a) to the 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 Contractor notified the awarding authority in writing of the act or failure to act involved in the claim.

In the event a suspension, delay, interruption, or failure to act of the awarding authority increases the cost of performance to any Subcontractor, that Subcontractor shall have the same rights against the Contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the Contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify, or alter any other rights which the Contractor or the Subcontractor may have against each other.

Except as otherwise provided by law and by this Section 5.2, the Contractor shall not be entitled to damages on account of any hindrances or delays, avoidable or unavoidable; but if such delay be occasioned by the awarding authority, the Contractor may be entitled to an extension of time only, in which to complete the work, to be determined by the Engineer.

5.3. Deviations. In accordance with Massachusetts General Laws Chapter 30, Section 39I:

The Contractor shall perform all the work required by this contract in conformity with the plans and specifications contained herein. No willful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the Engineer or Engineer in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by this contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or the Engineer or Engineer so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating: (1) If such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor; (2) that the specified deviation does not materially injure the project as a whole; (3) that either the work substituted for the work specified is of the same costs and quality, or that an equitable adjustment has been agreed upon between the awarding authority and the Contractor and the amount in dollars of said adjustment, and (4) that the deviation is in the best interest of the awarding authority.

Such certificates shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

5.4. Finality of Decisions by Awarding Authority or Engineer. In accordance with Massachusetts General Laws Chapter 30, Section 39J:

Notwithstanding any contrary provision of this contract, no decision by the awarding authority or the Engineer on a dispute, whether of fact or of law, arising under this contract shall be final or conclusive

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if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily, is unsupported by substantial evidence, or is based upon error of law.

5.5. Differing Site Conditions. In accordance with Massachusetts General Laws Chapter 30, Section 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 awarding 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 awarding 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 awarding authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly.

The Owner may adopt reasonable rules or regulations in conformity with this Section 5.5 concerning the filing, investigation and settlement of such claims and has done so as provided in Section 4.03 of the General Conditions and the Supplementary General Conditions.

5.6. Interpretations by Awarding Authority. In accordance with Massachusetts General Laws Chapter 30, Section 39P:

In every case in which this contract requires the awarding authority, any official or the Engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, the decision shall be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, any official or the 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.

6. Appropriations and Payments.

6.1. Certificate of Appropriation. In accordance with Massachusetts General Laws Chapter 44, Section 31C:

This contract shall not be deemed to have been made until the auditor or accountant or other officer of the awarding authority having similar duties has certified thereon that an appropriation in the amount of this contract is available therefor and that an officer or agent of the awarding authority has been authorized to execute said contract and approve all requisitions and change orders. No order to the Contractor for a change in or addition to the Work, whether in the form of a drawing, plan, detail or any other written instruction, unless it is an order which the Contractor is willing to perform without any increase in the contract price, shall be deemed to be given until the auditor or accountant, or other officer of the awarding authority having similar duties, has certified thereon that an appropriation in the amount

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of such order is available therefor; but such certificate shall not be construed as an admission by the awarding authority of its liability to pay for such work. The certificate of the auditor or accountant or other officer of the awarding authority having similar duties, that an appropriation in the amount of this contract or order is available shall bar any defense by the awarding authority on the grounds of insufficient appropriation; and any law barring payment in excess of appropriations shall not apply to amounts covered by any certificate under this Section 6.1.

6.2. Direct Payment. In accordance with Massachusetts General Laws Chapter 30, Section 39F:

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

(b) Not later than the sixty-fifth day after each Subcontractor substantially completes its work in accordance with the plans and specifications, the entire balance due under the subcontract, less amounts retained by the 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 Contractor. The 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 Contractor.

(c) Each payment made by the awarding authority to the Contractor pursuant to clauses (a) and (b) of this Section 6.3 for the labor performed and the materials furnished by a Subcontractor shall be made to the Contractor for the account of that Subcontractor; and the awarding authority shall take reasonable steps to compel the 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 Contractor or which is to be included in a payment to the Contractor for payment to the Subcontractor as provided in clauses (a) and (b) of this Section 6.3, the awarding authority shall act upon the demand as provided in this Section 6.3.

(d) If, within seventy days after the Subcontractor has substantially completed the subcontract work, the Subcontractor has not received from the Contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the Contractor, less any amount retained by the 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 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 Contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. 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

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the Subcontractor has delivered or so mailed the demand to the awarding authority and delivered or so mailed a copy to the Contractor, the Contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the 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 Contractor and of the amount due for each claim made by the 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 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 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 clause (d) of this Section 6.3. The awarding authority shall make further direct payments to the Subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this clause (e).

(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of clause (e) of this Section 6.3 in an interest-bearing joint account in the names of the Contractor and the Subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the Contractor and the Subcontractor and shall notify the Contractor and the Subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the Contractor and the Subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to clause (f) of this Section 6.3 shall be made out of amounts payable to the Contractor at the time of receipt of a demand for direct payment from a Subcontractor and out of amounts which later become payable to the Contractor and in the order of receipt of such demands from Subcontractors. All direct payments shall discharge the obligation of the awarding authority to the Contractor to the extent of such payment.

(h) The awarding authority shall deduct from payments to a Contractor amounts which, together with the deposits in interest bearing accounts pursuant to clause (f) of this Section 6.3, are sufficient to satisfy all unpaid balances of demands for direct payment received from Subcontractors. All such amounts shall be earmarked for such direct payments, and the Subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the Contractor.

6.3. Substantial Completion. In accordance with Massachusetts General Laws Chapter 30, Section 39G:

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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 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 per cent retainage on that work, including the quantity, price and all but one per cent retainage for the 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 payment filed by Subcontractors and not yet paid to Subcontractors or deposited in joint accounts pursuant to section thirty-nine F of Chapter 30, but no contract subject to said section thirty-nine F of Chapter 30 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

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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 therefor, 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 so 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 has 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 awarding authority may deduct from its payment a retention based on its estimate of the fair value of its claims against the Contractor, a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of section thirty-nine F of Chapter 30, 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 per cent 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.

7. Wages and Employment Practices.

7.1. Preference to Veterans and Citizens In Public Work; Rate of Wages. In accordance with Massachusetts General Laws Chapter 149, Section 26:

(a) In the employment of mechanics and apprentices, teamsters, chauffeurs and laborers by the Contractor and all Subcontractors, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least

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six months at the commencement of their employment, who are male veterans as defined in Massachusetts General Laws Chapter 4, Section 7, clause 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, and every contract for such work shall contain a provision to this effect. Each county, town, authority or district in the construction of public works, or persons contracting or subcontracting for such works, shall give preference to veterans and citizens who are residents of such county, town, authority or district.

(b) The rate per hour of the wages paid to said mechanics and apprentices, teamsters, chauffeurs and laborers in the construction of public works shall not be less than the rate or rates of wages to be determined by the Commissioner of Labor and Industries as hereinafter provided; provided, that the wages paid to laborers employed on said works shall not be less than those paid to laborers in the municipal service of the town or towns where said works are being constructed; provided, further, that where the same public work is to be constructed in two or more towns, the wages paid to laborers shall not be less than those paid to laborers in the municipal service of the town paying the highest rate; provided, further, that if, in any of the towns where the works are to be constructed, a wage rate or wage rates have been established in certain trades and occupations by collective agreements or understandings in the private construction industry between organized labor and employers, the rate or rates to be paid on said works shall not be less than the rates so established; provided, further, that in towns where no such rate or rates have been so established, the wages paid to mechanics, teamsters, chauffeurs and laborers on public works, shall not be less than the wages paid to the employees in the same trades and occupations by private employers engaged in the construction industry. This section shall also apply to regular employees of the Commonwealth or of a county, town, authority or district, when such employees are employed in the construction, addition to or alteration of public buildings for which special appropriations of more than one thousand dollars are provided. Payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans under collective bargaining agreements or understandings between organized labor and employers shall be included for the purpose of establishing minimum wage rates as herein provided.

7.2. <u>List of Jobs; Classifications; Determination of Rate of Wages; Schedule</u>. In accordance with Massachusetts General Laws Chapter 149, Section 27:

The Commissioner of Labor and Industries shall prepare, for the use of such public officials or public bodies whose duty it shall be to cause public works to be constructed, a list of the several jobs usually performed on various types of public works upon which mechanics and apprentices, teamsters, chauffeurs and laborers are employed including the transportation of gravel or fill to the site of said public works or the removal of surplus gravel or fill from such site. The Commissioner shall classify said jobs, and he may revise such classifications from time to time, as he may deem advisable. Prior to awarding a contract for the construction of public works, said public official or public body shall submit to the Commissioner a list of the jobs upon which mechanics and apprentices, teamsters, chauffeurs and laborers are to be employed, and shall request the Commissioner to determine the rate of wages to be paid on each job. Said rates shall apply to all persons engaged in transporting gravel or fill to the site of said public

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works or removing gravel or fill from such site, regardless of whether such persons are employed by a contractor or subcontractor or are independent contractors or owner-operators. The Commissioner, subject to the provisions of Section 7.1 of this Contract Supplement, shall proceed forthwith to determine the same, and shall furnish said official or public body with a schedule of such rate or rates of wages as soon as said determination shall have been made. In advertising or calling for bids for said works, the awarding official or public body shall incorporate said schedule in the advertisement or call for bids by an appropriate reference thereto, and shall furnish a copy of said schedule, without cost, to any person requesting the same. Said schedule shall be made a part of the contract for said works and shall continue to be the minimum rate or rates of wages for said employees during the life of the contract. Any person engaged in the construction of said works shall cause a legible copy of said schedule to be kept posted in a conspicuous place at the site of said works during the life of the contract. An apprentice performing work on a project subject to this section shall maintain in his possession an apprentice identification card issued pursuant to section 11W of chapter 23. The aforesaid rates of wages in the schedule of wage rates shall include payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans as provided in Section 7.1 of this Contract Supplement, and such payments shall be considered as payments to persons under this section performing work as herein provided. Any employer engaged in the construction of such works who does not make payments to a health and welfare plan, a pension plan and a supplementary unemployment benefit plan, where such payments are included in said rates of wages, shall pay the amount of said payments directly to each employee engaged in said construction. Note: The awarding authority does not guarantee the accuracy of any schedule of wage rates furnished to the Contractor hereunder, and the Contractor shall be responsible for ascertaining the prevailing wages in the area where the work will be performed.

7.3. Employment Records To Be Kept By Contractor, Subcontractors; Statement Of Compliance. In accordance with Massachusetts General Laws Chapter 149, Section 27B:

Every Contractor, Subcontractor or public body engaged in said public works to which Section 7.2 of this Contract Supplement applies shall keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each such employee, and shall promptly furnish to the attorney general or his representative, upon his request, a copy of said record, signed by the employer or his authorized agent under the penalties of perjury. For every week in which an apprentice is employed by a Contractor, Subcontractor or public body subject to this Section, a photocopy of the apprentice's apprentice identification card, issued pursuant to section 11W of chapter 23, shall be attached to the records submitted under this Section. Such records shall be open to inspection by any authorized representative of the Department of Labor and Industries at any reasonable time, and as often as may be necessary. Every Contractor and Subcontractor required to keep such a record shall submit a copy of said record to the awarding authority directly on a weekly basis.

Each such Contractor, Subcontractor or public body shall preserve its payroll records for a period of three years from the date of completion of the contract.

Each such Contractor, Subcontractor or public body shall furnish to the awarding authority within fifteen days after completion of its portion of the work a statement, executed by the Contractor, Subcontractor, or public body who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE _____, 20__

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I, _____(Name of signatory party) (Title)
do hereby state:

That I pay or supervise the payment of the persons employed by
_____
(Contractor, Subcontractor or public body)

on the _____
(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_____

The above mentioned copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to the awarding authority for such inspection and copying.

7.4. Certain Additional Provisions Relating to Prevailing Wages and Employee Matters.

(a) Attention is called to the Advisory issued by the Office of the Attorney General on April 8, 1994 which provide, among other things, that "(t)he revised statute requires every contractor or subcontractor on public works projects to submit a certified payroll to the awarding authority every week." The Advisory further notes that the Secretary of State and the Attorney General have ruled that "certified weekly payrolls are public records and therefore should be made available to parties on request." The Contractor shall comply with these requirements.

(b) The Contractor and all Subcontractors (excluding any Subcontractors under procurement contracts with the Owner assigned to the Contractor to the extent such procurement contracts so provide) shall maintain and participate in a bona fide apprenticeship training program as defined by M.G.L. Chapter 23, Section 11H and 11I for each apprenticeship trade or occupation represented in his or her work force that is approved by the Division of Apprentice Training of the Department of Labor and Industries and must abide by the apprentice to journeyman ratio for each trade prescribed therein the performance of the Contract Documents.

(c) The Contract and all Subcontractors (excluding any Subcontractors under procurement contracts with the Owner assigned to the Contractor to the extent such procurement contracts so provide) must furnish and maintain, at its or their expense, hospitalization and medical benefits for all their employees employed on the project and/or coverage at least comparable to the hospitalization and/or medical benefits

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provided by the health and welfare plans in the applicable craft recognized by M.G.L. Chapter 149 Section 26 in establishing minimum wage rates Payment in lieu of hospitalization and medical benefits shall not be permitted on this contract. The Contractor and Subcontractor regardless of tier shall furnish the Owner with evidence of hospitalization and medical benefits being furnished to their employees.

(d) The Contractor and all Subcontractors excluding any Subcontractors under procurement contracts with the Owner assigned to the Contractor to the extent such procurement contracts so provide) must properly classify employees as employees rather than independent contractors and treat them accordingly for purposes of workers' compensation insurance coverage, unemployment taxes, social security taxes and income tax withholding in accordance with M.G.L. Chapter 149, Section 148B.

7.5. Wages Paid to Operators of Trucks and Other Equipment. In accordance with Massachusetts General Laws Chapter 149, Section 27F:

Prescribed rates of wages, as determined by the Commissioner of Labor and Industries, shall be paid to the operators of all trucks, vehicles or equipment employed on the Project. Said rates of wages shall be requested of said Commissioner by the awarding authority and shall be furnished by the Commissioner in a schedule containing the classifications of jobs, and the rate of wages to be paid for each job. Said rates of wages shall include payments to health and welfare plans, or, if no such plan is in effect between employers and employees, the amount of such payments shall be paid directly to said operators.

7.6. Reserve Police Officers. In accordance with Massachusetts General Laws Chapter 149, Section 34B:

The Contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wage paid to regular police officers in such city or town.

7.7. Eight-Hour Day, etc. In accordance with Massachusetts General Laws Chapter 149, Sections 30 and 34:

No laborer, worker, mechanic, foreman or inspector working within this Commonwealth in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or part of the work contemplated by this contract, 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 emergency.

7.8. Lodging, etc. In accordance with Massachusetts General Laws Chapter 149, Section 25:

Every employee under this contract shall lodge, board and trade where and with whom he elects, and neither the Contractor, any Subcontractor nor their respective 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. This Section 7.7 shall be made a part of all contracts for such employment.

7.9. Worker's Compensation Insurance. In accordance with Massachusetts General

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Laws Chapter 149, Section 34A.

The Contractor shall, before commencing performance of this contract, provide by insurance for the payment of compensation and the furnishing of other benefits under Massachusetts General Laws Chapter 152 to all persons to be employed under this contract, and the Contractor shall continue such insurance in full force and effect during the term of this contract. Sufficient proof of compliance with this Section 7.8 must be furnished at the time of execution of this contract. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to the other party and to the awarding authority at least fifteen days prior to the intended effective date thereof, which date shall be expressed in said notice. Such notice shall be provided in accordance with the provisions of Massachusetts General Laws Chapter 149, Section 34A.

8. Miscellaneous.

8.1. Shoring. In accordance with Massachusetts General Laws Chapter 149, Section 129A:

On any construction project carried on by any city, town, county, or other subdivision of the Commonwealth in which a trench is to be dug to a depth of five feet or more, except for trenches for laying of water pipes dug to a depth of six and one-half feet which will be open less than 48 hours, and except for digging of graves, trenches shall be shored and braced in conformity with the rules and regulations for the prevention of accidents in construction operations, as adopted and enforced by the Attorney General.

8.2. Bonding. The Contractor shall provide all bonds required by Massachusetts General Laws Chapter 149, Section 29 and 44E including a performance bond and a labor and materials payment bond for work on the Project all of which shall be in form and substance and issued by a surety satisfactory to the awarding authority. The bonds must be (a) in a form satisfactory to the awarding authority; (b) with a surety company (i) qualified to do business in the Commonwealth under the provisions of Chapter 175 Section 106, (ii) approved by the U.S. Department of Treasury and (iii) acceptable as a surety and reinsurer on federal bonds under Title 31 of the United States Code, sections 9304 to 9308; (c) with a surety company satisfactory to the awarding authority; and (d) conditioned upon the faithful performance by the principal of the agreements contained in the bid.

END OF SECTION

SECTION 00860

The Massachusetts Prevailing Wage Law

M.G.L. c. 149, §§26-27

NOTICE TO AWARDING AUTHORITIES

- The enclosed wage schedule applies only to the specific project listed at the top of the schedule, and these rates will remain in effect for the duration of the project, except in the case of multi-year projects. For projects lasting longer than one year, awarding authorities must request updated rates.

- You should request an updated wage schedule from the Division of Occupational Safety if you have not opened bids or selected a contractor within 90 days of the date of issuance of the enclosed wage schedule.

- The wage schedule shall be incorporated in any advertisement or call for bids for the project for which it has been issued.

- Once a contractor has been selected by the awarding authority, the wage schedule shall be made a part of the contract for that project.

NOTICE TO CONTRACTORS

- The enclosed wage schedule must be posted in a conspicuous place at the work site during the life of the project.

- The wages listed on the enclosed wage schedule must be paid to employees on public works projects regardless of whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.

- The enclosed wage schedule applies to all phases of the project, including the final clean-up. Contractors whose only role is to perform final clean-up must pay their employees according to this wage schedule.

- All apprentices must be registered with the Massachusetts Division of Apprenticeship Training (DAT) in order to be paid at the lower apprentice rates. All apprentices must keep his/her apprentice identification card on his/her person during all work hours. If a worker is not registered with DAT, they must be paid the “total rate” listed on the wage schedule regardless of experience or skill level. For further information, please call 617-626-5409, or write to:
  DAT, 19 Staniford Street, 1st Floor, P.O. Box 146759, Boston, MA 02114.

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

DEVAL L. PATRICK
Governor

Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

RACHEL KAPRIELIAN
Secretary

HEATHER E. ROWE
Director

Awarding Authority: City of Marlborough

Contract Number: ED 2015-08 **City/Town:** MARLBOROUGH

Description of Work: Artemas Ward Park Improvements; irrigated natural turf field, basketball, tennis, volleyball courts; skate board area, children's playground, parking lot, fencing, drainage, landscaping and lighting

Job Location: 32 New Street Marlborough MA

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **If an apprentice rate is not listed on the prevailing wage schedule for the trade in which an apprentice is registered with the DAS, the apprentice must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

Issue Date: 08/05/2014 **Wage Request Number:** 20140805-022

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2014	$31.30	$9.91	$8.80	$0.00	$50.01
	12/01/2014	$31.30	$9.91	$9.33	$0.00	$50.54
	06/01/2015	$31.65	$9.91	$9.33	$0.00	$50.89
	08/01/2015	$31.65	$10.41	$9.33	$0.00	$51.39
	12/01/2015	$31.65	$10.41	$10.08	$0.00	$52.14
	06/01/2016	$32.15	$10.41	$10.08	$0.00	$52.64
	08/01/2016	$32.15	$10.91	$10.08	$0.00	$53.14
	12/01/2016	$32.15	$10.91	$10.89	$0.00	$53.95
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2014	$31.37	$9.91	$8.80	$0.00	$50.08
	12/01/2014	$31.37	$9.91	$9.33	$0.00	$50.61
	06/01/2015	$31.72	$9.91	$9.33	$0.00	$50.96
	08/01/2015	$31.72	$10.41	$9.33	$0.00	$51.46
	12/01/2015	$31.72	$10.41	$10.08	$0.00	$52.21
	06/01/2016	$32.22	$10.41	$10.08	$0.00	$52.71
	08/01/2016	$32.22	$10.91	$10.08	$0.00	$53.21
	12/01/2016	$32.22	$10.91	$10.89	$0.00	$54.02
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2014	$31.49	$9.91	$8.80	$0.00	$50.20
	12/01/2014	$31.49	$9.91	$9.33	$0.00	$50.73
	06/01/2015	$31.84	$9.91	$9.33	$0.00	$51.08
	08/01/2015	$31.84	$10.41	$9.33	$0.00	$51.58
	12/01/2015	$31.84	$10.41	$10.08	$0.00	$52.33
	06/01/2016	$32.34	$10.41	$10.08	$0.00	$52.83
	08/01/2016	$32.34	$10.91	$10.08	$0.00	$53.33
	12/01/2016	$32.34	$10.91	$10.89	$0.00	$54.14
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2014	$87.36	$9.80	$18.17	$0.00	$115.33
	08/01/2015	$90.51	$9.80	$18.17	$0.00	$118.48
AIR TRACK OPERATOR *LABORERS - ZONE 2*	06/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	12/01/2014	$31.60	$7.30	$12.10	$0.00	$51.00
	06/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	12/01/2015	$32.60	$7.30	$12.10	$0.00	$52.00
	06/01/2016	$33.10	$7.30	$12.10	$0.00	$52.50
	12/01/2016	$33.85	$7.30	$12.10	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	06/01/2014	$31.58	$10.40	$5.95	$0.00	$47.93
	12/01/2014	$32.48	$10.40	$5.95	$0.00	$48.83
	06/01/2015	$33.43	$10.40	$5.95	$0.00	$49.78
	12/01/2015	$34.38	$10.40	$5.95	$0.00	$50.73
ASPHALT RAKER *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 2*	06/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	12/01/2014	$31.60	$7.30	$12.10	$0.00	$51.00
	06/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	12/01/2015	$32.60	$7.30	$12.10	$0.00	$52.00
	06/01/2016	$33.10	$7.30	$12.10	$0.00	$52.50
	12/01/2016	$33.85	$7.30	$12.10	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2010	$37.70	$6.97	$11.18	$0.00	$55.85

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2010

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$24.51	$6.97	$11.18	$0.00	$42.66
2	65	$24.51	$6.97	$11.18	$0.00	$42.66
3	70	$26.39	$6.97	$11.18	$0.00	$44.54
4	75	$28.28	$6.97	$11.18	$0.00	$46.43
5	80	$30.16	$6.97	$11.18	$0.00	$48.31
6	85	$32.05	$6.97	$11.18	$0.00	$50.20
7	90	$33.93	$6.97	$11.18	$0.00	$52.08
8	95	$35.82	$6.97	$11.18	$0.00	$53.97

Notes:

Apprentice to Journeyworker Ratio:1:5

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (LOWELL)*	03/01/2014	$45.96	$10.18	$17.55	$0.00	$73.69
	09/01/2014	$46.86	$10.18	$17.62	$0.00	$74.66
	03/01/2015	$47.42	$10.18	$17.62	$0.00	$75.22
	09/01/2015	$48.32	$10.18	$17.69	$0.00	$76.19
	03/01/2016	$48.89	$10.18	$17.69	$0.00	$76.76
	09/01/2016	$49.79	$10.18	$17.77	$0.00	$77.74
	03/01/2017	$50.36	$10.18	$17.77	$0.00	$78.31

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Lowell*

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.98	$10.18	$17.55	$0.00	$50.71
2	60	$27.58	$10.18	$17.55	$0.00	$55.31
3	70	$32.17	$10.18	$17.55	$0.00	$59.90
4	80	$36.77	$10.18	$17.55	$0.00	$64.50
5	90	$41.36	$10.18	$17.55	$0.00	$69.09

Effective Date - 09/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.43	$10.18	$17.62	$0.00	$51.23
2	60	$28.12	$10.18	$17.62	$0.00	$55.92
3	70	$32.80	$10.18	$17.62	$0.00	$60.60
4	80	$37.49	$10.18	$17.62	$0.00	$65.29
5	90	$42.17	$10.18	$17.62	$0.00	$69.97

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2014	$35.20	$7.30	$12.90	$0.00	$55.40
	12/01/2014	$35.95	$7.30	$12.90	$0.00	$56.15
	06/01/2015	$36.70	$7.30	$12.90	$0.00	$56.90
	12/01/2015	$37.45	$7.30	$12.90	$0.00	$57.65
	06/01/2016	$38.20	$7.30	$12.90	$0.00	$58.40
	12/01/2016	$39.20	$7.30	$12.90	$0.00	$59.40
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2014	$34.05	$7.30	$12.90	$0.00	$54.25
	12/01/2014	$34.80	$7.30	$12.90	$0.00	$55.00
	06/01/2015	$35.55	$7.30	$12.90	$0.00	$55.75
	12/01/2015	$36.30	$7.30	$12.90	$0.00	$56.50
	06/01/2016	$37.05	$7.30	$12.90	$0.00	$57.25
	12/01/2016	$38.05	$7.30	$12.90	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2014	$34.05	$7.30	$12.90	$0.00	$54.25
	12/01/2014	$34.80	$7.30	$12.90	$0.00	$55.00
	06/01/2015	$35.55	$7.30	$12.90	$0.00	$55.75
	12/01/2015	$36.30	$7.30	$12.90	$0.00	$56.50
	06/01/2016	$37.05	$7.30	$12.90	$0.00	$57.25
	12/01/2016	$38.05	$7.30	$12.90	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 2 (Eastern Massachusetts)*	03/01/2014	$34.78	$9.80	$15.91	$0.00	$60.49
	09/01/2014	$35.55	$9.80	$15.91	$0.00	$61.26
	03/01/2015	$36.32	$9.80	$15.91	$0.00	$62.03

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.39	$9.80	$1.57	$0.00	$28.76
2	60	$20.87	$9.80	$1.57	$0.00	$32.24
3	70	$24.35	$9.80	$11.20	$0.00	$45.35
4	75	$26.09	$9.80	$11.20	$0.00	$47.09
5	80	$27.82	$9.80	$12.77	$0.00	$50.39
6	80	$27.82	$9.80	$12.77	$0.00	$50.39
7	90	$31.30	$9.80	$14.34	$0.00	$55.44
8	90	$31.30	$9.80	$14.34	$0.00	$55.44

Effective Date - 09/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.78	$9.80	$1.57	$0.00	$29.15
2	60	$21.33	$9.80	$1.57	$0.00	$32.70
3	70	$24.89	$9.80	$11.20	$0.00	$45.89
4	75	$26.66	$9.80	$11.20	$0.00	$47.66
5	80	$28.44	$9.80	$12.77	$0.00	$51.01
6	80	$28.44	$9.80	$12.77	$0.00	$51.01
7	90	$32.00	$9.80	$14.34	$0.00	$56.14
8	90	$32.00	$9.80	$14.34	$0.00	$56.14

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (LOWELL)*	07/01/2014	$40.12	$10.90	$18.71	$1.30	$71.03
	01/01/2015	$40.80	$10.90	$18.71	$1.30	$71.71
	07/01/2015	$41.63	$10.90	$18.71	$1.30	$72.54
	01/01/2016	$42.32	$10.90	$18.71	$1.30	$73.23

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CEMENT MASONRY/PLASTERING - Lowell*

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.06	$10.90	$12.21	$1.30	$44.47
2	60	$24.07	$10.90	$13.71	$1.30	$49.98
3	65	$26.08	$10.90	$14.71	$1.30	$52.99
4	70	$28.08	$10.90	$15.71	$1.30	$55.99
5	75	$30.09	$10.90	$16.71	$1.30	$59.00
6	80	$32.10	$10.90	$17.71	$1.30	$62.01
7	90	$36.11	$10.90	$18.71	$1.30	$67.02

Effective Date - 01/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.40	$10.90	$12.21	$1.30	$44.81
2	60	$24.48	$10.90	$13.71	$1.30	$50.39
3	65	$26.52	$10.90	$14.71	$1.30	$53.43
4	70	$28.56	$10.90	$15.71	$1.30	$56.47
5	75	$30.60	$10.90	$16.71	$1.30	$59.51
6	80	$32.64	$10.90	$17.71	$1.30	$62.55
7	90	$36.72	$10.90	$18.71	$1.30	$67.63

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$41.49	$10.00	$14.18	$0.00	$65.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$28.11	$10.00	$14.18	$0.00	$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2014	$46.76	$7.85	$16.10	$0.00	$70.71
	01/01/2015	$47.66	$7.85	$16.10	$0.00	$71.61
	07/01/2015	$48.56	$7.85	$16.10	$0.00	$72.51
	01/01/2016	$49.51	$7.85	$16.10	$0.00	$73.46
	07/01/2016	$50.46	$7.85	$16.10	$0.00	$74.41
	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.38	$7.85	$0.00	$0.00	$31.23
2	55	$25.72	$7.85	$3.66	$0.00	$37.23
3	60	$28.06	$7.85	$3.99	$0.00	$39.90
4	65	$30.39	$7.85	$4.32	$0.00	$42.56
5	70	$32.73	$7.85	$14.11	$0.00	$54.69
6	75	$35.07	$7.85	$14.44	$0.00	$57.36
7	80	$37.41	$7.85	$14.77	$0.00	$60.03
8	90	$42.08	$7.85	$15.44	$0.00	$65.37

Effective Date - 01/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.83	$7.85	$0.00	$0.00	$31.68
2	55	$26.21	$7.85	$3.66	$0.00	$37.72
3	60	$28.60	$7.85	$3.99	$0.00	$40.44
4	65	$30.98	$7.85	$4.32	$0.00	$43.15
5	70	$33.36	$7.85	$14.11	$0.00	$55.32
6	75	$35.75	$7.85	$14.44	$0.00	$58.04
7	80	$38.13	$7.85	$14.77	$0.00	$60.75
8	90	$42.89	$7.85	$15.44	$0.00	$66.18

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 2*	06/01/2014	$34.25	$7.30	$12.70	$0.00	$54.25
	12/01/2014	$35.00	$7.30	$12.70	$0.00	$55.00
	06/01/2015	$35.75	$7.30	$12.70	$0.00	$55.75
	12/01/2015	$36.50	$7.30	$12.70	$0.00	$56.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 2*	06/01/2014	$35.25	$7.30	$12.70	$0.00	$55.25
	12/01/2014	$36.00	$7.30	$12.70	$0.00	$56.00
	06/01/2015	$36.75	$7.30	$12.70	$0.00	$56.75
	12/01/2015	$37.50	$7.30	$12.70	$0.00	$57.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 2*	06/01/2014	$35.00	$7.30	$12.70	$0.00	$55.00
	12/01/2014	$35.75	$7.30	$12.70	$0.00	$55.75
	06/01/2015	$36.50	$7.30	$12.70	$0.00	$56.50
	12/01/2015	$37.25	$7.30	$12.70	$0.00	$57.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 2*	06/01/2014	$35.25	$7.30	$12.70	$0.00	$55.25
	12/01/2014	$36.00	$7.30	$12.70	$0.00	$56.00
	06/01/2015	$36.75	$7.30	$12.70	$0.00	$56.75
	12/01/2015	$37.50	$7.30	$12.70	$0.00	$57.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 2*	06/01/2014	$35.00	$7.30	$12.70	$0.00	$55.00
	12/01/2014	$35.75	$7.30	$12.70	$0.00	$55.75
	06/01/2015	$36.50	$7.30	$12.70	$0.00	$56.50
	12/01/2015	$37.25	$7.30	$12.70	$0.00	$57.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 2*	06/01/2014	$34.25	$7.30	$12.70	$0.00	$54.25
	12/01/2014	$35.00	$7.30	$12.70	$0.00	$55.00
	06/01/2015	$35.75	$7.30	$12.70	$0.00	$55.75
	12/01/2015	$36.50	$7.30	$12.70	$0.00	$56.50
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2014	$58.24	$9.80	$18.17	$0.00	$86.21
	08/01/2015	$60.34	$9.80	$18.17	$0.00	$88.31
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2014	$41.60	$9.80	$18.17	$0.00	$69.57
	08/01/2015	$43.10	$9.80	$18.17	$0.00	$71.07
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2014	$62.40	$9.80	$18.17	$0.00	$90.37
	08/01/2015	$64.65	$9.80	$18.17	$0.00	$92.62
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2014	$87.36	$9.80	$18.17	$0.00	$115.33
	08/01/2015	$90.51	$9.80	$18.17	$0.00	$118.48
ELECTRICIAN *ELECTRICIANS LOCAL 96*	06/01/2014	$38.12	$7.91	$12.86	$0.00	$58.89
	12/01/2014	$38.37	$8.16	$13.12	$0.00	$59.65
	06/01/2015	$38.87	$8.16	$13.62	$0.00	$60.65
	12/01/2015	$39.37	$8.41	$13.68	$0.00	$61.46

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 96*

Effective Date - 06/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$15.25	$7.91	$0.46	$0.00	$23.62
2	43	$16.39	$7.91	$0.49	$0.00	$24.79
3	48	$18.30	$7.91	$10.09	$0.00	$36.30
4	55	$20.97	$7.91	$10.47	$0.00	$39.35
5	65	$24.78	$7.91	$11.00	$0.00	$43.69
6	80	$30.50	$7.91	$11.81	$0.00	$50.22

Effective Date - 12/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$15.35	$8.16	$0.46	$0.00	$23.97
2	43	$16.50	$8.16	$0.50	$0.00	$25.16
3	48	$18.42	$8.16	$10.33	$0.00	$36.91
4	55	$21.10	$8.16	$10.70	$0.00	$39.96
5	65	$24.94	$8.16	$11.24	$0.00	$44.34
6	80	$30.70	$8.16	$12.05	$0.00	$50.91

Notes:

Steps 1-2 are 1000 hrs; Steps 3-6 are 1500 hrs.

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2012	$52.45	$8.78	$6.96	$0.00	$68.19

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.23	$8.78	$0.00	$0.00	$35.01
2	55	$28.85	$8.78	$6.96	$0.00	$44.59
3	65	$34.09	$8.78	$6.96	$0.00	$49.83
4	70	$36.72	$8.78	$6.96	$0.00	$52.46
5	80	$41.96	$8.78	$6.96	$0.00	$57.70

Notes:

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2012	$38.59	$8.78	$6.96	$0.00	$54.33

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FENCE & GUARD RAIL ERECTOR *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2014	$38.87	$10.00	$14.18	$0.00	$63.05
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2014	$40.29	$10.00	$14.18	$0.00	$64.47
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2014	$20.92	$10.00	$14.18	$0.00	$45.10
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 96*	06/01/2014	$38.12	$7.91	$12.86	$0.00	$58.89
	12/01/2014	$38.37	$8.16	$13.12	$0.00	$59.65
	06/01/2015	$38.87	$8.16	$13.62	$0.00	$60.65
	12/01/2015	$39.37	$8.41	$13.68	$0.00	$61.46
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINT/COMMISSIONING *ELECTRICIANS LOCAL 96*	06/01/2014	$38.12	$7.91	$12.86	$0.00	$58.89
	12/01/2014	$38.37	$8.16	$13.12	$0.00	$59.65
	06/01/2015	$38.87	$8.16	$13.62	$0.00	$60.65
	12/01/2015	$39.37	$8.41	$13.68	$0.00	$61.46
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$33.76	$10.00	$14.18	$0.00	$57.94
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER *LABORERS - ZONE 2*	06/01/2014	$20.50	$7.30	$12.10	$0.00	$39.90
	12/01/2014	$20.50	$7.30	$12.10	$0.00	$39.90
	06/01/2015	$20.50	$7.30	$12.10	$0.00	$39.90
	12/01/2015	$20.50	$7.30	$12.10	$0.00	$39.90
	06/01/2016	$20.50	$7.30	$12.10	$0.00	$39.90
	12/01/2016	$20.50	$7.30	$12.10	$0.00	$39.90
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE 1*	03/01/2014	$39.87	$9.80	$16.96	$0.00	$66.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.94	$9.80	$1.79	$0.00	$31.53
2	55	$21.93	$9.80	$1.79	$0.00	$33.52
3	60	$23.92	$9.80	$11.59	$0.00	$45.31
4	65	$25.92	$9.80	$11.59	$0.00	$47.31
5	70	$27.91	$9.80	$13.38	$0.00	$51.09
6	75	$29.90	$9.80	$13.38	$0.00	$53.08
7	80	$31.90	$9.80	$15.17	$0.00	$56.87
8	85	$33.89	$9.80	$15.17	$0.00	$58.86

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$28.11	$10.00	$14.18	$0.00	$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 2)*	07/01/2014	$36.26	$7.85	$16.10	$0.00	$60.21
	01/01/2015	$37.16	$7.85	$16.10	$0.00	$61.11
	07/01/2015	$38.06	$7.85	$16.10	$0.00	$62.01
	01/01/2016	$39.01	$7.85	$16.10	$0.00	$62.96
	07/01/2016	$39.96	$7.85	$16.10	$0.00	$63.91
	01/01/2017	$40.91	$7.85	$16.10	$0.00	$64.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *GLAZIER - Local 35 Zone 2*

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.13	$7.85	$0.00	$0.00	$25.98
2	55	$19.94	$7.85	$3.66	$0.00	$31.45
3	60	$21.76	$7.85	$3.99	$0.00	$33.60
4	65	$23.57	$7.85	$4.32	$0.00	$35.74
5	70	$25.38	$7.85	$14.11	$0.00	$47.34
6	75	$27.20	$7.85	$14.44	$0.00	$49.49
7	80	$29.01	$7.85	$14.77	$0.00	$51.63
8	90	$32.63	$7.85	$15.44	$0.00	$55.92

Effective Date - 01/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.58	$7.85	$0.00	$0.00	$26.43
2	55	$20.44	$7.85	$3.66	$0.00	$31.95
3	60	$22.30	$7.85	$3.99	$0.00	$34.14
4	65	$24.15	$7.85	$4.32	$0.00	$36.32
5	70	$26.01	$7.85	$14.11	$0.00	$47.97
6	75	$27.87	$7.85	$14.44	$0.00	$50.16
7	80	$29.73	$7.85	$14.77	$0.00	$52.35
8	90	$33.44	$7.85	$15.44	$0.00	$56.73

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 12/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.27	$10.00	$0.00	$0.00	$32.27
2	60	$24.29	$10.00	$14.18	$0.00	$48.47
3	65	$26.32	$10.00	$14.18	$0.00	$50.50
4	70	$28.34	$10.00	$14.18	$0.00	$52.52
5	75	$30.37	$10.00	$14.18	$0.00	$54.55
6	80	$32.39	$10.00	$14.18	$0.00	$56.57
7	85	$34.42	$10.00	$14.18	$0.00	$58.60
8	90	$36.44	$10.00	$14.18	$0.00	$60.62

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2014	$43.61	$9.82	$19.74	$2.17	$75.34
	02/01/2015	$44.51	$9.82	$19.74	$2.17	$76.24
	08/01/2015	$45.51	$9.82	$19.74	$2.17	$77.24
	02/01/2016	$46.51	$9.82	$19.74	$2.17	$78.24
	08/01/2016	$47.66	$9.82	$19.74	$2.17	$79.39
	02/01/2017	$48.76	$9.82	$19.74	$2.17	$80.49
	08/01/2017	$49.86	$9.82	$19.74	$2.17	$81.59
	02/01/2018	$51.01	$9.82	$19.74	$2.17	$82.74
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 96*	06/01/2014	$38.12	$7.91	$12.86	$0.00	$58.89
	12/01/2014	$38.37	$8.16	$13.12	$0.00	$59.65
	06/01/2015	$38.87	$8.16	$13.62	$0.00	$60.65
	12/01/2015	$39.37	$8.41	$13.68	$0.00	$61.46
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2014	$43.61	$9.82	$19.74	$2.17	$75.34
	02/01/2015	$44.51	$9.82	$19.74	$2.17	$76.24
	08/01/2015	$45.51	$9.82	$19.74	$2.17	$77.24
	02/01/2016	$46.51	$9.82	$19.74	$2.17	$78.24
	08/01/2016	$47.66	$9.82	$19.74	$2.17	$79.39
	02/01/2017	$48.76	$9.82	$19.74	$2.17	$80.49
	08/01/2017	$49.86	$9.82	$19.74	$2.17	$81.59
	02/01/2018	$51.01	$9.82	$19.74	$2.17	$82.74
For apprentice rates see "Apprentice- SHEET METAL WORKER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537*	03/01/2014	$48.19	$9.20	$16.14	$0.00	$73.53
	09/01/2014	$49.19	$9.20	$16.14	$0.00	$74.53
	03/01/2015	$50.19	$9.20	$16.14	$0.00	$75.53
	09/01/2015	$51.19	$9.20	$16.14	$0.00	$76.53
	03/01/2016	$52.19	$9.20	$16.14	$0.00	$77.53
	09/01/2016	$53.19	$9.20	$16.14	$0.00	$78.53
	03/01/2017	$54.19	$9.20	$16.14	$0.00	$79.53
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537*	03/01/2014	$48.19	$9.20	$16.14	$0.00	$73.53
	09/01/2014	$49.19	$9.20	$16.14	$0.00	$74.53
	03/01/2015	$50.19	$9.20	$16.14	$0.00	$75.53
	09/01/2015	$51.19	$9.20	$16.14	$0.00	$76.53
	03/01/2016	$52.19	$9.20	$16.14	$0.00	$77.53
	09/01/2016	$53.19	$9.20	$16.14	$0.00	$78.53
	03/01/2017	$54.19	$9.20	$16.14	$0.00	$79.53
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 2*	06/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	12/01/2014	$31.60	$7.30	$12.10	$0.00	$51.00
	06/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	12/01/2015	$32.60	$7.30	$12.10	$0.00	$52.00
	06/01/2016	$33.10	$7.30	$12.10	$0.00	$52.50
	12/01/2016	$33.85	$7.30	$12.10	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2013	$42.11	$10.95	$12.10	$0.00	$65.16
	09/01/2014	$44.11	$10.95	$12.10	$0.00	$67.16

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.06	$10.95	$9.00	$0.00	$41.01
2	60	$25.27	$10.95	$9.62	$0.00	$45.84
3	70	$29.48	$10.95	$10.24	$0.00	$50.67
4	80	$33.69	$10.95	$10.86	$0.00	$55.50

Effective Date - 09/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.06	$10.95	$9.00	$0.00	$42.01
2	60	$26.47	$10.95	$9.62	$0.00	$47.04
3	70	$30.88	$10.95	$10.24	$0.00	$52.07
4	80	$35.29	$10.95	$10.86	$0.00	$57.10

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (WORCESTER AREA)*	03/16/2014	$40.89	$7.70	$19.25	$0.00	$67.84

Apprentice - *IRONWORKER - Local 7 Worcester*

Effective Date - 03/16/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$24.53	$7.70	$19.25	$0.00	$51.48
2	70	$28.62	$7.70	$19.25	$0.00	$55.57
3	75	$30.67	$7.70	$19.25	$0.00	$57.62
4	80	$32.71	$7.70	$19.25	$0.00	$59.66
5	85	$34.76	$7.70	$19.25	$0.00	$61.71
6	90	$36.80	$7.70	$19.25	$0.00	$63.75

Notes:

Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75

For apprentice rates see "Apprentice- LABORER"

LABORER *LABORERS - ZONE 2*	06/01/2014	$30.35	$7.30	$12.10	$0.00	$49.75
	12/01/2014	$30.85	$7.30	$12.10	$0.00	$50.25
	06/01/2015	$31.35	$7.30	$12.10	$0.00	$50.75
	12/01/2015	$31.85	$7.30	$12.10	$0.00	$51.25
	06/01/2016	$32.35	$7.30	$12.10	$0.00	$51.75
	12/01/2016	$33.10	$7.30	$12.10	$0.00	$52.50

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 2*

Effective Date - 06/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.21	$7.30	$12.10	$0.00	$37.61
2	70	$21.25	$7.30	$12.10	$0.00	$40.65
3	80	$24.28	$7.30	$12.10	$0.00	$43.68
4	90	$27.32	$7.30	$12.10	$0.00	$46.72

Effective Date - 12/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.51	$7.30	$12.10	$0.00	$37.91
2	70	$21.60	$7.30	$12.10	$0.00	$41.00
3	80	$24.68	$7.30	$12.10	$0.00	$44.08
4	90	$27.77	$7.30	$12.10	$0.00	$47.17

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 2*	06/01/2014	$30.35	$7.30	$12.10	$0.00	$49.75
	12/01/2014	$30.85	$7.30	$12.10	$0.00	$50.25
	06/01/2015	$31.35	$7.30	$12.10	$0.00	$50.75
	12/01/2015	$31.85	$7.30	$12.10	$0.00	$51.25
	06/01/2016	$32.35	$7.30	$12.10	$0.00	$51.75
	12/01/2016	$33.10	$7.30	$12.10	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 2*	06/01/2014	$30.35	$7.30	$12.10	$0.00	$49.75
	12/01/2014	$30.85	$7.30	$12.10	$0.00	$50.25
	06/01/2015	$31.35	$7.30	$12.10	$0.00	$50.75
	12/01/2015	$31.85	$7.30	$12.10	$0.00	$51.25
	06/01/2016	$32.35	$7.30	$12.10	$0.00	$51.75
	12/01/2016	$33.10	$7.30	$12.10	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 2*	06/01/2014	$30.55	$7.30	$12.05	$0.00	$49.90
	12/01/2014	$31.05	$7.30	$12.05	$0.00	$50.40
	06/01/2015	$31.55	$7.30	$12.05	$0.00	$50.90
	12/01/2015	$32.05	$7.30	$12.05	$0.00	$51.40
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 2*	06/01/2014	$30.35	$7.30	$12.10	$0.00	$49.75
	12/01/2014	$30.85	$7.30	$12.10	$0.00	$50.25
	06/01/2015	$31.35	$7.30	$12.10	$0.00	$50.75
	12/01/2015	$31.85	$7.30	$12.10	$0.00	$51.25
	06/01/2016	$32.35	$7.30	$12.10	$0.00	$51.75
	12/01/2016	$33.10	$7.30	$12.10	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 2*	06/01/2014	$30.35	$7.30	$12.10	$0.00	$49.75
	12/01/2014	$30.85	$7.30	$12.10	$0.00	$50.25
	06/01/2015	$31.35	$7.30	$12.10	$0.00	$50.75
	12/01/2015	$31.85	$7.30	$12.10	$0.00	$51.25
	06/01/2016	$32.35	$7.30	$12.10	$0.00	$51.75
	12/01/2016	$33.10	$7.30	$12.10	$0.00	$52.50
This classification applies to all tree work associated with the removal of standing trees, and trimming and removal of branches and limbs when the work is not done for a utility company for the purpose of operation, maintenance or repair of utility company equipment. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2014	$37.37	$10.18	$16.90	$0.00	$64.45
	02/01/2015	$37.82	$10.18	$16.90	$0.00	$64.90
	08/01/2015	$38.53	$10.18	$16.97	$0.00	$65.68
	02/01/2016	$38.98	$10.18	$16.97	$0.00	$66.13
	08/01/2016	$39.68	$10.18	$17.05	$0.00	$66.91
	02/01/2017	$40.14	$10.18	$17.05	$0.00	$67.37

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.69	$10.18	$16.90	$0.00	$45.77
2	60	$22.42	$10.18	$16.90	$0.00	$49.50
3	70	$26.16	$10.18	$16.90	$0.00	$53.24
4	80	$29.90	$10.18	$16.90	$0.00	$56.98
5	90	$33.63	$10.18	$16.90	$0.00	$60.71

Effective Date - 02/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.91	$10.18	$16.90	$0.00	$45.99
2	60	$22.69	$10.18	$16.90	$0.00	$49.77
3	70	$26.47	$10.18	$16.90	$0.00	$53.55
4	80	$30.26	$10.18	$16.90	$0.00	$57.34
5	90	$34.04	$10.18	$16.90	$0.00	$61.12

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2014	$49.00	$10.18	$18.22	$0.00	$77.40
	02/01/2015	$49.56	$10.18	$18.22	$0.00	$77.96
	08/01/2015	$50.46	$10.18	$18.29	$0.00	$78.93
	02/01/2016	$51.03	$10.18	$18.29	$0.00	$79.50
	08/01/2016	$51.93	$10.18	$18.37	$0.00	$80.48
	02/01/2017	$52.50	$10.18	$18.37	$0.00	$81.05

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.50	$10.18	$18.22	$0.00	$52.90
2	60	$29.40	$10.18	$18.22	$0.00	$57.80
3	70	$34.30	$10.18	$18.22	$0.00	$62.70
4	80	$39.20	$10.18	$18.22	$0.00	$67.60
5	90	$44.10	$10.18	$18.22	$0.00	$72.50

Effective Date - 02/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.78	$10.18	$18.22	$0.00	$53.18
2	60	$29.74	$10.18	$18.22	$0.00	$58.14
3	70	$34.69	$10.18	$18.22	$0.00	$63.09
4	80	$39.65	$10.18	$18.22	$0.00	$68.05
5	90	$44.60	$10.18	$18.22	$0.00	$73.00

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 2) *MILLWRIGHTS LOCAL 1121 - Zone 2*	04/01/2014	$33.16	$9.80	$16.21	$0.00	$59.17
	10/01/2014	$33.92	$9.80	$16.21	$0.00	$59.93
	04/01/2015	$34.69	$9.80	$16.21	$0.00	$60.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 2*

Effective Date - 04/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$18.24	$9.80	$4.48	$0.00	$32.52
2	65	$21.55	$9.80	$13.36	$0.00	$44.71
3	75	$24.87	$9.80	$14.18	$0.00	$48.85
4	85	$28.19	$9.80	$14.99	$0.00	$52.98

Effective Date - 10/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$18.66	$9.80	$4.48	$0.00	$32.94
2	65	$22.05	$9.80	$13.36	$0.00	$45.21
3	75	$25.44	$9.80	$14.18	$0.00	$49.42
4	85	$28.83	$9.80	$14.99	$0.00	$53.62

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$20.96	$10.00	$14.18	$0.00	$45.14
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$24.43	$10.00	$14.18	$0.00	$48.61
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2014	$46.76	$7.85	$16.10	$0.00	$70.71
	01/01/2015	$47.66	$7.85	$16.10	$0.00	$71.61
	07/01/2015	$48.56	$7.85	$16.10	$0.00	$72.51
	01/01/2016	$49.51	$7.85	$16.10	$0.00	$73.46
	07/01/2016	$50.46	$7.85	$16.10	$0.00	$74.41
	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.38	$7.85	$0.00	$0.00	$31.23
2	55	$25.72	$7.85	$3.66	$0.00	$37.23
3	60	$28.06	$7.85	$3.99	$0.00	$39.90
4	65	$30.39	$7.85	$4.32	$0.00	$42.56
5	70	$32.73	$7.85	$14.11	$0.00	$54.69
6	75	$35.07	$7.85	$14.44	$0.00	$57.36
7	80	$37.41	$7.85	$14.77	$0.00	$60.03
8	90	$42.08	$7.85	$15.44	$0.00	$65.37

Effective Date - 01/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.83	$7.85	$0.00	$0.00	$31.68
2	55	$26.21	$7.85	$3.66	$0.00	$37.72
3	60	$28.60	$7.85	$3.99	$0.00	$40.44
4	65	$30.98	$7.85	$4.32	$0.00	$43.15
5	70	$33.36	$7.85	$14.11	$0.00	$55.32
6	75	$35.75	$7.85	$14.44	$0.00	$58.04
7	80	$38.13	$7.85	$14.77	$0.00	$60.75
8	90	$42.89	$7.85	$15.44	$0.00	$66.18

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	07/01/2014	$37.66	$7.85	$16.10	$0.00	$61.61
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2015	$38.56	$7.85	$16.10	$0.00	$62.51
	07/01/2015	$39.46	$7.85	$16.10	$0.00	$63.41
	01/01/2016	$40.41	$7.85	$16.10	$0.00	$64.36
	07/01/2016	$41.36	$7.85	$16.10	$0.00	$65.31
	01/01/2017	$42.31	$7.85	$16.10	$0.00	$66.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.83	$7.85	$0.00	$0.00	$26.68
2	55	$20.71	$7.85	$3.66	$0.00	$32.22
3	60	$22.60	$7.85	$3.99	$0.00	$34.44
4	65	$24.48	$7.85	$4.32	$0.00	$36.65
5	70	$26.36	$7.85	$14.11	$0.00	$48.32
6	75	$28.25	$7.85	$14.44	$0.00	$50.54
7	80	$30.13	$7.85	$14.77	$0.00	$52.75
8	90	$33.89	$7.85	$15.44	$0.00	$57.18

Effective Date - 01/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.28	$7.85	$0.00	$0.00	$27.13
2	55	$21.21	$7.85	$3.66	$0.00	$32.72
3	60	$23.14	$7.85	$3.99	$0.00	$34.98
4	65	$25.06	$7.85	$4.32	$0.00	$37.23
5	70	$26.99	$7.85	$14.11	$0.00	$48.95
6	75	$28.92	$7.85	$14.44	$0.00	$51.21
7	80	$30.85	$7.85	$14.77	$0.00	$53.47
8	90	$34.70	$7.85	$15.44	$0.00	$57.99

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2014	$35.72	$7.85	$16.10	$0.00	$59.67
	01/01/2015	$36.62	$7.85	$16.10	$0.00	$60.57
	07/01/2015	$37.52	$7.85	$16.10	$0.00	$61.47
	01/01/2016	$38.47	$7.85	$16.10	$0.00	$62.42
	07/01/2016	$39.42	$7.85	$16.10	$0.00	$63.37
	01/01/2017	$40.37	$7.85	$16.10	$0.00	$64.32

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint*

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.86	$7.85	$0.00	$0.00	$25.71
2	55	$19.65	$7.85	$3.66	$0.00	$31.16
3	60	$21.43	$7.85	$3.99	$0.00	$33.27
4	65	$23.22	$7.85	$4.32	$0.00	$35.39
5	70	$25.00	$7.85	$14.11	$0.00	$46.96
6	75	$26.79	$7.85	$14.44	$0.00	$49.08
7	80	$28.58	$7.85	$14.77	$0.00	$51.20
8	90	$32.15	$7.85	$15.44	$0.00	$55.44

Effective Date - 01/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.31	$7.85	$0.00	$0.00	$26.16
2	55	$20.14	$7.85	$3.66	$0.00	$31.65
3	60	$21.97	$7.85	$3.99	$0.00	$33.81
4	65	$23.80	$7.85	$4.32	$0.00	$35.97
5	70	$25.63	$7.85	$14.11	$0.00	$47.59
6	75	$27.47	$7.85	$14.44	$0.00	$49.76
7	80	$29.30	$7.85	$14.77	$0.00	$51.92
8	90	$32.96	$7.85	$15.44	$0.00	$56.25

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) *LABORERS - ZONE 2*	06/01/2014	$30.35	$7.30	$12.10	$0.00	$49.75
	12/01/2014	$30.85	$7.30	$12.10	$0.00	$50.25
	06/01/2015	$31.35	$7.30	$12.10	$0.00	$50.75
	12/01/2015	$31.85	$7.30	$12.10	$0.00	$51.25
	06/01/2016	$32.35	$7.30	$12.10	$0.00	$51.75
	12/01/2016	$33.10	$7.30	$12.10	$0.00	$52.50
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	07/01/2014	$36.26	$7.85	$16.10	$0.00	$60.21
	01/01/2015	$37.16	$7.85	$16.10	$0.00	$61.11
	07/01/2015	$38.06	$7.85	$16.10	$0.00	$62.01
	01/01/2016	$39.01	$7.85	$16.10	$0.00	$62.96
	07/01/2016	$39.96	$7.85	$16.10	$0.00	$63.91
	01/01/2017	$40.91	$7.85	$16.10	$0.00	$64.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.13	$7.85	$0.00	$0.00	$25.98
2	55	$19.94	$7.85	$3.66	$0.00	$31.45
3	60	$21.76	$7.85	$3.99	$0.00	$33.60
4	65	$23.57	$7.85	$4.32	$0.00	$35.74
5	70	$25.38	$7.85	$14.11	$0.00	$47.34
6	75	$27.20	$7.85	$14.44	$0.00	$49.49
7	80	$29.01	$7.85	$14.77	$0.00	$51.63
8	90	$32.63	$7.85	$15.44	$0.00	$55.92

Effective Date - 01/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.58	$7.85	$0.00	$0.00	$26.43
2	55	$20.44	$7.85	$3.66	$0.00	$31.95
3	60	$22.30	$7.85	$3.99	$0.00	$34.14
4	65	$24.15	$7.85	$4.32	$0.00	$36.32
5	70	$26.01	$7.85	$14.11	$0.00	$47.97
6	75	$27.87	$7.85	$14.44	$0.00	$50.16
7	80	$29.73	$7.85	$14.77	$0.00	$52.35
8	90	$33.44	$7.85	$15.44	$0.00	$56.73

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2014	$34.32	$7.85	$16.10	$0.00	$58.27
	01/01/2015	$35.22	$7.85	$16.10	$0.00	$59.17
	07/01/2015	$36.12	$7.85	$16.10	$0.00	$60.07
	01/01/2016	$37.07	$7.85	$16.10	$0.00	$61.02
	07/01/2016	$38.02	$7.85	$16.10	$0.00	$61.97
	01/01/2017	$38.97	$7.85	$16.10	$0.00	$62.92

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

Effective Date - 07/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.16	$7.85	$0.00	$0.00	$25.01
2	55	$18.88	$7.85	$3.66	$0.00	$30.39
3	60	$20.59	$7.85	$3.99	$0.00	$32.43
4	65	$22.31	$7.85	$4.32	$0.00	$34.48
5	70	$24.02	$7.85	$14.11	$0.00	$45.98
6	75	$25.74	$7.85	$14.44	$0.00	$48.03
7	80	$27.46	$7.85	$14.77	$0.00	$50.08
8	90	$30.89	$7.85	$15.44	$0.00	$54.18

Effective Date - 01/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.61	$7.85	$0.00	$0.00	$25.46
2	55	$19.37	$7.85	$3.66	$0.00	$30.88
3	60	$21.13	$7.85	$3.99	$0.00	$32.97
4	65	$22.89	$7.85	$4.32	$0.00	$35.06
5	70	$24.65	$7.85	$14.11	$0.00	$46.61
6	75	$26.42	$7.85	$14.44	$0.00	$48.71
7	80	$28.18	$7.85	$14.77	$0.00	$50.80
8	90	$31.70	$7.85	$15.44	$0.00	$54.99

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2012	$30.28	$9.07	$8.00	$0.00	$47.35
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2014	$41.60	$9.80	$18.17	$0.00	$69.57
	08/01/2015	$43.10	$9.80	$18.17	$0.00	$71.07
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2014	$41.60	$9.80	$18.17	$0.00	$69.57
	08/01/2015	$43.10	$9.80	$18.17	$0.00	$71.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.80	$9.80	$18.17	$0.00	$48.77
2	60	$24.96	$9.80	$18.17	$0.00	$52.93
3	70	$29.12	$9.80	$18.17	$0.00	$57.09
4	75	$31.20	$9.80	$18.17	$0.00	$59.17
5	80	$33.28	$9.80	$18.17	$0.00	$61.25
6	80	$33.28	$9.80	$18.17	$0.00	$61.25
7	90	$37.44	$9.80	$18.17	$0.00	$65.41
8	90	$37.44	$9.80	$18.17	$0.00	$65.41

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.55	$9.80	$18.17	$0.00	$49.52
2	60	$25.86	$9.80	$18.17	$0.00	$53.83
3	70	$30.17	$9.80	$18.17	$0.00	$58.14
4	75	$32.33	$9.80	$18.17	$0.00	$60.30
5	80	$34.48	$9.80	$18.17	$0.00	$62.45
6	80	$34.48	$9.80	$18.17	$0.00	$62.45
7	90	$38.79	$9.80	$18.17	$0.00	$66.76
8	90	$38.79	$9.80	$18.17	$0.00	$66.76

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537*	03/01/2014	$48.19	$9.20	$16.14	$0.00	$73.53
	09/01/2014	$49.19	$9.20	$16.14	$0.00	$74.53
	03/01/2015	$50.19	$9.20	$16.14	$0.00	$75.53
	09/01/2015	$51.19	$9.20	$16.14	$0.00	$76.53
	03/01/2016	$52.19	$9.20	$16.14	$0.00	$77.53
	09/01/2016	$53.19	$9.20	$16.14	$0.00	$78.53
	03/01/2017	$54.19	$9.20	$16.14	$0.00	$79.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PIPEFITTER - Local 537*

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.28	$9.20	$7.00	$0.00	$35.48
2	45	$21.69	$9.20	$16.14	$0.00	$47.03
3	60	$28.91	$9.20	$16.14	$0.00	$54.25
4	70	$33.73	$9.20	$16.14	$0.00	$59.07
5	80	$38.55	$9.20	$16.14	$0.00	$63.89

Effective Date - 09/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.68	$9.20	$7.00	$0.00	$35.88
2	45	$22.14	$9.20	$16.14	$0.00	$47.48
3	60	$29.51	$9.20	$16.14	$0.00	$54.85
4	70	$34.43	$9.20	$16.14	$0.00	$59.77
5	80	$39.35	$9.20	$16.14	$0.00	$64.69

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

PIPELAYER *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
PLUMBERS & GASFITTERS *PLUMBERS & GASFITTERS LOCAL 12*	03/01/2014	$49.41	$9.82	$14.29	$0.00	$73.52
	09/01/2014	$50.41	$9.82	$14.29	$0.00	$74.52
	03/01/2015	$51.41	$9.82	$14.29	$0.00	$75.52
	09/01/2015	$52.41	$9.82	$14.29	$0.00	$76.52
	03/01/2016	$53.56	$9.82	$14.29	$0.00	$77.67
	09/01/2016	$54.61	$9.82	$14.29	$0.00	$78.72
	03/01/2017	$55.61	$9.82	$14.29	$0.00	$79.72

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PLUMBER/GASFITTER - Local 12*

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.29	$9.82	$5.33	$0.00	$32.44
2	40	$19.76	$9.82	$6.02	$0.00	$35.60
3	55	$27.18	$9.82	$8.08	$0.00	$45.08
4	65	$32.12	$9.82	$9.47	$0.00	$51.41
5	75	$37.06	$9.82	$10.85	$0.00	$57.73

Effective Date - 09/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.64	$9.82	$5.33	$0.00	$32.79
2	40	$20.16	$9.82	$6.02	$0.00	$36.00
3	55	$27.73	$9.82	$8.08	$0.00	$45.63
4	65	$32.77	$9.82	$9.47	$0.00	$52.06
5	75	$37.81	$9.82	$10.85	$0.00	$58.48

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic$54.58 Step5 with lic$60.90

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537*	03/01/2014	$48.19	$9.20	$16.14	$0.00	$73.53
	09/01/2014	$49.19	$9.20	$16.14	$0.00	$74.53
	03/01/2015	$50.19	$9.20	$16.14	$0.00	$75.53
	09/01/2015	$51.19	$9.20	$16.14	$0.00	$76.53
	03/01/2016	$52.19	$9.20	$16.14	$0.00	$77.53
	09/01/2016	$53.19	$9.20	$16.14	$0.00	$78.53
	03/01/2017	$54.19	$9.20	$16.14	$0.00	$79.53
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER *LABORERS - ZONE 2*	06/01/2014	$31.35	$7.30	$12.10	$0.00	$50.75
	12/01/2014	$31.85	$7.30	$12.10	$0.00	$51.25
	06/01/2015	$32.35	$7.30	$12.10	$0.00	$51.75
	12/01/2015	$32.85	$7.30	$12.10	$0.00	$52.25
	06/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
	12/01/2016	$34.10	$7.30	$12.10	$0.00	$53.50
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2013	$28.11	$10.00	$14.18	$0.00	$52.29
READY-MIX CONCRETE DRIVER *TEAMSTERS LOCAL 170*	05/01/2010	$22.04	$6.50	$5.44	$0.00	$33.98
RECLAIMERS *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
RESIDENTIAL WOOD FRAME (All Other Work) *CARPENTERS -ZONE 2 (Residential Wood)*	04/01/2011	$24.24	$8.67	$15.51	$0.00	$48.42
RESIDENTIAL WOOD FRAME CARPENTER ** ** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement.*CARPENTERS -ZONE 2 (Residential Wood)* As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER rate.	05/01/2011	$24.24	$6.34	$6.23	$0.00	$36.81

Apprentice - *CARPENTER (Residential Wood Frame) - Zone 2*

Effective Date - 05/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$14.54	$6.34	$0.00	$0.00	$20.88
2	60	$14.54	$6.34	$6.23	$0.00	$27.11
3	65	$15.76	$6.34	$6.23	$0.00	$28.33
4	70	$16.97	$6.34	$6.23	$0.00	$29.54
5	75	$18.18	$6.34	$6.23	$0.00	$30.75
6	80	$19.39	$6.34	$6.23	$0.00	$31.96
7	85	$20.60	$6.34	$6.23	$0.00	$33.17
8	90	$21.82	$6.34	$6.23	$0.00	$34.39

Notes:

Apprentice to Journeyworker Ratio:1:5

RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	08/01/2014	$39.21	$10.50	$11.60	$0.00	$61.31
	02/01/2015	$40.11	$10.50	$11.60	$0.00	$62.21
	08/01/2015	$41.01	$10.50	$11.60	$0.00	$63.11
	02/01/2016	$41.91	$10.50	$11.60	$0.00	$64.01

Apprentice - *ROOFER - Local 33*

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.61	$10.50	$3.38	$0.00	$33.49
2	60	$23.53	$10.50	$11.60	$0.00	$45.63
3	65	$25.49	$10.50	$11.60	$0.00	$47.59
4	75	$29.41	$10.50	$11.60	$0.00	$51.51
5	85	$33.33	$10.50	$11.60	$0.00	$55.43

Effective Date - 02/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.06	$10.50	$3.38	$0.00	$33.94
2	60	$24.07	$10.50	$11.60	$0.00	$46.17
3	65	$26.07	$10.50	$11.60	$0.00	$48.17
4	75	$30.08	$10.50	$11.60	$0.00	$52.18
5	85	$34.09	$10.50	$11.60	$0.00	$56.19

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	08/01/2014	$39.46	$10.50	$11.60	$0.00	$61.56
	02/01/2015	$40.36	$10.50	$11.60	$0.00	$62.46
	08/01/2015	$41.26	$10.50	$11.60	$0.00	$63.36
	02/01/2016	$42.16	$10.50	$11.60	$0.00	$64.26
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2014	$43.61	$9.82	$19.74	$2.17	$75.34
	02/01/2015	$44.51	$9.82	$19.74	$2.17	$76.24
	08/01/2015	$45.51	$9.82	$19.74	$2.17	$77.24
	02/01/2016	$46.51	$9.82	$19.74	$2.17	$78.24
	08/01/2016	$47.66	$9.82	$19.74	$2.17	$79.39
	02/01/2017	$48.76	$9.82	$19.74	$2.17	$80.49
	08/01/2017	$49.86	$9.82	$19.74	$2.17	$81.59
	02/01/2018	$51.01	$9.82	$19.74	$2.17	$82.74

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.44	$9.82	$4.28	$0.00	$31.54
2	40	$17.44	$9.82	$4.28	$0.00	$31.54
3	45	$19.62	$9.82	$8.70	$1.13	$39.27
4	45	$19.62	$9.82	$8.70	$1.13	$39.27
5	50	$21.81	$9.82	$9.49	$1.22	$42.34
6	50	$21.81	$9.82	$9.74	$1.23	$42.60
7	60	$26.17	$9.82	$11.05	$1.40	$48.44
8	65	$28.35	$9.82	$11.84	$1.48	$51.49
9	75	$32.71	$9.82	$13.41	$1.66	$57.60
10	85	$37.07	$9.82	$14.48	$1.82	$63.19

Effective Date - 02/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.80	$9.82	$4.28	$0.00	$31.90
2	40	$17.80	$9.82	$4.28	$0.00	$31.90
3	45	$20.03	$9.82	$8.70	$1.16	$39.71
4	45	$20.03	$9.82	$8.70	$1.16	$39.71
5	50	$22.26	$9.82	$9.49	$1.25	$42.82
6	50	$22.26	$9.82	$9.74	$1.25	$43.07
7	60	$26.71	$9.82	$11.05	$1.43	$49.01
8	65	$28.93	$9.82	$11.84	$1.52	$52.11
9	75	$33.38	$9.82	$13.41	$1.70	$58.31
10	85	$37.83	$9.82	$14.48	$1.86	$63.99

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SIGN ERECTOR *PAINTERS LOCAL 35 - ZONE 2*	06/01/2013	$25.81	$7.07	$7.05	$0.00	$39.93

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SIGN ERECTOR - Local 35 Zone 2*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$12.91	$7.07	$0.00	$0.00	$19.98
2	55	$14.20	$7.07	$2.45	$0.00	$23.72
3	60	$15.49	$7.07	$2.45	$0.00	$25.01
4	65	$16.78	$7.07	$2.45	$0.00	$26.30
5	70	$18.07	$7.07	$7.05	$0.00	$32.19
6	75	$19.36	$7.07	$7.05	$0.00	$33.48
7	80	$20.65	$7.07	$7.05	$0.00	$34.77
8	85	$21.94	$7.07	$7.05	$0.00	$36.06
9	90	$23.23	$7.07	$7.05	$0.00	$37.35

Notes:

Steps are 4 mos.

Apprentice to Journeyworker Ratio:1:1

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2014	$31.59	$9.91	$8.80	$0.00	$50.30
	12/01/2014	$31.59	$9.91	$9.33	$0.00	$50.83
	06/01/2015	$31.94	$9.91	$9.33	$0.00	$51.18
	08/01/2015	$31.94	$10.41	$9.33	$0.00	$51.68
	12/01/2015	$31.94	$10.41	$10.08	$0.00	$52.43
	06/01/2016	$32.44	$10.41	$10.08	$0.00	$52.93
	08/01/2016	$32.44	$10.91	$10.08	$0.00	$53.43
	12/01/2016	$32.44	$10.91	$10.89	$0.00	$54.24
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2014	$31.88	$9.91	$8.80	$0.00	$50.59
	12/01/2014	$31.88	$9.91	$9.33	$0.00	$51.12
	06/01/2015	$32.23	$9.91	$9.33	$0.00	$51.47
	08/01/2015	$32.23	$10.41	$9.33	$0.00	$51.97
	12/01/2015	$32.23	$10.41	$10.08	$0.00	$52.72
	06/01/2016	$32.73	$10.41	$10.08	$0.00	$53.22
	08/01/2016	$32.73	$10.91	$10.08	$0.00	$53.72
	12/01/2016	$32.73	$10.91	$10.89	$0.00	$54.53
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1*	03/01/2014	$53.58	$8.42	$13.60	$0.00	$75.60
	10/01/2014	$54.73	$8.42	$13.60	$0.00	$76.75
	01/01/2015	$54.73	$8.42	$13.75	$0.00	$76.90
	03/01/2015	$55.73	$8.42	$13.75	$0.00	$77.90
	10/01/2015	$56.88	$8.42	$13.75	$0.00	$79.05
	01/01/2016	$56.88	$8.67	$13.90	$0.00	$79.45
	03/01/2016	$57.88	$8.67	$13.90	$0.00	$80.45
	10/01/2016	$59.03	$8.67	$13.90	$0.00	$81.60
	03/01/2017	$60.03	$8.67	$13.90	$0.00	$82.60

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SPRINKLER FITTER - Local 550 (Section A) Zone 1*

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$18.75	$8.42	$8.25	$0.00	$35.42
2	40	$21.43	$8.42	$8.25	$0.00	$38.10
3	45	$24.11	$8.42	$8.25	$0.00	$40.78
4	50	$26.79	$8.42	$8.25	$0.00	$43.46
5	55	$29.47	$8.42	$8.25	$0.00	$46.14
6	60	$32.15	$8.42	$8.25	$0.00	$48.82
7	65	$34.83	$8.42	$8.25	$0.00	$51.50
8	70	$37.51	$8.42	$8.25	$0.00	$54.18
9	75	$40.19	$8.42	$8.25	$0.00	$56.86
10	80	$42.86	$8.42	$8.25	$0.00	$59.53

Effective Date - 10/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$19.16	$8.42	$8.25	$0.00	$35.83
2	40	$21.89	$8.42	$8.25	$0.00	$38.56
3	45	$24.63	$8.42	$8.25	$0.00	$41.30
4	50	$27.37	$8.42	$8.25	$0.00	$44.04
5	55	$30.10	$8.42	$8.25	$0.00	$46.77
6	60	$32.84	$8.42	$8.25	$0.00	$49.51
7	65	$35.57	$8.42	$8.25	$0.00	$52.24
8	70	$38.31	$8.42	$8.25	$0.00	$54.98
9	75	$41.05	$8.42	$8.25	$0.00	$57.72
10	80	$43.78	$8.42	$8.25	$0.00	$60.45

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2014	$47.90	$10.18	$18.22	$0.00	$76.30
	02/01/2015	$48.46	$10.18	$18.22	$0.00	$76.86
	08/01/2015	$49.36	$10.18	$18.29	$0.00	$77.83
	02/01/2016	$49.93	$10.18	$18.29	$0.00	$78.40
	08/01/2016	$50.83	$10.18	$18.37	$0.00	$79.38
	02/01/2017	$51.40	$10.18	$18.37	$0.00	$79.95

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.95	$10.18	$18.22	$0.00	$52.35
2	60	$28.74	$10.18	$18.22	$0.00	$57.14
3	70	$33.53	$10.18	$18.22	$0.00	$61.93
4	80	$38.32	$10.18	$18.22	$0.00	$66.72
5	90	$43.11	$10.18	$18.22	$0.00	$71.51

Effective Date - 02/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.23	$10.18	$18.22	$0.00	$52.63
2	60	$29.08	$10.18	$18.22	$0.00	$57.48
3	70	$33.92	$10.18	$18.22	$0.00	$62.32
4	80	$38.77	$10.18	$18.22	$0.00	$67.17
5	90	$43.61	$10.18	$18.22	$0.00	$72.01

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	06/01/2014	$35.45	$7.30	$12.90	$0.00	$55.65
	12/01/2014	$36.20	$7.30	$12.90	$0.00	$56.40
	06/01/2015	$36.95	$7.30	$12.90	$0.00	$57.15
	12/01/2015	$37.70	$7.30	$12.90	$0.00	$57.90
	06/01/2016	$38.45	$7.30	$12.90	$0.00	$58.65
	12/01/2016	$39.45	$7.30	$12.90	$0.00	$59.65
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	06/01/2014	$34.17	$7.30	$12.90	$0.00	$54.37
	12/01/2014	$34.92	$7.30	$12.90	$0.00	$55.12
	06/01/2015	$35.67	$7.30	$12.90	$0.00	$55.87
	12/01/2015	$36.42	$7.30	$12.90	$0.00	$56.62
	06/01/2016	$37.17	$7.30	$12.90	$0.00	$57.37
	12/01/2016	$38.17	$7.30	$12.90	$0.00	$58.37
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2014	$34.05	$7.30	$12.90	$0.00	$54.25
	12/01/2014	$34.80	$7.30	$12.90	$0.00	$55.00
	06/01/2015	$35.55	$7.30	$12.90	$0.00	$55.75
	12/01/2015	$36.30	$7.30	$12.90	$0.00	$56.50
	06/01/2016	$37.05	$7.30	$12.90	$0.00	$57.25
	12/01/2016	$38.05	$7.30	$12.90	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.11	$10.00	$14.18	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2014	$32.17	$9.91	$8.80	$0.00	$50.88
	12/01/2014	$32.17	$9.91	$9.33	$0.00	$51.41
	06/01/2015	$32.52	$9.91	$9.33	$0.00	$51.76
	08/01/2015	$32.52	$10.41	$9.33	$0.00	$52.26
	12/01/2015	$32.52	$10.41	$10.08	$0.00	$53.01
	06/01/2016	$33.02	$10.41	$10.08	$0.00	$53.51
	08/01/2016	$33.02	$10.91	$10.08	$0.00	$54.01
	12/01/2016	$33.02	$10.91	$10.89	$0.00	$54.82
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	06/01/2014	$46.33	$7.30	$13.30	$0.00	$66.93
	12/01/2014	$47.08	$7.30	$13.30	$0.00	$67.68
	06/01/2015	$47.83	$7.30	$13.30	$0.00	$68.43
	12/01/2015	$48.58	$7.30	$13.30	$0.00	$69.18
	06/01/2016	$49.33	$7.30	$13.30	$0.00	$69.93
	12/01/2016	$50.33	$7.30	$13.30	$0.00	$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	06/01/2014	$48.33	$7.30	$13.30	$0.00	$68.93
	12/01/2014	$49.08	$7.30	$13.30	$0.00	$69.68
	06/01/2015	$49.83	$7.30	$13.30	$0.00	$70.43
	12/01/2015	$50.58	$7.30	$13.30	$0.00	$71.18
	06/01/2016	$51.33	$7.30	$13.30	$0.00	$71.93
	12/01/2016	$52.33	$7.30	$13.30	$0.00	$72.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	06/01/2014	$38.40	$7.30	$13.30	$0.00	$59.00
	12/01/2014	$39.15	$7.30	$13.30	$0.00	$59.75
	06/01/2015	$39.90	$7.30	$13.30	$0.00	$60.50
	12/01/2015	$40.65	$7.30	$13.30	$0.00	$61.25
	06/01/2016	$41.40	$7.30	$13.30	$0.00	$62.00
	12/01/2016	$42.40	$7.30	$13.30	$0.00	$63.00
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	06/01/2014	$40.40	$7.30	$13.30	$0.00	$61.00
	12/01/2014	$41.15	$7.30	$13.30	$0.00	$61.75
	06/01/2015	$41.90	$7.30	$13.30	$0.00	$62.50
	12/01/2015	$42.65	$7.30	$13.30	$0.00	$63.25
	06/01/2016	$43.40	$7.30	$13.30	$0.00	$64.00
	12/01/2016	$44.40	$7.30	$13.30	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2014	$31.59	$9.91	$8.80	$0.00	$50.30
	12/01/2014	$31.59	$9.91	$9.33	$0.00	$50.83
	06/01/2015	$31.94	$9.91	$9.33	$0.00	$51.18
	08/01/2015	$31.94	$10.41	$9.33	$0.00	$51.68
	12/01/2015	$31.94	$10.41	$10.08	$0.00	$52.43
	06/01/2016	$32.44	$10.41	$10.08	$0.00	$52.93
	08/01/2016	$32.44	$10.91	$10.08	$0.00	$53.43
	12/01/2016	$32.44	$10.91	$10.89	$0.00	$54.24
VOICE-DATA-VIDEO TECHNICIAN *ELECTRICIANS LOCAL 96*	06/01/2013	$25.86	$7.66	$10.09	$0.00	$43.61

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *VOICE-DATA-VIDEO TECHNICIAN - Local 96*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$12.93	$7.66	$2.85	$0.00	$23.44
2	55	$14.22	$7.66	$2.89	$0.00	$24.77
3	60	$15.52	$7.66	$9.78	$0.00	$32.96
4	65	$16.81	$7.66	$9.81	$0.00	$34.28
5	70	$18.10	$7.66	$9.85	$0.00	$35.61
6	75	$19.40	$7.66	$9.89	$0.00	$36.95
7	80	$20.69	$7.66	$9.93	$0.00	$38.28
8	85	$21.98	$7.66	$9.97	$0.00	$39.61

Notes:

Apprentice to Journeyworker Ratio:1:1

WAGON DRILL OPERATOR *LABORERS - ZONE 2*	06/01/2014	$30.60	$7.30	$12.10	$0.00	$50.00
	12/01/2014	$31.10	$7.30	$12.10	$0.00	$50.50
	06/01/2015	$31.60	$7.30	$12.10	$0.00	$51.00
	12/01/2015	$32.10	$7.30	$12.10	$0.00	$51.50
	06/01/2016	$32.60	$7.30	$12.10	$0.00	$52.00
	12/01/2016	$33.35	$7.30	$12.10	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2013	$40.49	$10.00	$14.18	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12*	03/01/2014	$49.41	$9.82	$14.29	$0.00	$73.52
	09/01/2014	$50.41	$9.82	$14.29	$0.00	$74.52
	03/01/2015	$51.41	$9.82	$14.29	$0.00	$75.52
	09/01/2015	$52.41	$9.82	$14.29	$0.00	$76.52
	03/01/2016	$53.56	$9.82	$14.29	$0.00	$77.67
	09/01/2016	$54.61	$9.82	$14.29	$0.00	$78.72
	03/01/2017	$55.61	$9.82	$14.29	$0.00	$79.72
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						

Outside Electrical - East

CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$25.66	$8.70	$4.48	$0.00	$38.84
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$36.55	$8.70	$6.58	$0.00	$51.83
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$29.94	$8.70	$6.05	$0.00	$44.69
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$23.52	$8.70	$5.24	$0.00	$37.46
For apprentice rates see "Apprentice- LINEMAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$36.35	$8.70	$9.43	$0.00	$54.48
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$32.08	$8.70	$6.59	$0.00	$47.37
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$23.52	$8.70	$3.72	$0.00	$35.94
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$19.25	$8.70	$2.85	$0.00	$30.80
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$42.77	$8.70	$11.78	$0.00	$63.25

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.66	$8.70	$4.24	$0.00	$38.60
2	65	$27.80	$8.70	$4.71	$0.00	$41.21
3	70	$29.94	$8.70	$5.43	$0.00	$44.07
4	75	$32.08	$8.70	$6.16	$0.00	$46.94
5	80	$34.22	$8.70	$6.88	$0.00	$49.80
6	85	$36.35	$8.70	$7.62	$0.00	$52.67
7	90	$38.49	$8.70	$8.83	$0.00	$56.02

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$26.33	$4.18	$2.79	$0.00	$33.30
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$24.78	$4.18	$2.74	$0.00	$31.70
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$24.78	$4.18	$2.74	$0.00	$31.70
TREE TRIMMER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground. This classification does not apply to wholesale tree removal.	01/29/2012	$17.18	$3.37	$0.00	$0.00	$20.55
TREE TRIMMER GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.	01/29/2012	$15.15	$3.37	$0.00	$0.00	$18.52

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours) unless otherwise specified.

* Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof.
** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

WEEKLY PAYROLL RECORDS REPORT
& STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided. A Payroll Form has been printed on the reverse of this page and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract.

In addition, every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority. For every week in which an apprentice is employed, a photocopy of the apprentice's identification card must be attached to the payroll report. Once collected, the awarding authority is also required to preserve those records for three years.

In addition, each such contractor, subcontractor, or public body shall furnish to the awarding authority directly, within fifteen days after completion of its portion of the work a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE

_____, 20_____

I,_____,_____
(Name of signatory party) (Title)

do hereby state:

That I pay or supervise the payment of the persons employed by
_____ on the _____
(Contractor, subcontractor or public body) (Building or project)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty nine of the General Laws.

Signature _____

Title _____

MASSACHUSETTS WEEKLY CERTIFIED PAYROLL REPORT FORM

Company's Name:	Address:	Phone No.:	Payroll No.:

Employer's Signature:	Title:	Contract No:	Tax Payer ID No.	Work Week Ending:

Awarding Authority's Name:	Public Works Project Name:	Public Works Project Location:	Min. Wage Rate Sheet No.

General / Prime Contractor's Name:	Subcontractor's Name:

Employee Name & Complete Address	Employee is OSHA 10 Certified (?)	Work Classification:	Appr. Rate (%)	Hours Worked Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.	Project Hours (A) / All Other Hours	Hourly Base Wage (B)	"Employer" Hourly Fringe Benefit Contributions: Health & Welfare Insurance (C')	ERISA Pension Plan (D)	Supp. Unemp. (E)	Total Hourly Prev. Wage (F) (B+C+D+E)	Project Gross Wages (G) (A x F) / Total Gross Wages	Check No. (H)

NOTE: Pursuant to MGL Ch. 149 s.27B, every contractor and subcontractor is required to submit a "true and accurate" copy of their weekly payroll records directly to the awarding authority. Failure to comply may result in the commencement of a criminal action or the issuance of a civil citation.

Date recieved by awarding authority

/ /

DIVISIONS 2-16

SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Install sedimentation and erosion controls as shown on the Drawings. Removal and disposal of existing vegetation within the existing site and removal of other materials indicated to be removed, including stripping existing, topsoil, subsoils, removal and disposal of footings and appurtenances, saw cutting and removal and disposal of bituminous concrete and removal of site debris and unsuitable materials to approved off-site locations. Include removal and disposal of existing pavements and sub-base in paved areas not to be replaced with new pavement.

B. Perform site removals and reinstallation of existing site features and facilities.

C. Protection from injury or defacement of existing buildings and vegetation to remain, including pavements, building and structure walls, utilities, signs, off-site pavements indicated to be retained/protected, and other objects indicated by the Engineer to be preserved.

D. Removal and legal disposal of incidental excess and unsuitable fill materials, boulders and vegetation and other items not indicated on the Drawings to be protected.

E. Furnish and install temporary chain link fence as needed to supplement existing fencing in areas of work to prevent unauthorized public access to construction site until all work is completed.

1.02 RELATED WORK

A. Special Provisions is included in Section 01170.

B. Earthwork is included in Section 02200.

1.03 REFERENCE STANDARDS

A. Except as otherwise specified herein, the material and construction shall be in accordance with the Massachusetts Highway Standard Specifications for Highways and Bridges (SSHB) of the Commonwealth of Massachusetts, latest edition, including addenda

1.04 SUBMITTALS

A. Submit for review by Engineer, a comprehensive schedule indicating proposed methods and sequence of operations for site preparation work prior to commencement of actual activities. Utilize Project Schedule Requirements herein.

1.05 PRESERVATION OF PROPERTY

A. Any damage to on-site structures, pavements, gas, water, sewer, storm drain, electric lights, or any other pipes, mains, conduits, overhead or underground utility wire, fences, buildings, and any

other property shall be repaired at no cost to the Owner. Should any damage or injury be caused by the Contractor or anyone in his employ, or by work under this Contract, the Contractor shall at his own expense, make good such damage and assume responsibility for such damage and assume responsibility for such injury without cost to the Owner.

PART 2 PRODUCTS

2.01 TEMPORARY CONSTRUCTION FENCE

A. Temporary construction fence shall be as specified in Section 01500 – Temporary Facilities.

PART 3 EXECUTION

3.01 PROJECT SCHEDULE REQUIREMENTS

A. Conform to project schedule requirement in Section 01010.

3.02 EXISTING CONDITIONS

A. Existing materials shall have been removed and disposed to a depth sufficient to accommodate a complete, continuous installation of new subsurface and surfacing materials including complete base preparation as shown on the Drawings and as specified herein.

B. All materials to be removed, relocated, and reinstalled shall be cleaned and stored in a secure, dry location immediately upon removal.

C. All materials to be turned over to the Owner shall be cleaned and delivered to a location in Marlborough as approved by the Owner

3.03 PROTECTION

A. Protect and maintain protection until all work in the vicinity has been completed.

B. Protect and maintain existing improvements indicated on the Drawings to remain in place. At completion of site clearing work, restore any damaged improvements to their original condition, to the satisfaction of the Owner or other parties or authorities having jurisdiction.

3.04 ACCESS

A. Restrict construction activities to those areas within the limits of construction designated on the Drawings. Adjacent properties and improvements thereon, public or private, which become damaged by construction operations shall be promptly restored to their original condition, to the full satisfaction of the property Owner.

B. Areas outside the limits of work shall be protected from damage and no equipment or materials shall be stored in these areas.

C. Access to site shall be confirmed with the Owner(s) at the preconstruction meeting.

3.05 SITE SECURITY

A. Contractor shall be responsible to secure work areas during construction period including providing temporary fencing along limit of work as necessary to prevent public access to construction area.

END OF SECTION

SECTION 02140

DEWATERING AND DRAINAGE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Design, furnish, install, operate, monitor, maintain and remove a temporary dewatering system, as required, to lower and control water levels below subgrades of excavations to permit construction in the dry.

B. Furnish, maintain and remove temporary surface water control measures adequate to drain and remove surface water entering excavations.

C. Collect and properly dispose of all discharge water from the dewatering and drainage systems in accordance with the provisions of Section 01170.

1.02 DESIGN AND PERFORMANCE RESPONSIBILITY

A. Design and execution of methods for controlling surface water and groundwater.

B. For damage to properties, buildings or structures, sewers and other utility installations, pavements and work that may result from dewatering or surface water control operations.

C. Design review and field monitoring activities by the Owner or of the Engineer shall not relieve the Contractor of his/her responsibilities for the work.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, detailed plans of the proposed dewatering method, as specified in Paragraph 3.03 below.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe for observation wells, if required, shall consist of minimum 1-in I.D., Schedule 80 PVC pipe and machine slotted PVC wellpoints, maximum slot size 0.020-in.

PART 3 EXECUTION

3.01 GENERAL

A. Control surface water and groundwater such that excavation to final grade is made in-the-dry, the bearing soils are maintained undisturbed and softening and/or instability or disturbance due to the presence or seepage of water does not occur. All construction and backfilling shall proceed in-the-dry and flotation of completed portions of work shall be prohibited.

3.02 SURFACE WATER CONTROL

A. Construct surface water control measures, including dikes, ditches, sumps and other methods to prevent, as necessary, flow of surface water into excavations.

3.03 EXCAVATION DEWATERING

A. All times during construction furnish and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations. Excavations shall be kept dry, so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

B. Pipe and masonry shall not be laid in water or submerged within 24 hours after being placed. Water shall not flow over new masonry within 4 days after placement.

C. In no event shall water rise to cause unbalanced pressure on structures until the concrete or mortar has set at least 24 hours. Prevent flotation of the pipe by promptly placing backfill.

D. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed capacity of the subgrade soils at proposed bottom of excavation. If the subgrade of the trench bottom or excavation becomes disturbed due to inadequate drainage, excavate below normal grade as directed by the Engineer and refill with screened gravel at the Contractor's expense.

E. Evaluate the impact of the anticipated subsurface soil/water conditions on the proposed method of excavation and removal of water.

F. Where groundwater level is above the proposed bottom of excavation level, it is expected that some type of pumped dewatering system will be required for predrainage of the soils prior to final excavation and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline or fill will not be floated or otherwise damaged. It is further expected that the type of system, spacing of dewatering units and other details of the work will have to be varied depending on soil/water conditions at a particular location.

G. At least 2 weeks prior to the start of construction in any areas of anticipated dewatering submit to the Engineer for review, a proposed initial plan for removal of water, method of excavation and support of the excavation. Do not proceed with construction in any of these areas until the initial plan has been reviewed and commented upon by the Engineer. It is expected that the initial plan may have to be modified to suit the variable soil/water conditions to be encountered along the route. Dewater and excavate, at all times, in a manner which does not cause loss of ground or disturbance to the pipe bearing soil or soil which supports overlying or adjacent structures.

H. If the method of dewatering does not properly dewater the trench as specified, install groundwater observation wells as directed by the Engineer and do not place any pipe or structure until the readings obtained from the observation wells indicate that the groundwater has been lowered a minimum of 6-in below the bottom of the final excavation within the trench limits.

I. Dewatering units used in the work shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from the dewatering system shall be continuous until pipe or structure is adequately backfilled. Stand-by pumps shall be provided.

J. Water entering the excavation from precipitation or surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sump and pumped from the excavation to maintain a bottom free from standing water.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 STATUTORY REQUIREMENTS

A. All excavation, trenching, sheeting, bracing, etc shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations" (Chapter 454 CMR 10.00 et seq.)., State and local requirements. Where conflict between OSHA, State and local regulations exists, the most stringent requirements shall apply.

B. At least 2 weeks prior to any excavation activities, Contractor shall notify Dig Safe at 1-888-DIG-SAFE (1-888-344-7233).

1.02 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all excavation work and grading; place and compact backfill and fill including excavation at existing beach sand areas, at site improvements, at all paved areas, and all other areas shown, including complete removal and disposal of surplus material and restoration of surface materials as designated by the Engineer, or as specified herein.

B. Remove and dispose of existing pavements and concrete pads as shown on the Drawings. Contractor may re-use as processed gravel base material under new pavement as specified in Section 02575.

C. Proof compact the excavated subgrade below all pathways, play area, basketball court, and parking lots. Notify Engineer and Owner in advance of these activities for required observation. Contractor shall be responsible for all compaction testing.

D. Remove and dispose from the excavation all materials which the Engineer may deem unsuitable for backfilling, the bottom excavations shall be firm, dry, and in all respects, acceptable. If conditions warrant, the Contractor may be ordered to deposit sand refill for excavation below grade, directly on the bottom of the excavation immediately after excavation has reached the proper depth and before the bottom of the excavation has become softened or disturbed by any cause whatever.

E. The work shall include, but not necessarily be limited to; excavation for structures, footings, pipes, paving, precast concrete utility structures, and all other items shown including all backfilling and fill, mounding preparation and grading, disposal of waste materials, and all related work.

F. Existing topsoil excavated under this Section shall be handled as specified in Section 01170.

G. Wherever the requirement for percent compaction is referenced to herein, it shall mean “at least the required percent of maximum density as determined by ASTM D1557, Method D.”

1.03 SPECIAL REQUIREMENTS

A. The Contractor shall satisfy him/her as to the character, quantity, and distribution of all material to be excavated. No payment will be made for the placement of any excavated material, which is used for purposes other than those designated and as specified herein.

B. The Contractor shall be familiar with the locations of all existing utilities, such as gas, telecom, electrical conduits and water lines and verify as necessary to protect them.

C. All exploratory excavation to locate existing subsurface utilities shall be at the Contractor's discretion to assist him/her in the work of this project and no extra payment shall be made for such verification. This does not constitute a waiver of the Contractor's responsibility to verify all utilities and is intended to insure verification of existing services.

1.04 RELATED WORK

A. Trenching, Backfilling and Compaction is included in Section 02221.

B. Pavement and Appurtenances is included in Section 02575.

1.05 REFERENCE SPECIFICATIONS

A. Except as otherwise specified herein, the material and construction shall be in accordance with the MADOT, Standard Specifications for Highways and Bridges of the Commonwealth of Massachusetts, latest edition, including all addenda (SSHB).

1.06 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, the proposed methods of construction, including excavation, excavation support systems designs, backfilling and filling and compaction for the various portions of the work. Excavation support system designs shall be prepared by a licensed Professional Engineer, registered in the state in which the work is located, having a minimum of 5 years of professional experience in the design and construction of excavation support systems. Review will be for information only. Contractor shall remain responsible for adequacy and safety of construction means, methods, and techniques.

B. Fill Materials: For each off-site source of fill material the Contractor shall notify the Engineer of the source of the material and shall deliver test results and a representative 1 gallon sample at least 30 calendar days prior to the date of anticipated use of such material. All testing shall be performed by an experienced soils testing laboratory approved by Owner at the Contractor's own expense. Contractor shall also obtain approval of placement and compaction of all materials before next lift is placed.

1.07 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

2. ASTM D2922 - Density of Soil in Place by Nuclear Methods (Shallow Depth).

3. ASTM D3017 - Standard Test Method for Water Content of Soil in Place by Nuclear Methods (Shallow Depth).

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.08 QUALITY ASSURANCE

A. Prior to completion of filling, and during such placement, Contractor shall perform soils compaction testing as specified herein. The Engineer and Owner may select areas for testing the degree of compaction obtained. The Contractor shall cooperate fully in obtaining the information desired and verify that all areas meet specifications. Contractor shall notify Owner at least 72 hours in advance of scheduled compaction testing.

B. Payment for testing will be made by the Contractor. If test results are unsatisfactory to Owner or Engineer, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the Engineer will be borne by the Contractor.

1.09 CONSTRUCTION CONTROL

A. Contractor is responsible for all construction layout and reference staking necessary for the proper control and satisfactory completion of all structures, cutting, filling, grading, drainage and utilities installation, fencing, curbing, pavements and all other appurtenances required for the completion of the construction work and acceptance of the Contract as specified and as shown on the Drawings.

B. All construction layout and staking shall be performed by a Professional Land Surveyor or Professional Engineer registered by the Commonwealth of Massachusetts, experienced and skilled in construction layout and staking of the type required under this Contract, and acceptable to the Engineer and Owner.

C. The Contractor shall be responsible for the placement and preservation of adequate ties to all control points necessary for the accurate re-establishment of all base lines or center lines shown on the Drawings.

D. The Engineer or Owner may check the control of the work as established by the Contractor, at any time as the work progresses. The Contractor will be informed of the results of these checks, but by so doing, the Engineer in no way shall relieve the Contractor of his/her responsibility for the accuracy of the layout work.

1.10 DEFINITIONS

A. Where the phrase "in-the-dry" is used in this Section, it shall be defined to mean a soil condition such that the in-place moisture content of the soil at that time is no more than two percentage points above the optimum moisture content of that soil as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Backfill and Fill materials shall consisting of suitable excavated materials, natural or processed mineral soils obtained from off-site sources, or graded crushed stone or gravel. Backfill and Fill materials shall be free of all organic material, trash, snow, ice, frozen soil, or other objectionable materials which may be compressible or which cannot be properly compacted. Soft, wet, plastic soils, which may be expansive, clay soils having a natural, in-place water content in excess of 30 percent, soils containing more than 5 percent (by weight) fibrous organic materials, and soils having a plasticity index greater than 30 shall be considered unsuitable for use as backfill and fill. Backfill and fill materials shall have a maximum of 1 percent expansion when testing is performed on a sample remolded to 95 percent of maximum dry density (per ASTM D698) at 2 percent below optimum moisture content under a 100 lbs/sq ft surcharge.

B. Select Common Fill shall conform to the requirements of Common Fill except that the material shall not contain any materials larger than 2-in in largest dimension.

C. Common Fill shall not contain granite blocks, broken concrete, masonry rubble, asphalt pavement, or any other material larger than 10-in in any dimension. Common Fill shall have a plasticity index of less than 15 and shall conform to the following gradation limits:

Sieve Size	Percent Finer by Weight
2-in	100
No. 40	75
No. 200	20

D. Crushed stone for around underdrains, in traffic islands, and under concrete walk slabs shall be natural color grey crushed stone, free of soil and any foreign material. sound, durable stone, angular in shape without structural defects and chemical decay, and shall conform to Section M2.01.3 of SSHB. Crushed stone for construction entrance shall conform to M2.01.01 of SSHB. Submit sample for Engineer's approval prior to delivery to the site.

E. Processed gravel for pavement subbase shall conform to Section M1.03.1 of SSHB. Submit sample for Engineer’s approval prior to delivery to site.

F. Screened Gravel

1. Screened gravel shall consist of hard, durable, rounded or subangular particles of proper size and gradation and shall be free from sand, loam, clay, excess fines and deleterious materials. Screened gravel shall conform to Section M2.01.05 of SSHB and be graded within the following limits:

Sieve Size	Percent Finer by Weight
5/8-in	100
1/2-in	40-100
3/8-in	15-45
No. 10	0-5

G. Dense graded crushed stone for pavement base shall be a combination of crusher run coarse aggregate of crushed stone and fine aggregates of natural sand or stone screening uniformly

premixed with a predetermined quantity of water conforming to Section M2.01.7 of the SSHB specifications. Submit sample for Engineer's approval prior to delivery to site.

H. Sand for concrete, grout, and masonry shall conform to ASTM C33 for fine aggregate. General purpose sand shall be Select Common Fill.

I. Sand for around field drains shall be a clean, very coarse sand with approximate particle size of between 1.0 and 2.0mm, natural color, and be graded within the following limits:

Sieve Size	Percent Finer by Weight
No. 4	100
No. 10	95-100
No. 30	0-5
No. 50	0-1

J. Structural Fill

1. Structural Fill (bank run gravel) shall be gravel, sandy gravel, or gravelly sand free of organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable material and shall be well graded within the following limits:

Sieve Size	Percent Finer by Weight
3-in	100
No. 4	20 to 70
No. 40	5 to 35
No. 200	0 to 10

K. Geotextile Subsurface Drainage Fabric

1. Geotextile filter fabric shall be non-woven Mirafi 140N by Mirafi Inc. or equal as approved by the Engineer. Fabric shall meet or exceed the following standards:

Mechanical Properties:

a. Grab Tensile	ASTM D4632	120 lbs.
b. Trapezoidal Tear	ASTM D4355	50 lbs
c. Puncture	ASTM D4833	65 lbs

Hydraulic Properties:

a. Permittivity	ASTM D4491	1.8 sec^{-1}
b. Flow Rate	ASTM D4491	135 $gal/min/ft^2$

L. Sandy Gravel fill material shall conform to Section M1.04 Type B of MADOTSSHB. Submit sample for Engineer's approval prior to delivery to site.

M. Crushed stone (off-white crushed gravel) shall be natural color grey crushed stone ¾”-1½” in size and free of soil and other materials.

N. Controlled Density Fill (CDF), also known as Controlled Low-Strength Material (CLSM), used as backfill in utility trenches in City streets shall be M4.08.0 Type 1E or 2E flowable fill. CDF shall contain no fly ash. Materials, methods of preparation, and placement techniques shall comply with current standards and Massachusetts DOT requirements. Design mix shall result in flowable and excavatable material with 28-day compressive strength of between 30-80 psi and a 90-day compressive strength of approximately 100 psi. Mix shall allow traffic use within 10 hours of installation.

O. Clay for horseshoe pits shall be a manufactured commercial sporting grade raw clay mix specifically made for horseshoe pitching pits, without stones, sticks or other contaminants, weighing approximately 2500 lbs per c.y., as manufactured by Sheffield Pottery Rt. 7, PO Box 399 Sheffield, MA 01257, www.sheffield-pottery.com, or equal.

P. Surface and subsurface granular materials to be installed underneath permeable interlocking concrete pavers shall conform to the following:

1. Jointing material shall be clean, washed natural or manufactured sand conforming to ASTM No. 9. It shall be non-plastic and free from deleterious or foreign matter and the use of limestone screenings will not be permitted.

2. Setting bed shall conform to M2.01.6 of SSHB.

3. Base aggregate shall conform to M2.01.4 of SSHB.

4. Sub-base aggregate shall conform to M2.01.1 of SSHB.

PART 3 EXECUTION

3.01 PREPARATION

A. Test Pits

1. Perform exploratory excavation work (test pits) for the purpose of verifying the location of underground utilities and structures and to check for unknown utilities and structures, prior to commencing excavation work.

2. Test pits shall be backfilled as soon as the desired information has been obtained. Backfilled surfaces shall be stabilized in a manner approved by Engineer.

3.02 EXCAVATION SUPPORT

A. Furnish, install, monitor and maintain excavation support (e.g., shoring, sheeting, bracing, trench boxes, etc) as required by Federal, State or local laws, ordinances, regulations and safety requirements. Support the sides of excavation, to prevent any movement which could in any way reduce the width of the excavation below that necessary for proper construction and protect adjacent structures from undermining, settlement or other damage. Take care to prevent the

formation of voids outside of sheeting. If voids occur behind sheeting, immediately backfill and compact the voids with common fill material. Voids in locations that cannot be properly compacted upon backfilling shall be filled with lean concrete.

B. Excavation supports shall be carefully removed in such manner so as not to endanger the Work or other adjacent structures, utilities, or property. All voids left or caused by withdrawal of supports shall be immediately filled with sand and compacted.

3.03 EXCAVATION AND FILLING

A. Contractor shall excavate a minimum of 8-in of topsoil from all areas of future pathways, or deeper as required for proper installation of base materials.

B. Fill and backfill materials shall be placed in lifts to suit the specified compaction requirements to the lines and grades required, making allowances for settlement and placement of cover materials (i.e. topsoil, sod, etc). Soft spots or uncompacted areas shall be corrected.

C. Fill and backfill materials shall not be placed on frozen surfaces, or surfaces covered by snow or ice. Fill and backfill material shall be free of snow, ice and frozen earth.

D. Compaction in open areas may be accomplished by any of the following methods: compaction equipment, fully loaded ten-wheel trucks, tractor dozers weighing at least 30,000 lbs and operated at full speed, or heavy vibratory rollers. Compaction in confined areas (including areas within a 45 degree angle extending upward and outward from the base of a wall) and in areas where the use of large equipment is impractical, shall be accomplished by hand operated vibratory equipment or mechanical tampers. Lift thickness shall not exceed 6-in (measured before compaction) when hand operated equipment is used.

E. Fill and backfill shall not be placed and compacted when the materials are too wet to properly compact (i.e. the in-place moisture content of the soil at that time is no more than three percentage points above the optimum moisture content of that soil as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction).

F. Materials placed in fill areas shall be deposited to the lines and grades shown on the Drawings making due allowances for settlement of the material and for the placing of surface materials thereon.

G. The surfaces of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the grading plan, and no soft spots or uncompacted areas will be allowed in the work.

H. Protect all existing features to remain. Hand excavate around all items to remain including existing drains or where utilities must be verified.

I. If existing facilities require temporary removal in order for the work to proceed, such as fences, walkways, etc. except as noted on the Drawings, they shall be accomplished by the Contractor at no additional cost to the Owner. Restoration of the facility shall be to a similar or better condition than the conditions before removal to the satisfaction of the Owner.

J. Grading activity shall be performed to the lines, grades, and elevations shown on the plans and staked in the field or as directed by the Engineer, and shall be made in such a manner that the requirements for formation of the final grade can be followed.

K. No earthwork activity shall be started until the Engineer and the infill turf installer has reviewed the grade stake layout and proposed grades. During the process of grading, the grade shall be maintained in such a condition that it will be well drained at all times.

L. No payment will be made for suitable materials removed, manipulated or replaced in order to obtain density and finished grades. Any removal, manipulation, replacement and recompaction of suitable materials necessary to obtain the required grades shall be considered as incidental to the operations and shall be performed by the Contractor at no additional cost to the Owner.

M. Protect all existing areas against damage due to the work under this Contract, and perform all repair and replacement work to any such areas which are damaged hereunder, as approved by the Engineer.

N. No extra work shall be initiated without notification of the Owner in writing, and the written approval of the Owner in response.

O. No pavement patches shall be allowed for pavement damage. Damaged pavement outside limits of work and repavement shall be fully repaired with new binder and surface course as specified in Section 02575 to the limits agreed upon by the Engineer.

P. Fill and level all trenches at the end of the day.

3.05 DRAINAGE

A. Upon entering the premises, the Contractor shall assume responsibility for site and surface drainage and shall maintain such drainage during the life of his/her Contract in a manner acceptable to the Engineer at all times protecting and maintaining the existing conditions and public park use in adjacent areas.

3.06 GRADING

A. Grading in preparation for placing of fill materials and appurtenances shall be performed at all places that are indicated on the Drawings, to the lines, grades, and elevations shown and otherwise as directed by the Engineer. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water, which may affect the prosecution or condition of the work.

B. If at the time of grading it is not possible to place any material in its proper section, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.

C. The Engineer reserves the right to make minor adjustments or revisions in lines or grades if found necessary as the work progresses, due to discrepancies on the Drawings or in order to obtain satisfactory construction.

D. In cuts, all loose or protruding rocks on the back slopes shall be barred loose or otherwise removed to line or finished grade of slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the drawings or as directed by the Engineer.

E. Place backfill material in such a manner that unbalanced horizontal loads will not be applied to newly placed structures or portion of structures, utilities, or pipe lines.

F. Grading and finishing: In areas designated for grading and finishing, rake or machine grade the areas to remove stones over one inch and other unsatisfactory material, fill depressions, and finish the surface within the indicated tolerances.

G. Contractor shall notify the Engineer in advance of fine grading, seeding, and rolling activities and make prepared surfaces available to the Engineer for observation.

H. Grade Stakes

1. Contractor shall engage a registered professional engineer or registered land surveyor or other qualified individual as approved by the Engineer to set grade stakes to establish finish grades as follows:

a. Using a 50-ft. grid, stakes shall be placed a maximum of 50-ft. apart. Additional stakes shall be placed by the Contractor as required by the Engineer.

b. Mark grade stakes to show location of finish grades. Contractor shall be responsible to maintain grade stakes throughout construction and shall immediately replace and mark elevations on damaged or removed stakes.

3.07 COMPACTION REQUIREMENTS

A. Proofcompact areas to receive fill. Proofcompaction is defined as a minimum of four completed coverages of the full area with the rear wheels of a fully loaded 10-wheel dump truck. Proofcompaction shall be conducted in the presence of the Engineer. Subgrade soil areas that appear unstable to the Engineer during proofcompaction shall be excavated down to firm soil. The excavated material shall then be dried and/or blended with dry mineral soil and placed and compacted in layers within the excavated area and proofcompacted until firm and stable.

B. Place backfill in layers not to exceed six inches of loose material. The dense-graded crushed stone and processed gravel shall be spread and compacted in layers not exceeding four inches in depth. All backfill materials shall be placed at a moisture content within two percent of the optimum moisture content and shall be compacted to the required percent of the maximum dry density of the material as determined by ASTM D1557.

C. Compaction shall continue until the surface is even and true to the proposed lines and grades within a tolerance of 3/8 inch above or below the required cross sectional elevations and to a maximum irregularity not exceeding 3/8 inch under a 10 foot line longitudinally. Any specific areas of base which, after being rolled, does not form a satisfactory, solid, stable foundation shall be removed, replaced and recompacted by the Contractor without extra compensation.

1. Subgrade under areas not to receive pavement shall be compacted to not less than 92 percent of maximum density as defined by ASTM D1557.

2. Subgrade under and within 18-in laterally from the edges of pavements shall be compacted to not less than 95 percent of maximum density as defined by ASTM D1557.

3. Notify the Engineer in advance of compaction activities and make prepared subgrade surfaces available to the Engineer and infill turf installer for observation and testing. Note that the greater degree of compaction governs in the event of a conflict.

D. Place horseshoe clay mix in lifts not to exceed 3-in. and compact each lift. Adjust moisture content of clay per manufacturer's instructions.

3.08 QUALITY CONTROL DURING PLACEMENT

A. The Contractor shall retain the services of an experienced geotechnical testing laboratory approved by the Engineer to provide a Troxler certified field technician to monitor, document and report to the Engineer on placement and compaction of all backfill materials. As a minimum, soil density (ASTM D2992) and moisture content (ASTM D3017) testing shall be conducted during placement and compaction of backfill materials in the following locations and frequencies:

Location	Frequency
Culvert foundations	two per vertical support
Pathways and parking lot and basketball court	one per 1000-sf per lift of parking lot or court and one per 100-lf of pathway

Actual test locations shall be determined by the Engineer.

B. In the event that test results fail to meet the minimum compaction requirements listed in Paragraph 3.07, the lift of fill within an area represented by the failed test location shall be removed and replaced with suitably compacted material at the Contractor's expense. The lift of fill material within the failed area can be removed, dried out, replaced and recompacted if it meets the material requirements for that area.

3.09 ROCK AND BOULDER EXCAVATION

A. Rock excavation shall be understood to mean ledge rock, which, in the opinion of the Engineer, requires for its removal by drilling, ripping, blasting, wedging, sledging or barring. Rock excavation shall be made to the widths and depths directed by the Engineer in the field.

B. Boulder excavation shall be understood to mean only boulders or concrete construction debris encountered in excavation exceeding three (3) cu. yds in volume which can be excavated without resorting to blasting. Boulders less than three (3) cu. yds in volume shall be handled by the contractor as part of excavation work.

C. All blasting operations shall be conducted in full compliance with all the laws of the Commonwealth, all local ordinances, and with all possible care so as to avoid injury to persons an property. The rock shall be well covered, and sufficient warning shall be given to all persons in the vicinity of the work before blasting. Care shall be taken to avoid injury to pipes or other structures and to private property. The Contractor, in addition to observing all municipal and other ordinances relating to the storage and handling of explosives, shall also conform to any further regulations, which the Engineer shall deem necessary.

D. If rock below grade is shattered on account of holes having been drilled to deep, or too heavy charges of explosives are used for any other reasons for blasting by the Contractor; and if, in the opinion of the Engineer, said shattered rock is unfit for foundation, the shattered rock shall be removed and the excavation refilled as required by the Engineer at the expense of the Contractor.

E. Where rock is encountered, it shall be uncovered but not excavated until measurements have been made by the Engineer or Owner.

F. Payment for rock and boulder excavation shall be in accordance with Article 11 of the General Conditions and the Bid Form.

3.10 SUBGRADE PREPARATION

A. Prior to placing fill materials Contractor shall thoroughly compact subgrade materials to the specified degree of compaction required.

B. In areas to receive pavement, prior to placing subbase and base course, Contractor shall thoroughly compact subgrade materials to the specified degree of compaction required.

C. Notify the Engineer and infill turf installer in advance of compaction activities and make prepared subgrade surfaces available to the Engineer and infill turf installer for observation and testing.

3.11 PROTECTION

A. Adjacent parking lots pavement, adjacent woodlands, trees and all other amenities shall be adequately protected, and if necessary, removed and restored. All existing site materials and appurtenances, which are damaged during construction shall be replaced with materials fully identical to, and including but not necessarily limited to, the same type, dimension, size, species and conditions before damage to the satisfaction of the Owner.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING AND COMPACTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all trenching for pipelines and appurtenances, including drainage, filling, backfilling, disposal of surplus material and restoration of trench surfaces and easements.

B. Excavation shall extend to the width and depth shown on the Drawings or as specified herein and shall provide suitable room for installing pipe, structures and appurtenances.

C. Furnish and place all sheeting, bracing and supports and remove from the excavation all materials which the Engineer may deem unsuitable for backfilling. The bottom of the excavation shall be firm, dry and in all respects, acceptable. If conditions warrant, deposit gravel for pipe bedding, or gravel refill for excavation below grade, directly on the bottom of the trench immediately after excavation has reached the proper depth and before the bottom of the trench has become softened or disturbed by any cause whatever. The length of open trench shall be related closely to the rate of pipe laying. All excavation shall be made in open trenches.

D. All excavation, trenching and related sheeting, bracing, etc, shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and the State and local requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

E. Wherever the requirement for percent compaction is referred to herein it shall mean "at least the specified percent of maximum density as determined by ASTM D1557".

F. Prior to the start of work submit the proposed method of backfilling and compaction to the Engineer for review.

1.02 RELATED WORK

A. Dewatering and Drainage is included in Section 02140.

B. Earthwork is included in Section 02200.

C. Loaming and Seeding is included in Section 02930.

D. Pavement is included in Section 02575.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TRENCH EXCAVATION

A. Trench excavation shall include material of every description and of whatever substance encountered, except rock and boulders. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.

B. Strip and stockpile topsoil from areas to be regarded or trenched. Topsoil shall be handled as specified in Section 01046, and Section 01170.

C. While excavating and backfilling is in progress, traffic shall be maintained, and all utilities and other property protected as provided in the General Conditions and General Requirements.

D. Trenches shall be excavated to the depth indicated on the Drawings and in widths sufficient for laying the pipe, bracing and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry and in all respects acceptable to the Engineer. Trench width shall be practical minimum.

E. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. The trench may be excavated by machinery to, or just below the designated subgrade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Subgrade soils which become soft, loose, "quick", or otherwise unsuitable as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by screened gravel fill as required by the Engineer at the Contractor's expense.

F. Clay and silt soils are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, use a smooth-edge bucket to excavate the last 1-ft of depth.

G. Where pipe is to be laid in screened gravel bedding, the trench may be excavated by machinery to the normal depth of the pipe provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

H. Where pipe is to be laid directly on the trench bottom, final excavation at the bottom of the trench shall be performed manually, providing a flat-bottom true to grade upon undisturbed material. Bell holes shall be made as required.

3.02 DISPOSAL OF MATERIALS

A. Excavated material shall be stacked without excessive surcharge on the trench bank or obstructing free access to hydrants and gate valves. Inconvenience to traffic and abutters shall be avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.

B. It is expressly understood that no excavated material shall be removed from the site of the work or disposed of, except as directed by the Owner. When removal of surplus materials has been approved dispose of such surplus material.

C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, suitable material shall be hauled and stored at a location provided. When required, it shall be re-handled and used in backfilling the trench.

3.03 SHEETING AND BRACING

A. Furnish, put in place and maintain sheeting and bracing required by Federal, State or local safety requirements to support the sides of the excavation and prevent loss of ground which could endanger personnel, damage or delay the work or endanger adjacent structures. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he/she may order additional supports placed at the expense of the Contractor. Compliance with such order shall not relieve the Contractor from his/her responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.

B. Where sheeting and bracing is required to support the sides of trenches, engage a professional engineer, registered in the State of Massachusetts, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design and certification of this shall be provided by the professional engineer. Submit P.E. Certification Form contained in Section 01300 to show compliance with this requirement.

C. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the screened gravel backfill.

1. When installing rigid pipe (R.C., etc), any portion of the box extending below mid diameter shall be raised above this point prior to moving the box ahead to install the next pipe. This is to prevent the separation of installed pipe joints due to movement of the box.

2. When installing flexible pipe (PVC, etc), trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened gravel shall be placed to fill any voids created and the screened gravel and backfill shall be recompacted to provide uniform side support for the pipe.

D. The cost for use of sheeting will be included in the bid items for pipe and shall include full compensation for driving, bracing and later removal of sheeting.

E. No payment will be given for sheeting, bracing, etc, during the progress of the work. No payment will be given for sheeting which has actually been left in the trench for the convenience of the Contractor.

F. All sheeting and bracing shall be carefully removed in such manner as not to endanger the construction of other structures, utilities, or property, whether public or private. All voids left after withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as directed.

G. Sheeting driven below mid-diameter of any pipe shall remain in place from the driven elevation to at least 1-ft above the top of the pipe.

3.04 TEST PITS

A. Excavation of test pits may be required for the purpose of locating underground utilities or structures as an aid in establishing the precise location of new work.

B. Test pits shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as specified.

3.05 EXCAVATION BELOW GRADE AND REFILL

A. Whatever the nature of unstable material encountered or the groundwater conditions, trench drainage shall be complete and effective.

B. If the Contractor excavates below grade through error or for the Contractor's own convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the Engineer to excavate below grade as set forth in the following paragraph, in which case the work of excavating below grade and furnishing and placing the refill shall be performed at his own expense.

C. If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel notwithstanding effective drainage, the subgrade material shall be removed to the extent directed and the excavation refilled with a 6-in layer of coarse sand, or a mixture graded from coarse sand to the fine peastone, as approved by the Engineer, to form a filter layer preserving the voids in the gravel bed of the pipe. The composition and gradation of gravel shall be approved by the Engineer prior to placement. Screened gravel shall then be placed in 6-in layers thoroughly compacted up to the normal grade of the pipe. If directed by the Engineer, bank-run gravel shall be used for refill of excavation below grade.

D. Geotextile filter fabric may be substituted for filter layer if approved by the Engineer. Fabric shall be Mirafi 140N or approved equal as specified in Section 02200.

3.06 BACKFILLING

A. As soon as practicable after the pipe has been laid and jointed, backfilling shall begin and thereafter be prosecuted expeditiously. Bedding gravel, as specified for the type of pipe installed, shall be placed up to 1-ft over the pipe.

B. An impervious dam or bulkhead cutoff of clay or other impervious material shall be constructed in the trench as directed, to interrupt the unnatural flow of groundwater after construction is completed. The dam shall be effectively keyed into the trench bottom and sidewalls. Provide at least one clay or other impervious material dam in the pipe bedding between each manhole where directed or every 300-ft, whichever is less.

C. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until selected material or screened gravel has been placed and compacted to a level 1-ft over the pipe.

D. Backfill shall be brought up evenly on all sides. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping, to 92 percent compaction. If rolling is employed, it shall be by use of a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench.

E. Where other methods are not practicable, compaction shall be by use of hand or pneumatic ramming with tools weighing at least 20 lbs. The material being spread and compacted shall be placed in layers not over 6-in thick. If necessary, sprinkling shall be employed in conjunction with rolling or ramming.

F. Backfill around structures shall be selected common fill material. All backfill shall be compacted, especially under and over pipes connected to the structures.

G. Subject to the approval of the Engineer, fragments of ledge and boulders smaller than 6-in may be used in trench backfill providing that the quantity in the opinion of the Engineer is not excessive. Rock fragments shall not be placed until the pipe has at least 2-ft of earth cover. Small stones and rocks shall be placed in thin layers alternating with earth to ensure that all voids are completely filled. Fill shall not be dropped into the trench in a manner to endanger the pipe.

H. Bituminous paving shall not be placed in backfilling.

I. Frozen material shall not be used under any circumstances.

J. All road surfaces shall be broomed and hose-cleaned immediately after backfilling. Dust control measures shall be employed at all times.

3.07 RESTORING TRENCH SURFACE

A. Where the trench occurs adjacent to existing track surface thoroughly consolidate the backfill and maintain the surface as the work progresses. If settlement takes place, immediately deposit additional fill to restore the level of the ground.

B. In paved areas, the top 12-in layer of trench backfill shall consist of compacted processed gravel. Should the Contractor wish to use material excavated from the trench as gravel subbase for pavement replacement, the Contractor, at his/her own expense, have samples of the material tested by an independent testing laboratory at intervals not to exceed 500-ft, in order to establish its compliance with the specifications. Only material which has been tested and approved by the Engineer shall be allowed to be incorporated into the work.

C. Any area which is disturbed by the trench excavation shall be restored to a condition at least equal to that existing before work began. Pavements disturbed shall be repaired in accordance with Section 02575.

D. In sections where the pipeline passes through grassed areas, and at the Contractor's own expense, remove and replace the sod, or loam and seed the surface to the satisfaction of the Engineer.

END OF SECTION

SECTION 02270

SEDIMENTATION AND EROSION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all installation, maintenance, removal and area cleanup related to erosion and sedimentation control work as shown on the Drawings as specified herein. The work shall include, but not necessarily be limited to: installation of crushed stone construction entrances and staging areas, sediment fences, catch basin sediment filters, sediment removal and disposal, device maintenance, removal of temporary devices, temporary mulching and final cleanup.

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

B. Loaming and Seeding is included in Section 02930.

C. Geotextile filter fabric is included in Section 02200.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, within 10 days after award of Contract, technical product literature for all commercial products.

B. Prior to the start of work, Contractor shall prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) in accordance with the U.S. Environmental Protection Agency (EPA) National Pollution Discharge Elimination System (NPDES) General Permit applicable to this work. (Submit to Engineer for record purposes only.)

C. Prior to the start of work, prepare and submit the EPA NPDES Notice of Intent to Discharge to the applicable EPA office in accordance with EPA regulations.

1.04 REFERENCE STANDARD

A. EPA document titled: “Stormwater Management for Construction Activities – Developing Pollution Prevention Plans and Best Management Practices” document number EPA 832-R-92-005, dated 1992, or most recent edition. State or appropriate Conservation Commission standards can be substituted for the EPA standard if the State or Conservation Commission standard is equal to, or more detailed than, the EPA standard.

B. Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas prepared by Franklin, Hampden, Hampshire Conservation Districts Northhampton, MA 01060.

1.05 QUALITY ASSURANCE

A. Be responsible for the timely installation and maintenance of all sedimentation and erosion control devices necessary to prevent the movement of sediment from the construction site to off site areas or into nearby stream systems via surface runoff or underground drainage systems. Measures in addition to those shown on the Drawings necessary to prevent the movement of sediment off site shall be installed, maintained, removed, and cleaned up at the expense of the Contractor. No additional charges to the Owner will be considered.

B. Where Contractor's efforts to control erosion and sediment have been demonstrated to be ineffective or potentially ineffective in the opinion of the Engineer, the Engineer may order that additional measures be implemented and constructed at no additional cost to the Owner.

C. Sedimentation and erosion control shall conform to the submittal requirements above (and other regulatory permits applicable to this Section).

D. Contractor shall keep parking areas and access roads as well as adjacent public streets free of tracked mud and soil from Contractor's activities. Sweep and dispose of swept material on a weekly basis at a minimum, or more frequently, as directed by the Owner.

PART 2 PRODUCTS

2.01 DUST CONTROL

A. Accomplish dust control by the use of potable water. Do not use calcium chloride. Water shall be furnished as specified in Section 01046.

2.02 MATERIALS

A. Crushed stone for stabilized construction entrance shall be as specified in Section 02200.

B. Sediment fence shall be a prefabricated commercial product made of a woven, polypropylene, ultraviolet resistant material such as "Envirofence" by Mirafi Inc., Charlotte, NC or equal.

C. Straw waddle (fiber roll) shall be a prefabricated commercial product with outside casing made of organic hessen by Phase II Stormwater Products, PO Box 737, Wrentham, MA 02093, or equal. Effective height shall be 12-in plus or minus 1-in; effective circumference shall be 38-in.

D. Straw mulch shall be utilized on all newly graded areas to protect areas against washouts and erosion. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, or rye that is free from noxious weeds, mold or other objectionable material. The straw mulch shall contain at least 50 percent by weight of material to be 10-in or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment.

E. Erosion control blanket shall be as specified in Section 02930.

F. Catch basin sediment filter control devises shall be sediment capture devices specifically designed for this purpose such as "Silt Sack" by Geo-Synthetics, LLC, or equal.

PART 3 EXECUTION

3.01 DUST CONTROL

A. Control dust on exposed areas of athletic fields, temporary accessways, construction routes or other construction areas subject to surface dust movement and blowing dust.

B. Respray areas as necessary to keep dust to a minimum and as directed by the Owner's Representative or Engineer.

3.02 INSTALLATION

A. Sediment Fence Installation

1. Sediment fences shall be positioned as indicated on the Drawings and as necessary to prevent off site movement of sediment produced by construction activities as directed by the Engineer.

2. Dig trench approximately 6-in wide and 6-in deep along proposed fence lines.

3. Drive wood stakes, 8-ft on center (maximum) at back edge of trenches. Stakes shall be driven 2-ft (minimum) into ground.

4. Hang filter fabric on wood stakes to bottom of trench with about 4-in of fabric laid across bottom of trench. Stretch fabric fairly taut along fence length and secure with tie wires 12-in on center both ways.

5. Backfill trench with excavated material and tamp.

6. Install pre-fabricated sediment fence according to manufacturer's instructions.

B. Straw Waddle (Fiber Roll) Installation

1. Straw waddles (fiber roll) shall be positioned as indicated on the Drawings and as necessary to prevent off site movement of sediment produced by construction activities as directed by the Engineer.

2. Drive wooden stakes, 5-ft on center (maximum) at back edge of waddle. Stakes shall be driven 2-ft (minimum) into ground.

3. Install pre-fabricated straw waddle (fiber roll) according to manufacturer's instructions.

C. Catch basin sediment control devices shall be installed in accordance with manufacturer's instructions and shall be cleaned of sediment in a manner as recommended by the manufacturer and as directed by the Engineer. Remove sediment from filter bag when saturated with sediment as directed by the Engineer.

D. Stabilized construction entrances shall be constructed as shown on the Drawings.

3.03 MAINTENANCE AND INSPECTIONS

A. Inspections

1. Make a visual inspection of all sedimentation and erosion control devices once per week and promptly after every rainstorm. If such inspection reveals that additional measures are

needed to prevent movement of sediment, promptly install additional devices as needed. Sediment and erosion controls in need of maintenance shall be repaired promptly.

B. Device Maintenance

1. Sediment Fences

a. Remove accumulated sediment once it builds up to 1/2 of the height.

b. Replace damaged materials, or patch sediment fence with a 2-ft minimum overlap.

c. Make other repairs as necessary to ensure that the device is filtering all runoff directed to the lower elevations.

2. Straw Waddle

a. Remove accumulated sediment once it builds up to 3”.

b. Make other repairs as necessary to ensure that the device is filtering all runoff directed to the lower elevations.

3. Add crushed stone to access ways and staging area as necessary to maintain a firm surface free of ruts and mudholes.

3.04 TEMPORARY MULCHING

A. Apply temporary mulch to areas where rough grading has been completed but final grading is not anticipated to begin within 30 days of the completion of rough grading.

3.05 REMOVAL AND FINAL CLEANUP

A. Once the site has been fully stabilized against erosion, remove sediment control devices (except erosion control blankets) and all accumulated silt. Dispose of silt and waste materials in proper manner. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as required and specified.

END OF SECTION

SECTION 02530

SAFETY SURFACING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to perform all installation, of safety surfacing to meet project requirements and as shown on the Drawings and as specified herein.

B. The work shall include, but not necessarily be limited to, preparation of subbase and base materials with wear mat and wood fiber safety surfacing materials.

1.02 RELATED WORK

A. Earthwork is included in Section 02200

B. Playground Equipment is included in Section 02860

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, within 5 days after award of Contract, technical product literature for all commercial products, including wood fiber surfacing and wear mat surfacing.

1.04 REFERENCE SPECIFICATIONS

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements the most restrictive requirement shall govern.

1. Massachusetts Department of Transportation Standard Specifications for Highways and Bridges, latest edition.

2. Massachusetts Architectural Access Board (MAAB) regulations.

3. Handbook for Public Playground Safety. U. S. Consumer Product Safety Commission Publication No. 325

4. American Society for Testing and Materials (ASTM):

a. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.

b. ASTM D624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

c. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.

d. ASTM D2859 Standard Test Method for Flammability of Finished Textile Floor Covering Materials.

e. ASTM E303 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.

f. ASTM F1292 Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment.

g. ASTM F1951 Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.

h. ASTM F2075-04 Standard Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Playground Equipment

1.05 QUALITY ASSURANCE

A. Qualifications: Utilize an installer approved and trained by the manufacturer of the playground surfacing system, having experience with other projects of the scope and scale of the work described in this section.

B. Certifications: Certification by manufacturer that installer is an approved applicator of the playground surfacing system.

C. International Play Equipment Manufacturers Association (IPEMA) certified.

PART 2 PRODUCTS

2.01 GENERAL

A. All playground surfacing materials shall be from the same manufacturer.

2.02 WOOD FIBER SAFETY SURFACING

A. Playground wood fiber safety surfacing shall be Woodcarpet Play Surfacing as manufactured by Zaeger Brothers, Inc. 4000 East Harrisburg Pike Middletown, PA 17057 tel no 800-346-8524, or equal.

B. Wood fiber mulch shall be composed of randomly sized, elongated, shredded fibrous wood materials free of leaves, bark, soil or other contaminants. Shredded hardwoods and selected softwoods shall have minimum moisture retaining properties with 98% of the fiber dimensions not exceeding 1-3/4" long and 1" wide. The product shall meet requirements of ASTM F1292

C. Geotextile stabilization fabric shall be as specified in 02200.

2.03 WEAR MATS

A. Wear mat shall be 6.5-ft x 7.5-ft Woodcarpet Mat as manufactured by Zeager Brothers, Inc. 4000 East Harrisburg Pike Middletown, PA 17057 tel no 800-346-8524, or equal.

B. Wear mat surfacing shall be a commercially manufactured product specifically designed to stabilize, and limit displacement of, the wood fiber safety surface, or other resilient materials, in the higher traffic areas, or kick out areas, of the playground.

C. The wear mat shall be made of recycled high-grade PVC and 40% virgin PVC, rough on one side and smooth on the other side. Subsurface stainless steel cables shall be installed to provide additional strength at anchor points. Mat shall be anchored with nylon tether that is connected to

steel stakes at anchor points. and to limit displacement of surfacing.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Do not proceed with playground surfacing installation until all applicable site work, including substrate preparation, fencing, concrete work, playground equipment installation and other relevant work, has been completed.

B. Install the geotextile fabric and wood fiber material as shown on the Drawings and as recommended by the manufacturer to minimum thickness of 12” or greater if required to meet final finish grade based on subgrade elevation.

C. Comply with the instructions and recommendations of the playground wood fiber surfacing and wear mat surfacing manufacturer.

1. Edges of wear mat shall be installed so that they slope beneath the surrounding finished grades of wood fiber resilient safety surfacing in a manner recommended by the manufacturer.

2. Prior to installation, confirm with the Engineer and Owner that the wear mat will be installed with rough or smooth side up, as approved.

3. For wear mat, furnish documentation for 5 year limited warranty as provided by the manufacturer.

D. Site Verification of Conditions: Engineer shall verify that substrate conditions are suitable for installation of the playground surfacing system.

E. Contractor shall not proceed with installation until unsuitable conditions are corrected.

F. Do not allow foot traffic or use of the surface until it is sufficiently cured.

G. Protect the installed playground surface materials from damage resulting from subsequent construction activity on the site.

H. Upon completion of installation, obtain certification from manufacturer that play surface materials are installed in accordance with manufacturer’s instructions.

END OF SECTION

SECTION 02575

PAVEMENTS, CURBS AND APPURTENANCES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to furnish and install the bituminous concrete pavements, granite curbs and edging, wood guard rail, and other appurtenances as shown on the Drawings and as specified herein.

B. Streets, driveways, parking areas or sidewalk pavements and curbs damaged or disturbed by the Contractor's operations shall be repaired, replaced or restored in accordance with the requirements specified herein, and as directed for the respective type of pavement and curb to be replaced, and shall be installed in a manner satisfactory to the Owner.

C. Bituminous concrete pavements and pavement match areas shall be composed of layered thicknesses as specified herein.

D. Granite curb, bituminous concrete pavement, concrete paver area, wood guard rail, and pavement markings shall be installed as specified herein.

1.02 RELATED WORK

A. Site Preparation is included in Section 02100.

B. Earthwork is included in Section 02200.

C. Dust Control is included in Section 02270.

D. Permeable Interlocking Concrete Pavers is included in Section 02575

E. Basketball, Volleyball, Tennis Court and Skatepark acrylic color surfacing is included in Section 02850.

F. Loaming and Seeding is included in Section 02930.

G. Concrete Walk Pavement is included in Section 03301.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings showing dimensions layouts and details of construction and accessories required.

1.04 REFERENCE STANDARDS

A. Except as otherwise specified herein, the material and construction shall be in accordance with the MADOT Standard Specifications for Highways and Bridges of the Commonwealth of Massachusetts, latest edition, including all addenda (SSHB).

B. American Society for Testing and Materials (ASTM)

1. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs 60,000 psi Tensile Strength.

C. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M144 - Standard Specification for Calcium Chloride

2. AASHTO M180 - Standard Specification for Corrugated Sheet Steel Beams for Highway Guardrail.

3. AASHTO M183 - Standard Specification for Structural Steel.

D. MADOT Construction and Traffic Standard Details (CTSD), latest edition.

E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

F. AWPA – American Wood Protection Association.

PART 2 PRODUCTS

2.01 BITUMINOUS CONCRETE PAVEMENT MATERIALS

A. Bituminous Concrete Paving shall be Class I, as specified in Sections 460 and M3.11.03 and constructed to the thicknesses shown on the Drawings for the following mixes:

1. Bituminous Concrete Pavement for pathways, parking areas, basketball court, volleyball court, skatepark area, and tennis court shall be 1 ½ ” top course; 2” binder course; 4-in dense graded crushed stone base; 8-in processed gravel subbase.

2. Bituminous Concrete Pavement for trenches in City streets shall be 1-1/2-in top course; 3-1/2-in binder course over controlled density fill (CDF).

B. Calcium chloride shall meet AASHTO M-144 and shall be spread wherever directed to allay dust conditions. The Engineer may direct the Contractor to employ sprinkling of water in lieu of calcium chloride for dust control.

C. Asphalt - Tack coat shall consist of either emulsified asphalt, grade RS-1 conforming to Section M3.03.0, or cutback asphalt, grade RC-70 or RC-250, conforming to Section M3.02.0 of SSHB. The contact surfaces of castings and other structures shall be painted with a tack coat.

D. All pavement thicknesses referred to herein are compacted thickness. Place sufficient mix to ensure that the specified thickness of pavement occurs wherever called for. Pavement layers shall be placed and compacted by steel rollers of sufficient weight to thoroughly compact pavement material without damaging existing underlying materials.

2.02 GRANITE CURB AND EDGING

A. Granite curb shall be 4-in x 16-in and shall conform to Sections M9.04.0 of SSHB. Top surface of the granite shall be sawcut.

B. Granite curb shall be free from wind, shall be pointed, peen hammered, or sawed to an approximately true plane and shall have no projections or depressions greater than 1/4-in. The front and back arris lines shall be pitched straight and true. Front faces shall be at right angles to the top and shall be smooth quarry split, free from drill holes and with no projection of more than 1-1/2-in and no depression greater than 1-in measured from the vertical plane of the face through the arris or pitch lines for the full depth of the face. The ends of stones shall be square with the planes of the top and face so that when stones are placed end to end, no spare shall show in the joint in the top face of more than 3/8-in for the full width of the top and 8-in down the face after which the ends may break back not more than 1-ft from the plane of the joint. On pieces less than 4-ft long, the ends shall not beak back more than 9-in. The arris formed by the intersection of the plane of the joint with the planes of the top and exposed faces shall have no variation from the plane of the top and exposed faces greater than 1/8-in.

C. Dimensions of granite curb shall be minimum 4-in wide at top and 16-in deep for island & radius curb unless otherwise shown on the Drawings, or specified herein as manufactured by Fletcher Granite Co., Smithfield, RI, or Swenson Granite Co., Concord, NH, or equal.

D. Granite curb shall be manufactured with squared ends and in a manner to be set vertically. General length shall be minimum 6-ft long for 4-in x 16-in curb The 16-in dimension shall be the minimum width at bottom for 2/3 of length.

E. Face of granite curb corner and driveway stones shall match face of adjacent curbing.

F. Concrete for curb anchor shall be as dimensioned on the Drawings and as specified in Section 03301.

G. Cement mortar for curb joints shall conform to M4.02.15 of SSHB.

H. Granite edging, cement mortar, and concrete anchor materials for use at concrete paver area shall match granite curb herein.

2.03 WOOD GUARD RAIL

A. Wood guard rail posts shall be sized as shown on the Drawings and shall be treated with CCA preservative in accordance with AWPA Standards for ground contact, and shall conform to Section M8.07.0.B.2. of SSHB.

B. Bolts, nuts, and washers shall conform to Section M8.07.0.D. of SSHB.

C. Rails shall be sized as shown on the Drawings and shall be constructed of Southern Yellow Pine treated with CCA preservative in accordance with AWPA Standards for ground contact, and shall select structural grade, surfaced four sides (S4S), conforming to the requirements of the Standard Grading Rules for Southern Yellow Pine of the Southern Forest Products Association.

2.04 PAVEMENT MARKINGS

A. Pavement markings shall be fast drying, white color, water-bourne traffic paint conforming to M7.01.23 of SSHB.

B. Handicap parking space pavement markings shall conform to City of Marlborough DPW standards.

PART 3 EXECUTION

3.01 BITUMINOUS CONCRETE PAVING - GENERAL

A. Bituminous concrete pavement shall be mixed, delivered and installed in accordance with Sections 460 and M3.11.00 of SSHB.

B. The binder course shall be placed as soon as possible after the subbase has been prepared, shaped and compacted.

C. The binder course shall be placed and compacted by steel-wheeled rollers of sufficient weight to thoroughly compact the bituminous concrete. Where necessary, the new pavement shall be rolled smooth and even with the existing pavement.

D. Maintain pavement under this Contract during the guarantee period of 1 year and promptly (within 3 days of notice given by Engineer or Owner) refill and repave areas which have settled or are otherwise unsatisfactory for traffic.

E. All pavement thicknesses referred to herein are compacted thicknesses. Place sufficient mix to ensure that the specified thickness of pavement occurs wherever called for.

F. When required, remove existing pavement by saw, pneumatic hammer or wheel, cutting edges of trenches to be repaved as directed by the Engineer. After pipe laying, backfilling and compaction operations are completed satisfactorily and after the gravel subbase is shaped and compacted, place the type of pavement as directed by the Engineer.

G. Hose clean all road surfaces after backfilling and before any surfacing, but in no case will pavement be placed until the gravel base is dry and compacted to at least 95 percent maximum density at optimum moisture content.

H. All frames and utility boxes are to be set at finish grade. At no time shall the frames be allowed to protrude above the surface of the finish grade unless approved by the Engineer.

I. The contact surfaces of castings and other structures shall be painted with a tack coat.

J. After the paving mixture has been properly spread, initial compaction shall be obtained by the use of power rollers weighing not less than 240 lbs/in width of tread.

K. Final compaction of the surface shall be accomplished by rollers weighing not less than 285 lbs/in width of tread. Along curbs, structures and all places not accessible with a roller, the mixture shall be thoroughly compacted with tampers. Such tampers shall not weigh less than 25 lbs and shall have a tamping face of not more than 50 sq in. The surface of the mixture after compaction shall be smooth and true to the established line and grade.

L. When the air temperature falls below 50 degrees F, extra precautions shall be taken in drying the aggregates, controlling the temperatures of the materials and placing and compacting the mixtures.

M. No mixtures shall be placed when the air temperature is below 40 degrees F, nor when the material on which the mixtures are to be placed contains frost or has a surface temperature the Engineer considers too low.

N. No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained and the material has cooled sufficiently to prevent distortion or loss of fines. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Engineer.

O. All pavements shall be laid over a prepared subbase, thoroughly compacted and shaped to the required grade and cross Section as shown on the Drawings or approved by the Engineer. Cross section of all handicap accessible pedestrian pathways and sidewalks shall not exceed 2% cross slope.

P. Where new concrete sidewalks or bituminous concrete patches or access roads meet existing pavements, Contractor shall create straight, clean and smooth transitions between pavements by saw cutting and patching existing pavements where necessary and matching finish grades of all pavements.

Q. Finish grade of all pavements shall have positive drainage. Ponds, puddles, depressed areas or grades creating bird baths deeper than 1/8-in will not be accepted, and at the request of the Engineer, such pavements shall be removed and reinstalled at the expense of the Contractor.

R. Contractor shall finish all edges with a neat, continuous tamped edge.

S. After completion, the bituminous concrete areas shall conform to the thickness shown on the Contract Drawings, smooth and even and of a dense and uniform structure. When tested with a 16-ft straightedge placed parallel to the straight sections of the centerline of the pavements, there shall be no deviation from a true surface in excess of 1/4-in.

3.02 TRENCH PAVEMENT RESTORATION

A. Place 2-1/2-in binder course over trenches cut in existing paved areas no later than 1 week after the trench has been backfilled and repair pavement to match existing prior to project completion.

3.03 PAVEMENT SETTLEMENT

A. If points of settlement or holes appear in the pavement, repair the same within 3 days of notification by the Engineer or Owner. If after due notice, if failure to make the repairs is evident, the work will be done by the Owner and the total cost of such repairs will be charged to the Contractor.

3.04 GRANITE CURB

A. Install all granite curb in accordance with Sections 501.60 through 501.63, and 501.65 of SSHB.

B. Furnish and install joint pointing of curbstones in accordance with Section 501.67 of SSHB. Top, front and back joints of vertical granite curb tire stops, shall be filled in accordance with Section 501.67 of SSHB.

3.05 WOOD GUARD RAIL

A. Install guard rail posts in accordance with Section 601.60 and 601.61 of SSHB.

B. Install guard rail plumb in augered holes and backfilled with the specified material and thoroughly tamped. Install uniform 4-in layer of off-white crushed stone at finished grade in areas shown on the Drawings.

C All connections or splices shall be formed with carriage bolts, nuts, and washers to minimize projections on both sides of the guardrail. Nut end of bolts shall be placed on the back side of the guardrail post and peened to prevent removal.

D. Rails shall be constructed parallel with finished grade and generally appear as one continuous line without abrupt changes in alignment.

3.07 PAVEMENT MARKINGS

A. Install pavement markings in areas as shown on the Drawings and in accordance with Section 860.60 through 860.64 of SSHB.

3.08 GUARANTEE/WARRANTY

A. All pavement materials and appurtenances placed shall be maintained over the winter. During this period, all pavement areas or curbs, or guard rails which have settled or are unsatisfactory for traffic shall be removed, refilled, reinstalled, and replaced at the direction of the Owner.

B. All pavements, curbs, guard rails, and pavement markings shall be guaranteed against defects in workmanship or quality for a period of one year after final acceptance. Contractor shall repair at no cost to the Owner.

END OF SECTION

SECTION 02576

PERMEABLE INTERLOCKING CONCRETE PAVERS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install the concrete paving units as shown on the Drawings and as specified herein.

B. After pavers are installed, and at a time near the end of the contract period, include at least one additional surface application of sand material over all new permeable paver areas, including the compaction procedure, in order to supplement any visibly settled aggregate materials and pavers that have moved out of position or alignment, as directed by the Engineer, and as specified herein.

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, at least five sample paving units including manufacturer's literature, product data, color chart, and samples that indicate color, texture, overall dimension, weight, and shape.

B. Submit pattern layout and details of construction and accessories required.

C. Submit test results from an independent testing laboratory for compliance of paving unit requirements to ASTM C 936 and CSA A231.2-95 for resistance to freeze thaw and other applicable requirements.

D. Sieve analysis for grading of bedding, aperture, and joint sand aggregates and materials.

1.04 REFERENCE STANDARDS

A. ASTM C 33 – Specification for Concrete Aggregates

B. ASTM C 136 – Method for Sieve Analysis for Fine and Coarse Aggregate

C. ASTM C 140 – Sampling and Testing Concrete Masonry Units

D. ASTM C 936 - Standard Specification for Solid Concrete Interlocking Paving Units

E. ASTM C 979 – Specification for Pigments for Integrally Colored Concrete

F. ASTM D 448 – Standard Sizes of Processed Aggregates

G. ASTM D 698 and D 1557 – Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures

H. ASTM D 2940 – Graded Aggregate Material for Bases or Sub bases for Highways or Airports

I. CSA A231.2-95 – Precast Concrete Pavers

J. Connecticut Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction, Form 816 (CTDOTSSRBIC).

1.05 QUALITY ASSURANCE

A. Paver manufacturer shall be an Interlocking Concrete Paver Institute (ICPI) Certified Producer.

B. Installation shall be performed by a contractor with at least 5 years experience in placing interlocking concrete pavers on projects of similar size and scope.

C. Contractor shall have received training by a certified instructor for the ICPI (Interlocking Concrete Paver Institute) Contractor Certification Program.

1.06 MOCK-UP

A. Prior to starting the work, a 10-ft x 10-ft area shall be installed to determine setting bed, joint sizes, lines, laying pattern, edging interface, and the color and texture of the pavers to be used on the project.

B. The approved mock-up will be the standard from which the work shall be judged and shall be left undisturbed until the work is completed. The approved mock-up may be incorporated into the work.

1.07 STORAGE AND HANDLING

A. Protect concrete pavers and accessory materials during shipment, storage and construction against staining and damage.

B. Coordinate delivery and paving schedule to minimize interference with other construction activity.

C. Cover sands with waterproof covering to prevent exposure to rainfall or removal by wind. Do not install sand or pavers during heavy rain or snowfall, or over frozen base materials. Do not install bedding layers over frozen base materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete Pavers

1. Concrete pavers shall be interlocking paving units as manufactured by Ideal Concrete Block Company of Westford, MA (781-894-3200), Unilock Philadelphia of Lumberton, NJ (609-914-000), or ICPI Certified Producer equal.

2. The interlocking paving units shall conform to reference standard ASTM C 936.

3. The units shall have a 28 day compressive strength minimum of 8,000 psi with no individual unit less than 7,200 psi.

4. No paver shall have a water absorption of greater than 5% when tested in accordance with reference standard ASTM C140.

5. Pavers shall have freeze thaw resistance according to reference standard ASTM C-67 section 8.

6. All pavers shall be by the same manufacturer. For reference purposes, pavers shall conform to the following:

   a. Pavers shall be permeable pavers, 2 3/8-in thick, with overall dimension of 4-in x 8-in. They shall be furnished with a 2mm chamfer around the top surface. Units shall be molded with a notch 32mm in length in each corner to provide an overall void space not less than 9.5% /sf and spacer bars shall be 4.5mm. Pavers shall be Aqua-Bric, with Quarry Blend color, or equal. Color to be approved by Owner.

7. Size, shape, design and colors shall be in accordance with the Drawings and specifications and shall match samples approved by the Owner.

B. Aggregate Fill shall be as specified in 02200.

C. Woven geotextile shall be a high modulus, woven polypropylene fabric with a minimum Mullen Burst Strength of not less than 450 psi in accordance with ASTM D 3786, Strata Micro grid or Mirafi Filterweave, or equal

PART 3 EXECUTION

3.01 INSTALLATION

A. Remove and dispose of all organic and unsuitable material from subgrade soil. Subgrade soil shall be graded uniform and parallel to finished grade, and compacted to 95% of maximum dry density in accordance with ASTM D-1557.

B. Install woven geotextile fabric over the entire area to receive pavers and overlap seams by min 24-in and extend up the sides of excavated area.

C. Compaction shall not be less than 95% Standard Proctor Density in accordance with ASTM D 698 for areas subject to pedestrian traffic only. All pavement subject to vehicular traffic shall be compacted to not less than 98% Modified Proctor density according to ASTM D 1557.

D. Install edge restraints and curbs in accordance with manufacturer's instructions and as shown on the Drawings.

E. The base shall be placed in layers uniformly spread and compacted. For vehicular areas, the material shall be placed in 4-in to 6-in thick lifts and compacted using a plate rammer or

vibratory roller. Base material for pedestrian areas may be placed in 4-in thick lifts and compacted using a plate compactor capable of exerting no less than a 5000-lb force.

F. In areas not accessible by rolling equipment, compact to specified density with hand operated equipment.

G. Spread the setting bed aggregate evenly over the base course and screed to a nominal 2-in thickness. Once screeded, do not compact or disturb bedding material. Do not use setting bed aggregate to fill depressions in the base surface. If the screeded sand is accidently pre-compacted by walking or rain, rake and re-screed as specified herein. Do not screed more of an area of setting bed on which pavers can be set that same day.

H. Ensure pavers are free of foreign material prior to installation. Set Type A field area of concrete pavers in running bond pattern with perimeter border area in dead soldier course pattern. Set Type B concrete pavers in herringbone pattern. Install in straight lines and true to grade. Install units hand tight to achieve uniform joints between pavers. String lines shall be used frequently to hold pattern lines true and accurate. Typical joints between pavers shall be between 1/16-in and 3/16-in wide on average. Minimize cutting of pavers, however, where necessary, cut pavers to accommodate field conditions and to achieve an accurate and consistent fit to pattern. Full units shall be laid first and cuts done subsequently. Use manufactured edge pieces or, as required, cut full units with a splitter designed for pavers, or with a masonry saw to insure all cuts fit neat and accurate without damaged edges. Pavers shall be free of stains, dirt, and dust after cutting. Fill gaps at the edges of the paver area with cut pavers. In paver edge areas subject to vehicle traffic, do not install cut units smaller than one-third of a whole paver. Proceed with installation of pavers by moving forward on top of previously installed units. Take pavers vertically from 3 pallets or more at a time to ensure colors are blended evenly. Redistribute units to achieve uniform color blending. Remove and replace pavers that are chipped, stained, cracked, broken, or otherwise damaged. Take care to transport materials over uncompacted areas to prevent damage or pre-compaction.

I. After the pavers have been placed, they shall be vibrated into the setting bed using a low amplitude, high frequency plate vibrator capable of applying a minimum force of 4000 to 5000 lbs. using overlapping passes. Replace broken or cracked pavers with new units to match adjoining pavers. Sweep ASTM No 8 stone into the joints and apertures. Compact the entire pavement in overlapping passes to insure the pavement surface is true to grade. Three or more passes with the vibrator shall be made at a 90º angle until the pavers are brought to the design levels and profiles. Compaction shall continue until lipping has been eliminated between adjoining pavers. Do not vibrate within 3-ft of the restrained edges of the paving units. Sand shall be spread and broomed over the installed paving units. At least one pass of the plate vibrator shall be made to consolidate the sand in the joints. Sweep additional ASTM No 8 stone over the pavement surface and compact until the joints and apertures are completely full. All work to within 3-ft of the laying face must be left fully compacted with sand filled joints at the end of each day. All pavers installed on a particular day must be compacted by the end of the same working day.

J. Sweep off excess stone and sand when the job is complete. Final surface elevations shall not deviate more than 3/8-in under a 10-ft long straight edge. After being swept clean, the completed surface shall be swept clean and washed down with water to provide a finished workmanlike installation. Clean exposed surfaces and examine work and repai r and correct unacceptable conditions. Paver joints shall be filled with sand at least three times after installation or on a monthly basis until project acceptance.

END OF SECTION

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SECTION 02605

DRAINAGE STRUCTURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment required and install concrete drainage structures, frames and covers, trench drains and appurtenances as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

B. Trenching, Backfilling, and Compaction is included in Section 02221.

C. Concrete is included in Section 03301.

D. Asbestos Concrete Pipe Abatement is included in Section 01170 Special Provisions.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings, product data, materials of construction, and details of installation, including reinforcing, joints, pipe connections to drainage structures, frames, grates, and covers.

B. Prior to each shipment of pipe, submit certified test reports that the pipe for this Contract was manufactured and tested in accordance with the ASTM, AASHO and ANSI/AWWA Standards specified herein.

C. Warranties

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A48 - Standard Specification for Gray Iron Castings.

2. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

3. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

4. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).

5. ASTM C33 - Standard Specification for Concrete Aggregates.

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6. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)

7. ASTM C150 - Standard Specification for Portland Cement

8. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes

9. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets

10. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections

11. ASTM C789 - Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers

12. ASTM D4101 - Standard Specification for Propylene Plastic Injection and Extrusion Materials.

B. American Concrete Institute (ACI)

1. ACI 318 - Building Code Requirements for Reinforced Concrete

2. ACI 350R - Environmental Engineering Concrete Structures

C. American Association of State Highway and Transportation Officials (AASHTO)

1. Standard Specifications for Highway Bridges

D. Occupational Safety and Health Administration (OSHA)

E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. All material shall be new and unused.

B. Materials' quality, manufacturing process and finished sections are subject to inspection and approval by Engineer or other Owner representative. Inspection may be made at place of manufacture, at work site following delivery, or both.

C. Materials will be examined for compliance with ASTM standards, this Section and approved manufacturer's drawings. Additional inspection criteria shall include: appearance, dimensions(s), blisters, cracks and soundness.

D. Materials shall be rejected for failure to meet any requirements specified herein. Rejection may occur at place of manufacture, at work site, or following installation. Mark for identification rejected materials and remove from work site immediately. Rejected materials shall be replaced at no cost to Owner.

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PART 2 PRODUCTS

2.01 GENERAL

A. Reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

B. Like items of materials/equipment shall be the products of one manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts and manufacturer's service.

C. Split ring couplings or equal shall be utilized, no spring-on couplings will be allowed. One-half-inch wide self adhesive neoprene foam strips shall be applied on each inner rib of the coupling prior to installation on pipes to minimize any water leakage out of the joints.

2.02 PRECAST CONCRETE DRAINAGE STRUCTURES

A. Precast concrete barrel sections and transition top sections, shall conform to Specifications for Precast Reinforced Concrete manhole and drain sections, ASTM C478 and meet the following requirements:

1. The wall thickness shall not be less than 5-in for 48-in diameter reinforced barrel sections, 6-in for 60-in diameter reinforced barrel sections 7-in for 72-in diameter reinforced barrel sections, and 9-in for 96-in diameter reinforced panel sections.

2. Top sections of manholes shall be eccentric except that barrel sections shall be used where shallow pipe cover requires a top section less than 4 feet as shown on the Drawings.

3. Barrel sections shall have tongue and groove joints.

4. All sections shall be cured by an approved method and shall not be shipped nor subjected to loading until the concrete compressive strength has attained 4,000 psi and not before 5 days after fabrication and/or repair, whichever is longer.

5. Design precast concrete top slabs, base, risers and transition sections for a minimum of H-20 loading plus the weight of the soil above at 120 pcf.

6. The date of manufacture and the name and trademark of the manufacturer shall be clearly marked on the inside of each precast section.

7. Precast concrete bases shall be constructed and installed as shown on the Drawings. The thickness of the bottom slab of the precast bases shall not be less than the manhole barrel sections or top slab whichever is greater.

8. Knock out panels shall be provided in precast manhole sections at the locations shown on the Drawings. They shall be integrally cast with the section, 2-1/2-in thick and shall be sized as shown on the Drawings. There shall be no steel reinforcing in knock out panels.

B. Precast access manholes for the concrete box culvert must be compatible with the culvert manufacturer's access openings.

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2.03 JOINTING PRECAST MANHOLES, CATCH BASINS, AND STRUCTURES

A. Tongue and groove joints of precast manhole (and structure) sections shall be sealed with either a round rubber "O"-ring gasket or a preformed flexible joint sealant. The "O"-ring shall conform to ASTM C443. The preformed flexible joint sealant shall be Kent Seal No. 2 as manufactured by Hamilton-Kent; Ram-Nek as manufactured by K.T. Snyder Company; or equal.

B. Joints shall be designed and manufactured so that the completed joint will withstand an internal water pressure of 15 psi without leakage or displacement of the gasket or sealant.

2.04 BRICK MASONRY

A. The bricks shall be good, sound, hard and uniformly burned, regular and uniform in shape and size, of compact texture and satisfactory to the Engineer. Underburned or salmon brick will not be acceptable and only whole brick shall be used unless otherwise permitted. In case bricks are rejected by the Engineer, they shall be immediately removed from the site of the work and satisfactory bricks substituted therefor.

1. Bricks for the channels and shelves shall comply with the latest specifications of ASTM C32 for Sewer Brick, Grade SS (from clay or shale) except that the mean of five tests for absorption shall not exceed 8 percent and no individual brick exceed 11 percent.

2. Bricks for building up and leveling manhole frames shall conform to ASTM C62.

B. Mortar used in the brickwork shall be composed of one part Type II portland cement conforming to ASTM C150 to two parts sand to which a small amount of hydrated lime not to exceed 10 lbs to each bag of cement shall be added. The hydrated lime shall also conform to ASTM C207.

C. Sand shall be washed, cleaned, screened, sharp and well graded as to different sizes and with no grain larger than will pass a No. 4 sieve. It shall be free from vegetable matter, loam, organic or other materials of such nature or of such quantity as to render it unsatisfactory.

2.05 MANHOLE FRAMES, COVERS AND CATCH BASIN GRATES

A. Manhole frames and covers and catch basin grates and traps shall be of good quality, strong, tough, even grained cast iron smooth, free from scale, lumps, blisters, sand holes and defects of any kind which render them unfit for the service for which they are intended. Manhole and catch basin covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30.

B. Manhole covers shall have a diamond pattern, pickholes and the word DRAIN cast in 3-in letters. Catch basin grates shall be 4-flange with square openings. Manhole frames and covers shall be East Jordan Iron Works (EJIW); Mechanics Iron Foundry; Neenah Foundry or approved equal. Match existing manhole frames and covers and existing catch basin grates or approved equal.

1. Drain Manhole Frame and Covers shall be EJIW Model No. 2007Z frame with 2006A cover or approved equal.

2. Catch basin grates shall be EJIW Model No. 5523Z frame with 5520MB grate or approved equal.

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2.06 DRAIN INLET BEDDING AND BACKFILL MATERIALS

A. Bedding shall extend as shown on the Drawings. Bedding material shall be Structural fill.

2.07 PIPE CONNECTIONS

A. Tapered hole filled with non-shrink waterproof grout, Hallemite; Waterplug; Embeco or equal. After the pipe is inserted place grout carefully to Completely fill around the pipe. Place concrete encasement to assure a total 12-in of concrete including manhole thickness around the pipe stub.

2.08 PIPE BEDDING AND BACKFILL MATERIALS

A. Pipe bedding shall extend from bottom of trench to the spring line of the pipe. Bedding material shall be screened gravel.

B. Material around pipe from the spring line to a point at least 12-in over the top of the pipe shall be selected backfill. Selected backfill shall be clean, well graded material of Soils Types GW, GP, GM, GC, or SW, as classified by ASTM D2487. Maximum particle size shall be 4-in.

2.09 PORTLAND CEMENT MORTAR

A. Mortar shall be a portland cement mortar conforming to ASTM C270, Type M.

B. Mortar shall contain a waterproofing admixture. Waterproofing admixture shall be one of the following:

Admixture	Manufacturer
Hydratite Plus	W.R. Grace and Company
Medusa Waterproofing	Medusa Portland Cement Company
Omicron Mortarproofing	Master Builders Company
Mortaron	The Aquabar Company
Hydrocide Powder	Sonneborn Building Products, Inc.

2.10 NONSHRINK GROUT

A. Grout shall be nonshrink cement-based type, such as Master Builders Company “Embeco” or U.S. Grout Corporation “5 Star Grout.”

2.11 BITUMINOUS PAINT

A. Bituminous paint shall be Koppers Company, Inc., “Bitumastic Black Solution”, Sonneborn Building Products, Inc., “Bilsonite Base Paint”, or equivalent bituminous-base product.

2.12 ASPHALT MASTIC CEMENT

A. Asphalt mastic cement shall be a pitch-base or asphalt-base compound fibrated with non-asbestos fibers conforming to Fed. Spec. SS-C-153.

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PART 3 EXECUTION

3.01. MANHOLE AND CATCH BASIN INSTALLATION

1. Manholes shall be constructed to the dimensions shown on the Drawings and as specified in these Specifications. All work shall be protected against flooding and flotation.

2. The bases of manholes and catch basins shall be placed on a bed of 12-in screened gravel as shown on the Drawings. The bases shall be set at a grade to assure that a maximum of 12-in thickness of brickwork will bring the manhole frame and cover to final grade. Cast-in-place bases, where permitted by Engineer, shall be constructed in accordance with the details shown on the Drawings and the requirements of Division 3. The 28-day compressive strength of concrete shall not be less than 5000 psi.

3. Precast concrete barrel sections and structures shall be set plumb and with sections in true alignment with a 1/4-in maximum tolerance to be allowed. The joints of precast barrel sections shall be sealed with either a rubber "O" ring set in a recess or the preformed flexible joint sealant used in sufficient quantity to fill 75 percent of the joint cavity. The outside and inside joint shall be filled with non-shrink mortar and finished flush with the adjoining surfaces. Allow joints to set for 24-hours before backfilling. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides. If any leaks appear in the manholes, catch basins, or structures, the inside joints shall be caulked with lead wool to the satisfaction of the Landscape Architect/Engineer. The Contractor shall install the precast sections in a manner that will result in a watertight joint.

4. Holes in the concrete barrel sections required for handling or other purposes shall be plugged with a non-shrinking grout or in combination with concrete plugs, and finished flush on the inside.

5. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be done prior to setting manhole and drain sections in place to prevent any subsequent jarring which may loosen the mortar joints.

B. Manhole Pipe Connections

1. Pipe connections shall be accomplished in the ways specified hereinbefore. Pipe stubs for future extensions shall also be connected and the stub end closed by a suitable watertight plug.

C. Brickwork

1. Mortar shall be mixed only in such quantity as may be required for immediate use and shall be used before the initial set has taken place. Mortar shall not be retained for more than one and one-half hours and shall be constantly worked over with hoe or shovel until used. Anti-freeze mixtures will not be allowed in the mortar. No masonry shall be laid when the outside temperature is below 40 F unless provisions are made to protect the mortar, bricks, and finished work from frost by heating and enclosing the work with tarpaulins or other suitable material. The Landscape Architect/Engineer's decision as to the adequacy of protection against freezing shall be final.

2. Setting Manhole Frame and Cover. Manhole covers and frames shall be set in a full mortar bed, and bricks, a minimum of 6-in and a maximum of 12-in thick, shall be utilized to

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assure frame and cover are set to the existing grade. If full-width paving is the permanent paving, the manhole frame and cover shall be reset to final grade prior to placement of permanent paving.

D. Dampproofing

1. Outer surfaces of precast manholes and catch basins shall be given two coats of bituminous dampproofing at the rate of 30-60 sq ft per gallon as directed by the Landscape Architect/Engineer and in accordance with manufacturer's instructions.

3.02 PIPING INSTALLATION

A. Piping and fittings shall be installed in accordance with the manufacturer’s instructions and as indicated on the Drawings.

1. Bottom of trench excavation shall be kept dry and free of water during pipe installation. Adequate measures shall be taken to prevent flotation of pipe in the trench.

2. Pipe shall be joined by standard split couplers as recommended by the manufacturer.

3. As soon as the excavation is complete to normal grade of the bottom of the trench, screened gravel bedding shall be placed, compacted, and graded to provide firm, uniform and continuous support for the pipe. Blocking under the pipe will not be permitted. Bedding shall be placed evenly on each side of the pipe to mid-diameter and hand tools shall be used to force the bedding where needed to give firm continuous support for the pipe. Screened gravel shall then be placed to 12-inches above the pipe. Generally the compaction shall be done evenly on each side of the pipe and compaction equipment shall not be operated directly over the pipe until sufficient backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe.

4. No pipe or fitting shall be permanently supported on saddles, blocking, or stones.

5. Piping shall be properly graded, free from pockets.

6. Pipe shall be thoroughly cleaned before installation, and shall be maintained free from foreign matter during installation.

7. Where necessary, tight-fitting temporary wood bulkheads shall be employed to close ends of pipeline at end of each day's work.

8. Entire length of pipe shall be thoroughly flushed clean following completion of backfill.

3.03 FRAME, COVER AND HOOD INSTALLATION

A. Provide brick to bring cast iron frame, cover, and grate to required elevation. Completed brick installation shall be coated with at least a 3/4-in thickness of mortar on outside to provide sealed watertight collar between top manhole or catch basin section and cover or grate frame. Manhole covers set below finished grade as shown on the drawings shall be covered with filter fabric.

1. Before installation of castings, touch up chipped and scraped areas with one coat of bituminous paint.

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2. Cast iron frame shall be set concentric with manhole or catch opening in a full bed of mortar. A thick ring of mortar extending to the outer edge of brick or concrete shall be placed all around the bottom flange of the cast iron frame. Mortar surface shall be smooth and shall be sloped to shed water away from the frame.

3. Waterproofing shall be added to the mortar for underground masonry in accordance with the waterproofing manufacturer's directions. Other additives will not be permitted in the mortar.

B. Portland cement-based mixture used on the work shall receive a minimum of three days of moist curing, which shall start immediately after the material has been placed. Suitable means shall be employed to protect cement-based mixtures from too rapid drying and damage from cold weather and frost.

C. Where required, connect new piping to existing manholes and catch basins by cutting or breaking into existing structures. Patch and finish with nonshrink grout to Engineer's satisfaction.

3.04 CLEANING

A. Thoroughly clean all structures of all silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION

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SECTION 02616

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install ductile iron pipe and fittings for gravity sewer and water mains, where required, complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Trenching, backfilling and compaction is included in Section 02221.

B. Granular materials are included in Section 02200.

C. Concrete is included in Section 03301.

1.03 SUBMITTALS

A. Submit to the Engineer, within thirty days of the Effective Date of the Agreement, the name of the pipe and fitting suppliers and a list of materials to be furnished.

B. Submit to the Engineer, as provided in Section 01300, completely detailed working drawings and schedules of all ductile iron pipe and fittings required.

C. Prior to each shipment of pipe, submit certified test reports that the pipe for this Contract was manufactured and tested in accordance with the ASTM and ANSI/AWWA Standards specified herein.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs 60,000 PSI Tensile Strength.

B. American Water Works Association (AWWA)

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pressure Pipe and Fittings.

2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.

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3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3-in Through 48-in for Water and Other Liquids.

4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

5. AWWA C115 - Standard for Flanged Ductile-Iron Pipe with Threaded Flanges.

6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

7. AWWA C153 - Ductile-Iron Compact Fittings, 3-in Through 16-in for Water and Other Liquids.

8. AWWA C600 - Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

9. AWWA C651 - Disinfection Water Mains

C. American National Standards Institute (ANSI)

1. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. All ductile iron pipe and fittings shall be from a single manufacturer. All ductile iron pipe to be installed under this Contract may be inspected at the foundry for compliance with these Specifications by an independent testing laboratory provided by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of foundry inspection of all pipe approved for this Contract, plus the cost of inspection of a reasonable amount of disapproved pipe will be borne by the Owner. Reference is made to Article 14.07 of the Supplementary Conditions for payment of excessive inspection costs.

B. Inspection of the pipe will also be made by the Engineer or other representatives of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

PART 2 PRODUCTS

2.01 MATERIALS

A. Ductile iron pipe with 3-ft of cover or less shall conform to ANSI/AWWA C151, Class 53. All other ductile iron pipe shall conform to ANSI/AWWA C151, Class 52.

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B. Ductile iron fittings shall conform to ANSI/AWWA C110 or C153.

C. All pipe and fittings shall have a bituminous outside coating in accordance with ANSI/AWWA C151 and C110, respectively. All pipe and fittings shall be cement-mortar lined and seal coated in accordance with ANSI/AWWA C104 double thickness.

D. Joints for pipe and fittings shall be push-on or mechanical joints conforming to ANSI/AWWA C111 or C153 except where flanged joints are shown on the Drawings. Two bronze wedges shall be inserted in every joint for every length of new water main.

E. Restrained joints shall be suitable for 350 psi working pressure and fabricated of heavy section ductile iron casting. Gaskets shall meet the material requirements of ANSI/AWWA C111 for mechanical joint gaskets. Bolts and nuts as required shall be low carbon steel conforming to ASTM A307, Grade B. Restrained joints for push-on joint pipe shall be TR Flex by U.S. Pipe and Foundry Company, or equal. Restrained joints for mechanical joint pipe and fittings shall employ a ductile iron retainer gland. Twist-off nuts shall be used to ensure anchoring of the gland. Retainer glands shall be "Megalug" as manufactured by EBBA Iron, Inc., Eastland, TX, or approved equal.

F. Sleeve type flexible couplings shall be of steel and shall be Style 38 by Dresser Mfg. Div., equal by Smith-Blair, JCM Industries Inc. or equal. Couplings shall be furnished with black steel bolts and nuts and with pipe stop removed from the middle ring. Gaskets shall be of a material suitable for exposure to liquid within the pipe.

G. Ductile iron pipe for gravity drain shall conform to ASTM A746 standards.

PART 3 EXECUTION

3.01 LAYING DUCTILE IRON PIPE AND FITTINGS

A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe, lining or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe linings or coatings shall be repaired as directed by the Engineer. Handling and laying of pipe and fittings shall be in accordance with the manufacturer's instruction and as specified herein.

B. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when laid, shall conform to the lines and grades required. Ductile iron pipe and fittings shall be installed in accordance with requirements of AWWA Standard Specification C600 except as otherwise provided herein. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner by the Contractor, at his own expense.

C. For all gravity drains (regardless of excavation conditions) and pressure pipe (water main) excavated in rock, a minimum 8-in bedding of screened gravel shall be placed and tamped up to mid-diameter of the pipe, with select common fill placed and compacted from mid-diameter to 1-foot above the top of the pipe. For pressure pipe excavated in earth, the bottom quadrant of the pipe shall be bed on undisturbed earth (provided it is firm and even) and select common fill shall

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be placed and compacted at the sides and up to 1-foot over the top of the pipe. Blocking will not be permitted.

D. All pipe shall be sound and clean before laying. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plugs or other approved means. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by manufacturer. Fittings, in addition to those shown on the Drawings, shall be provided, if required, for crossing utilities, which may be encountered upon opening the trench. Solid sleeves shall be used only where approved by the Engineer.

E. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be jointed with a bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged.

F. The Contractor shall have on hand at the start of the job, a sufficient number of various bends for each size of pipe to ensure pipe laying is not delayed. These shall be used as job conditions require.

3.02 PUSH-ON JOINTS

A. Push-on joints shall be made in accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe to be laid shall then be aligned and inserted in the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

3.03 MECHANICAL JOINTS

A. Mechanical joints shall be made in accordance with Appendix A of ANSI/AWWA C111 and the manufacturer's instructions. Thoroughly clean and lubricate the joint surfaces and rubber gasket with soapy water before assembly. Bolts shall be tightened to the specified torques. Under no conditions shall extension wrenches or pipe over handle of ordinary ratchet wrench be used to secure greater leverage.

3.04 RESTRAINED JOINTS

A. Restrained joints shall be installed where shown on the Drawings or as directed by Engineer. The joint assemblies shall be made in accordance with the manufacturer's recommendations.

3.05 SLEEVE TYPE COUPLINGS

A. Couplings shall be installed where shown. Couplings shall not be assembled until adjoining push-on joints have been assembled. After installation, apply a heavy bitumastic coating to bolts and nuts.

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3.06 CONNECTIONS TO STRUCTURES (Pressure Piping)

A. Wherever a pipe 3-in in diameter or larger passes from concrete to earth horizontally, two flexible joints spaced from 2 to 4 feet apart depending on pipe size shall be installed, within 2 feet of the exterior face of the wall, whether or not shown on the Drawings.

B. Wall pipes shall have a thrust collar located at mid-depth of wall.

3.07 TESTING (Pressure Piping)

A. Furnish all necessary equipment and labor for carrying out a pressure test and leakage test on the pipelines. The procedures and method for carrying out the pressure and leakage tests shall be approved by the Engineer.

B. Make any taps and furnish all necessary caps, plugs, etc., as required in conjunction with testing a portion of the pipe. Furnish a test pump, gauges, and any other equipment required in conjunction with carrying out the hydrostatic tests.

C. All pipelines shall be subjected to a hydrostatic pressure of 150 psi and this pressure maintained for at least two hours. The leakage test shall be conducted at the maximum operating pressure as determined by the Engineer, and this pressure shall be maintained for at least two hours during the test. For water mains, hydrant branch gate valves shall remain open during this test. The amount of leakage, which will be permitted, shall be in accordance with the following formula:

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

where: L is allowable leakage, in gallons per hour
S is the length of the pipe tested, in feet
D is the nominal diameter, in inches
P is the average pressure during the test, in PSI gauge

The Contractor shall, at his own expense, locate and make repairs as necessary until the leakage is within the specified allowances and shall repair all visible leaks.

3.08 CLEANING

A. At the conclusion of the work thoroughly clean all of the new pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood or other material, which may have entered during the construction period. If, after this cleaning, obstructions remain, they shall be removed.

B. After the pipelines are cleaned and if the groundwater level is above the pipe, or following a heavy rain, the Engineer will examine the pipe for leaks. If defective pipes or joints are discovered at this time, they shall be repaired or replaced by the Contractor.

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3.09 CHLORINATION OF PIPELINES (Water Mains)

A. Before being placed in service, all new water pipelines shall be chlorinated using the continuous feed method specified in AWWA C651. The procedure shall be approved by the Engineer in advance.

B. The location of the chlorination and sampling points will be determined by the Engineer in the field. Taps for chlorination and sampling shall be installed by the Contractor. The Contractor shall uncover and backfill the taps as required.

C. The general procedure for chlorination shall be first to flush all dirty or discolored water from the lines and then introduce chlorine in approved dosages through a tap at one end, while water is being withdrawn at the other end of the line. The chlorine solution shall remain in the pipeline for 36 hours.

D. Following the chlorination period, all treated water shall be flushed from the lines at their extremities and replaced with water from the distribution system. All treated water flushed from the lines shall be disposed of by discharging to the nearest sanitary sewer or by other approved means. No discharge to any storm sewer or natural watercourse will be allowed. Bacteriological sampling and analysis of the replacement water may then be made by the Engineer in full accordance with AWWA C651. The Contractor will be required to rechlorinate, if necessary and the line shall not be placed in service until the requirements of the State Public Health Department are met.

E. Special disinfecting procedures shall be used in connections to existing mains and where the method outlined above is not practical.

END OF SECTION

SECTION 02620

CONCRETE SEGMENTAL RETAINING WALL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary for design, inspection and construction of a modular concrete retaining wall including coping units and the drainage system as shown on the Drawings and specified herein.

1. Design, inspection and certification by a MA Registered Professional Engineer.

2. Excavation and foundation soil preparation.

3. Furnishing and placement of leveling base.

4. Furnishing and placement of the drainage system.

5. Furnishing and placement of geotextiles.

6. Furnishing and placement of segmental retaining wall facing units.

7. Furnishing and compaction of drainage and retained soils.

1.02 RELATED WORK

A. Groundwater control is included in Section 02140.

B. Earthwork is included in Section 02200.

C. Site Improvements are included in Section 02850.

1.03 REFERENCE STANDARDS

A. Engineering Design

1. NCMA Design Manual for Segmental Retaining Walls, Second Edition.

2. NCMA TEK 2-4 - Specifications for Segmental Retaining Wall Units.

3. NCMA SRWU-2 - Determination of Shear Strength between Segmental Concrete Units.

B. Segmental Retaining Wall Units

1. ASTM C 140 - Sampling and Testing Concrete Masonry Units

2. ASTM C 1262 - Evaluating the Freeze - Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units.

3. ASTM C 33 - Specification for Concrete Aggregates

4. ASTM C 90 - Standard Specification for Load-Bearing Concrete Masonry Units

5. ASTM C 150- Specification for Portland Cement

6. ASTM C 595 - Specification for Blended Hydraulic Cements.

C. Geotextile Filter

1. ASTM D 4751 - Standard Test Method for Apparent Opening Size

D. Soils

1. ASTM D 698 - Moisture Density Relationship for Soils, Standard Method

2. ASTM D 422 - Gradation of Soils

3. ASTM D 424 - Atterberg Limits of Soils

4. ASTM D G51 - Soil pH

E. Drainage Pipe

1. ASTM D 3034 - Specification for Polyvinyl Chloride (PVC) Plastic Pipe

2. ASTM D 1248 - Specification for Corrugated Plastic Pipe

F. Where specifications and reference documents conflict, the Owner or Owner's representative shall make the final determination of applicable document.

1.04 SUBMITTALS

A. Submit to the Engineer as provided in Section 01300, samples of the modular concrete wall modules and coping units. Engineer will approve sample of wall unit at the project site. Do not deliver sample to Engineer.

B. Submit to the Engineer for record purposes only calculations and drawings for the design of the wall, reinforcing and foundation, indicating that the wall will be stable against all forces acting on it. Calculations and drawings shall be prepared by, and shall bear the stamp of, a Professional Engineer registered in the Commonwealth of Massachusetts, engaged by the manufacturer of the wall units, and qualified by experience in the design of concrete segmental retaining walls or similar systems. Provide three sets of stamped construction drawings and detailed design calculations suitable to obtain city permits.

C. Submit to the Engineer, written certification from the manufacturer, or his/her representative, that the concrete segmental retaining walls have been properly installed in accordance with the manufacturer's recommendations.

1.05 DELIVERY, STORAGE AND HANDLING

A. Contractor shall check the materials upon delivery to assure that proper material has been received.

B. Contractor shall prevent excessive mud, wet cement, epoxy, and like material which may affix themselves, from coming into contact with the materials.

C. Contractor shall protect the materials from damage. Damaged material shall not be incorporated into the retaining wall system.

PART 2 PRODUCTS

2.01 MATERIALS

A. Geotextile filter fabric shall be as specified in Section 02200.

B. Modular Concrete Retaining Wall

1. Sienna Stone Segmental Retaining Wall System as supplied by Unilock, 35 Commerce Drive Uxbridge, Massachusetts, 508-278-4536 or equal. Color of units and coping shall be natural.

2. Wall modules shall be 185mm x 1200mm x 500 mm (7.25 x 48 x 20 inches) (Standard Unit) with a maximum tolerance of plus or minus 3 mm (1/8 in. for each dimension).

3. Coping units shall be 185mm x 1200mm x 500mm (7.25 x 48 x 20 inches) (Standard Unit) with a maximum tolerance of plus or minus 3 mm (1/8 in. for each dimension).

4. The retaining wall modules shall be solid units and have a minimum weight of 450kg (1,102 lbs.) and 366kg (807 lbs.) per unit.

5. The concrete wall modules shall have an integral shear key connection that shall be offset to permit a minimum wall batter of 1H : 8V.

6. The concrete wall modules shall have a minimum 28-day compressive strength of 35 MPa (5000 psi) as tested in accordance with ASTM C 140. The concrete shall have a maximum moisture absorption rate of 5 percent to ensure adequate freeze-thaw protection.

D. Retained Soil

1. The retained soil shall be on site soils. If imported fill is required it shall be examined by the Engineer prior to the placement of the base material.

D. Foundation Soil

1. The foundation soil shall be the native undisturbed on site soils. The foundation soil shall be examined and approval by the wall design Engineer prior to the placement of the base material.

E. Leveling Base Material

1. Leveling base material shall be Structural Fill approved by the manufacturer and wall design Engineer.

F. Concrete Adhesive

1. The adhesive is used to permanently secure the coping stone to the top course of the wall. The adhesive must provide sufficient strength and remain flexible. Adhesive shall be Chem-Caulk 900 by Bostok or equal. Adhesive shall be approved by Wall manufacturer.

G. Granular backfill (clear stone drainage layer) for drainage behind wall shall be screened gravel as required by manufacturer of modular concrete retaining wall.

H. General backfill (compacted infill soil) material shall be structural fill as specified in Section 02200.

I. Perforated PVC pipe shall be as specified in Section 02623.

J. Geotextile filter fabric shall be as specified in Section 02200.

2.02 DESIGN CRITERIA

A. Design shall be in accordance with the manufacturer's recommendations of concrete modular retaining walls.

B. A maximum allowable soil bearing pressure equal to 2000 psf for undisturbed, natural inorganic soils shall be assumed for purposes of the design.

C. Footing shall be as required by precast concrete wall manufacturer.

D. Wall shall be designed for seismic loading in accordance with the Commonwealth of Massachusetts State Building Code.

E. Walls shall be designed in accordance with recommendations of the NCMA Design Manual for Segmental Retaining Walls, Second Edition. The following is a summary of the minimum factors of safety for the various modes of failure evaluated in the proposed design.

1. External Stability

a. Base Sliding 1.5

b. Overturning 1.5

c. Bearing Capacity 2.0

d. Global Stability 1.3

2. Internal Stability

a. Shear Capacity 1.5

F. The minimum wall embedment shall be the greater of 1) the height of a SRW unit, 2) 150 mm (0.5 ft) or 3) the minimum embedment required because of the slope below the wall:

Slope Below Wall	Minimum embedment
Level	H/10
3 : 1 (18.4 deg)	H/10
2 : 1 (26.5 deg)	H/7

G. The following surcharges shall be applied to the top of each design cross section based on the following proposed uses above the wall. Use Above Wall Minimum Surcharge

Use Above Wall	Minimum Surcharge
No Traffic 0 kPa	(0 lb/sq. ft)
Light Traffic 4.8 kPa	(100 lb/sq. ft)
Heavy Traffic 12.0 kPa	(250 lb/sq. ft)

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. Subgrade under the wall shall be prepared in accordance with manufacturer's instructions and shall be excavated to the depth necessary to install the base material.

B. If subgrade is judged to be weak, disturbed or otherwise unsuitable by the Engineer, the Contractor shall remove the unsuitable material and replace it with structural fill as specified in Section 02200.

C. Over excavated areas shall be filled with compacted structural fill as specified in Section 02200.

D. Sub-grade for leveling base shall be a minimum 6-in layer compacted to not less than 98% standard proctor density.

E. At the discretion of the Engineer, a soil stabilization fabric shall be installed in lieu of geotextile filter fabric, but only on top of the compacted sub-grade before base material is placed.

F. The base material shall be compacted to not less than 98% of standard proctor density for unbound particle base.

3.02 WALL INSTALLATION

A. The following tolerances are the maximum allowable deviation from the planned construction,

1. Vertical Control: +/- 1.25 inches over a 10 ft distance, +/- 3 inches total
2. Horizontal Control: +/- 1.25 inches over a 10 ft distance, +/- 3 inches total
3. Rotation: +/- 2 degrees from planned wall batter
4. Bulging: 1.0 inch over a 10 ft distance

3.03 INSTALLING THE DRAINAGE SYSTEM

A. The approved non-woven geotextile shall be set against the back of the first retaining wall unit, over the prepared foundation, and extend towards the back of the excavation, up the excavation base and back over the top of the drainage material to the retaining wall, or as shown in the Construction Drawings.

B. The drainage pipe shall be placed behind the leveling base, or lower course of facing units as shown in the Construction Drawings or as directed by the Engineer.

C. The remaining length of geotextile shall be pulled taut and pinned over the face of the retained soil. Geotextile overlaps shall be a minimum of 300 mm (1 ft.) and shall be shingled down the face of the excavation in order to prevent the infiltration of retained soil into the drainage layer.

3.04 LEVELLING BASE OR SPREAD FOOTING PLACEMENT

A. The leveling base material shall be crushed stone compacted to 98% Standard Proctor Density, or vibrated concrete along the grades and dimensions shown on the Construction Drawings or as directed by the Engineer. The minimum thickness of the leveling base shall be 185 mm (7.25 inches)

3.05 INSTALLATION OF MODULAR CONCRETE WALL UNITS

A. The bottom row of retaining wall modules shall be placed on the prepared leveling base as shown on the Construction Drawings. Care shall be taken to ensure that the wall modules are aligned properly, leveled from side to side and front to back and are in complete contact with the base material.

B The wall modules above the bottom course shall be placed such that the tongue and grove arrangement provides the design batter (i.e. setback) of the wall face. Successive courses shall be placed to create a running bond pattern with the edge of all units being approximately aligned with the middle of the unit in the course below it.

C The wall modules shall be swept clean before placing additional levels to ensure that no dirt, concrete or other foreign materials become lodged between successive lifts of the wall modules.

D. A maximum of 3 courses of wall units can be placed above the level of the drainage material at any time.

E. The contractor shall check the level of wall modules with each lift to ensure that no gaps are formed between successive lifts.

F. Care shall be taken to ensure that the wall are not broken or damaged during handling and placement.

3.06 DRAINAGE SOIL

A The drainage soil will be placed behind the retaining wall modules with a minimum width of 300mm (1ft.) and separated from other soils using the approved non-woven geotextile.

B Drainage soil shall be placed behind the wall facing in maximum lifts of 6 inches and compacted to a minimum density of 95% Standard Proctor.

C. No heavy compaction equipment shall be allowed within 1 meter (3 ft.) of the back of the wall facia.

3.07 MANUFACTURER'S REPRESENTATIVE

A. A representative of the Owner and concrete modular unit manufacturer’s representative shall be present while subgrade is being prepared and wall is being installed.

B. The manufacturer's representative(s) shall certify in writing that the wall has been properly installed in accordance with the manufacturer's recommendations.

END OF SECTION

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SECTION 02622

POLYVINYL CHLORIDE (PVC) PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install and test polyvinyl chloride (PVC) sewer pipe and fittings, complete as shown on the Drawings and as specified herein.

B. Pipe or piping refers to all pipe, fittings, material and appurtenances required to install PVC sewer pipe complete, in place.

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

B. Trenching, Backfilling and Compaction is included in Section 02221.

C. Granular materials are included in Section 02200.

D. Pavement repair is included in Section 02575.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300 the name of the pipe and fitting manufacturers and a list of materials to be furnished by each manufacturer.

B. Shop Drawings including piping layouts and schedules shall include dimensioning, fittings, types and locations of valves and appurtenances, joint details, methods and location of supports, anchorage, gasket material, grade of material and all other pertinent technical information for all items to be furnished.

C. Prior to each shipment of pipe, certified test reports that the pipe for this contract was manufactured and tested in accordance with the ASTM Standards specified herein shall be submitted.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

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2. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

3. ASTM D2241 – Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

4. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

5. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

6. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

B. National Sanitation Foundation (NSF)

1. Standard No. 14 – Plastic Piping Components and Related Materials

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. All PVC sewer pipe and fittings shall be from a single manufacturer. The supplier shall be responsible for the provisions of all test requirements specified in ASTM D3034. In addition, all PVC pipe to be installed under this Contract may be inspected at the plant for compliance with this Section by an independent testing laboratory provided by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of plant inspection of all pipe approved for this Contract, plus the cost of inspection of a reasonable amount of disapproved pipe, will be borne by the Owner. Reference is made to Article 14.07 of the Supplementary Conditions for excessive plant inspection costs.

B. Inspections of the pipe may also be made by the Engineer or other representatives of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

1.06 DELIVERY, STORAGE AND HANDLING

A. All items shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Engineer.

B. PVC items deteriorate in sunlight and are slightly brittle, especially at lower temperatures, so care shall be taken in loading, transporting and unloading items to prevent injury to the items. All items shall be examined before installation and no piece shall be installed which is found to be

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defective. Handling and installation of pipe and fittings shall be in accordance with the manufacturer's instructions, referenced standards and as specified herein.

C. Any pipe or fitting showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

D. Any gouges or scratches that extend 10 percent or more into the pipe wall shall be cause for rejection of that pipe. The undamaged portion may be cut off and used. Rejected materials shall be clearly marked as rejected, segregated and removed from the site.

E. While stored, pipe shall be adequately supported from below at not more than 3-ft intervals to prevent deformation. The pipe shall be stored in stacks no higher than that given in the following table:

Pipe Diameter (inches)	Max. No. of Rows Stacked
8 or less	5
12 to 21	4
24 to 30	3

F. Pipe and fittings shall be stored in a manner which will keep them at ambient outdoor temperatures and out of the sunlight. Temporary shading as required to meet this requirement shall be provided. Simple covering of the pipe and fittings which allows temperature buildup or direct or indirect sunlight will not be permitted.

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. PVC solid wall gravity pipe and fittings shall be Type PSM, PVC SDR 35 with full diameter dimensions and shall conform to ASTM D3034 for sizes 4 through 15-in and shall conform to ASTM F679 for sizes 18 through 27-in. Straight pipe shall be furnished in lengths of not more than 14-ft and wyes shall be furnished in lengths of not more than 3-ft. Saddle wyes or tee wyes will not be allowed.

B. PVC pressure pipe and fittings shall be Type SDR 21 and shall conform to all requirements of ASTM D2241.

C. PVC gravity pipe and fittings shall have bell and spigot push-on joints. The bell shall consist of an integral wall section with a solid cross-section elastomeric gasket securely locked in place to prevent displacement during assembly. Installation of elastomeric gasketed joints and performance of the joint shall conform to ASTM F477, ASTM D3139 or ASTM D3212.

D. All fittings and accessories for sewers shall have bell and/or spigot configurations compatible with the pipe.

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2.02 PRESSURE SEWER CURB STOPS

A. Curb stops shall be compression type Water Works inverted-ground-key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of service pipe used. All parts shall be of bronze with female iron-pipe-size connections and PVC adaptors and shall be designed for a hydrostatic test pressure not less than 150 psi.

B. Service boxes shall be cast iron. Extension service boxes of the required length and having slide-type adjustment shall be installed at all service box locations. The boxes shall have housings of sufficient size to completely cover the service stop and shall be complete with identifying covers cast with the letter "S" for sewer.

PART 3 EXECUTION

3.01 INSTALLATION OF PVC PIPE AND FITTINGS

A. No single piece of pipe shall be laid unless it is straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16-in per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the manufacturer shall be explicitly followed.

B. If any defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost to the Owner. All pipe and fittings shall be thoroughly cleaned before installation, shall be kept clean until they are used in the work and when laid, shall conform to the lines and grades required. PVC pipe and fittings shall be installed in accordance with requirements of the manufacturer, ASTM D2321 or as otherwise provided herein.

C. As soon as the excavation is complete to normal grade of the bottom of the trench, bedding shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Screened gravel bedding shall be placed evenly on each side of the pipe to mid-diameter and hand tools shall be used to force the bedding under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe. Screened gravel bedding shall then be placed to 12-in above the top of the pipe. The initial 3-ft of backfill above the bedding shall be placed in 1-ft layers and carefully compacted. Generally the compaction shall be done evenly on each side of the pipe and compaction equipment shall not be operated directly over the pipe until sufficient backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe. Equipment used in compacting the initial 3-ft of backfill shall be approved by the pipe manufacturer's representative prior to use.

D. All pipe shall be sound and clean before installation. When installation is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved during installation. The deflection at joints shall not exceed that recommended by manufacturer. Fittings, in addition to those shown on the

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Drawings, shall be provided, if required, in crossing utilities which may be encountered upon opening the trench.

E. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end.

F. The Engineer may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such and immediately removed from the job site.

G. Each length of the pipe shall have the assembly mark aligned with the pipe previously laid and held securely until enough backfill has been placed to hold the pipe in place. Joints shall not be "pulled" or "cramped".

H. Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it.

I. Precautions shall be taken to prevent flotation of the pipe in the trench.

J. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the backfill. Trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below top of the pipe. If trench boxes, moveable sheeting, shoring or plates have been installed below the top of the pipe, they shall be moved slowly taking care not to disturb pipe, bedding or backfill. As trench boxes, moveable sheeting, shoring or plates are moved, pipe bedding shall be placed to fill any voids created and the backfill shall be recompacted to provide uniform side support for the pipe.

K. Concrete thrust blocks shall be installed at all fittings and other locations as directed by the Engineer. Minimum bearing area shall be as shown on the Drawings. Concrete shall be placed against undisturbed material and shall not cover joints, bolts or nuts, or interfere with the removal of any joint. Wooden side forms shall be provided for thrust blocks.

3.02 JOINTING POLYVINYL CHLORIDE (PVC) SEWER PIPE AND FITTINGS

A. PVC sewer pipe and fittings shall be jointed in accordance with the recommendations of the latest ASTM Standards and detailed instructions of the manufacturer. The pipe manufacturer shall furnish information and supervise the installation of at least the first five joints.

B. All manhole connections shall be as shown on the Drawings except that concrete and mortared connections shall be equipped with an integral O-ring or other sealant such that a positive watertight seal is established.

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3.03 SERVICE CONNECTIONS

A. Service connections shall be installed at a minimum slope of 2 percent at the locations and to the limits determined by the Engineer in the field. In each case the end shall be capped and backed with a 2-in by 4-in wood post extending to 1.5-feet below finished ground surface.

B. Service connections shall be 6-in diameter unless otherwise shown on the Drawings.

C. Pressure sewer service connections shall be 1-1/2-in PVC. Each pressure sewer service connection, which connects to a common pressure sewer or force main, shall be provided with a redundant check valve and curb stop with box.

3.04 TESTING (GRAVITY PIPELINES)

A. Testing and cleaning of pipe shall be as specified in Section 02610 and as follows and shall be completed within 120 days of pipe installation.

B. Allowable Deflection Test

1. Pipe deflection measured not less than 90 days after the backfill has been completed as specified shall not exceed 5 percent. Deflection shall be computed by multiplying the amount of deflection (nominal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.

2. Deflection shall be measured with a rigid mandrel (Go/No Go) device cylindrical in shape and constructed with a minimum of nine evenly spaced arms or prongs. Drawings of the mandrel with complete dimensions shall be submitted to the Engineer for approval for each diameter of pipe to be tested, prior to any testing. The mandrel shall be hand pulled through all sewer lines. The Engineer shall observe all testing.

3. Any section of sewer not passing the mandrel shall be uncovered at no additional cost to the Owner and the bedding and backfill replaced to prevent excessive deflection. Repaired pipe shall be retested at no additional cost to the Owner.

3.05 TESTING (PRESSURE SEWERS)

A. Furnish all necessary equipment and labor to perform pressure and leakage testing on the pipelines. Pressure sewers shall be tested to 50 psi. The procedures and method for carrying out the pressure and leakage tests shall be approved by the Engineer.

END OF SECTION

SECTION 02623

CORRUGATED HIGH DENSITY POLYETHYLENE (HDPE) DRAINAGE PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install the corrugated HDPE pipe and appurtenances as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Site preparation is included in Section 02100.

B. Trenching, backfill and compaction are included in Section 02221.

C. Precast concrete manholes, catch basins and structures are included in Section 02605.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, shop drawings showing details of pipe, fittings, joints and construction methods.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Application.

2. ASTM F447 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

3. ASTM F667 – Standard Specification for Large-Diameter Corrugated Polyethylene Tubing and Fittings.

4. ASTM F2306 – Standard Specification for 12 to 60-inch Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.

B. Where reference is made to one of the above standards the revision in effect at the time of bid opening shall apply.

1.05 QUALIFICATIONS

A. The polyethylene pipe shall be furnished by a manufacturer who is fully experienced, reputable, and qualified in the manufacture of the polyethylene pipe. The pipe shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with this Section.

PART 2 PRODUCTS

2.01 CORRUGATED HDPE PIPE

A. Corrugated HDPE pipe shall have an annular corrugated exterior, smooth inner wall and built-in bell and spigot joints.

B. Corrugated pipe and appurtenances shall be high density polyethylene of the size and type as shown on the Drawings, all manufactured by the same company and shall meet or exceed the ASTM F2306 specifications.

C. Backfilling over the pipe shall be to the pipe manufacturer's specifications. Cover shall be compacted to at least 92 percent of its maximum dry density as determined by ASTM Test D1557, Method D.

2.02 PIPE JOINTS

A. All joints shall meet the requirements of a silt-tight joint. Silt-tight bell and spigot joints will utilize an elastomeric rubber gasket. Silt-tight joints must be designated to pass a laboratory test of at least 14 kPa (2 psi).

PART 3 EXECUTION

3.01 INSTALLATION OF HDPE DRAINS

A. All pipe shall be examined before laying and no piece shall be installed which is found to be defective.

B. If any defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost to the Owner. All pipe and fittings shall be thoroughly cleaned before installation, shall be kept clean until used in the work and when laid, shall conform to the lines and grades required. HDPE pipe and fittings shall be installed in accordance with requirements of the manufacturer, or as otherwise provided herein or on the Drawings.

C. As soon as the excavation is complete to normal grade of the bottom of the trench, granular material bedding shall be placed and graded to provide continuous support for the pipe. The pipe shall be laid accurately to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Initial backfill shall be placed evenly on each side of the pipe in 8-in lifts and hand tools shall be used where needed to give firm continuous support for the pipe. Initial backfill shall be placed to 12-in above the top of the pipe and thoroughly compacted. The final backfill to 3 feet above the pipe shall be placed in 1-ft layers and carefully compacted. The compaction shall be done evenly on each side of the pipe and motorized compaction equipment shall not be operated directly over the pipe until sufficient backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe. Equipment used in compacting the initial 3 feet of backfill shall be approved by the pipe manufacturer's representative prior to use.

D. All piping shall be sound and clean before installation. When installation is not in progress, including lunchtime, the open ends of the pipe shall be closed by a watertight plug or other

approved means. Good alignment shall be preserved during installation. The deflection at joints shall not exceed that recommended by manufacturer.

E. Any pipe having defective joint surfaces shall be rejected, marked as such and immediately removed from the job site.

F. Precautions shall be taken to prevent flotation of the pipe in the trench.

G. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the backfill. Trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below top of the pipe. If trench boxes, moveable sheeting, shoring or plates have been installed below the top of the pipe, they shall be moved slowly taking care not to disturb pipe, bedding or backfill. As trench boxes, moveable sheeting, shoring or plates are moved, pipe backfill shall be placed to fill any voids created and the backfill shall be recompacted to provide uniform side support for the pipe.

3.02 TESTING PIPE

A. Testing of all HDPE pipe shall be as follows:

1. Allowable Deflection Test

a. Pipe deflection measured not less than 30 days after the backfill has been completed as specified shall not exceed 5 percent of the pipe's base inside diameter.

b. Deflection for pipe diameters 30 inches and less shall be measured with a rigid mandrel (Go/No-Go) device cylindrical in shape and constructed with evenly spaced arms of prongs. The dimensions of the mandrel will be field verified by the Engineer. The mandrel shall be hand-pulled through all pipelines. Mandrels used for 24-in and 30-in pipe need to be modified to be installed within the dimensions of the manhole and manhole openings.

c. Any section of pipe not passing the mandrel shall be uncovered at no additional cost to the Owner and the bedding and backfill replaced to prevent excessive deflection. Repaired pipe shall be retested.

3.03 INSPECTION OF PIPE

A. If an inspection of the completed pipe line or any part thereof shows manholes, pipes, or joints which allow any amount of infiltration, the defective work or material shall be replaced or repaired as directed.

3.04 CLEANING

A. At the conclusion of the work, the Contractor shall thoroughly clean all of the new pipe lines by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the lowest manhole. If, after this cleaning, obstructions remain, they shall be removed. After the pipe lines are cleaned and if the groundwater level is above the pipe, or

following a heavy rain, the Engineer will examine the pipe for leaks. If defective pipes or joints are discovered at this time, they shall be repaired by the Contractor.

END OF SECTION

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SECTION 02663

WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required in tapping and making the service connection where shown on the Drawings and as directed by the Engineer. Furnish all necessary labor and equipment to excavate the trench from the main to the building connection, backfill the trenches after the new connection is completed and restore the street and sidewalk to their original condition. Trench excavation and backfilling shall be done in accordance with all of the applicable sections of these Specifications.

B. Corporation cocks shall be installed for connecting all services to the water main. Keep a record of the locations of all corporation cocks installed. A copy of this record shall be given to the Engineer at the completion of the work. Copper tubing, curb stops and necessary adapters shall be used to make connections between new corporation cocks and new and existing service piping. Unless otherwise directed, the new curb stops shall be installed at the existing curb stop locations. Be responsible for the removal and/or installation of curb stops in the locations directed by the Engineer.

C. All existing services shall be maintained until the new service connections have been fully installed to the satisfaction of the Engineer. All service connections shall then be made to the mains as specified below. Alternatively, provide temporary water service, as necessary. Connect the existing service to the new service connections provided after the completed installation has been accepted by the Engineer. All abandoned services shall have ends crimped.

1.02 RELATED WORK

A. Excavation and backfill is included in Section 02200.

B. Trenching, Backfilling and Compaction are included in Section 02221.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, and within 10 days after signing the contract a list of materials to be furnished, the name of suppliers and the date of delivery of materials on the job site.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

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B. American Water Works Association (AWWA)

1. AWWA C800 - Underground Service Line Valves and Fittings.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

PART 2 PRODUCTS

2.01 MATERIALS

A. Service pipe shall be soft, annealed seamless 1-in tubing conforming to ASTM B88, Type K. The name and trademark of the manufacturer shall be stamped along the pipe.

B. Connection to the water main shall be made by use of a two-strap corporation saddle as manufactured by Smith-Blair or Mueller. Corporation stops for service connections shall be service brass conforming to AWWA C800 and pack joint end connections shall consist of Buna-N beveled gasket for watertight seal. An independent, split-clamp locking device or stainless steel beveled gripper shall be incorporated into the design for additional restraint. Corporation stops shall be as manufactured by Ford, Mueller, or Red Hed.

C. Curb stops shall be copper to copper thread, open right, with drain and shall employ an oriseal curb with drip. Pipe connections shall be suitable for the type of service pipe used. All parts shall be of service brass with female iron-pipe-size connections and shall be designed for a hydrostatic test pressure not less than 200 psi. Curb stops shall be as manufactured by Farnum or Mueller.

D. Service boxes shall be cast iron, extension-type, three-fourths inch rod, and cover shall be counter sunk one inch brass plug tapped for one inch iron pipe. Extension service boxes of the required length (4-1/2’ to 5-1/2’) and having slide-type adjustment shall be installed at all service box locations. The boxes shall have housings of sufficient size to completely cover the service stop and shall be complete with identifying covers.

E. Adapter couplings for connecting new copper tubing to existing service connection at the property line shall be standard straight coupling fittings conforming to AWWA C800.

F. Line fittings, if required on new service line, shall be standard three-part unions conforming to AWWA C800.

PART 3 EXECUTION

3.01 INSTALLATION

A. Corporation cocks. The tapping machine shall be rigidly fastened to the pipe at a 45 degree angle with the horizontal diameter. The length of travel of the tap should be so established that when the stop is inserted and tightened with a 14-in wrench, not more than one to three threads will be exposed on the outside. When a wet tapping machine is used, the corporation cock shall be inserted with the machine while it is still in place. Stops shall be tightened only sufficiently to give watertightness and care must be constantly exercised not to overtighten them.

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B. Straight couplings. Install straight couplings to existing water mains of the sizes required in the locations designated by the Engineer in the field. Utilize the manufacturer's recommended installation procedures while performing the work. Care shall be taken to ensure a watertight connection.

C. Curb stops will, in most cases, be installed at the location of the existing curb stop. Install the curb cocks and boxes in a workmanlike manner as described herein and as directed by the Engineer and place compacted screened gravel around and below the cock to permit ready draining of the pipe through the waste opening.

D. The boxes shall be set in a true vertical position and if they are within the limits of the roadway or within limits where plowing of snow will take place in the winter, the tops of the boxes shall be set about 1/2-in below the top of the finished grade. In locations where these boxes are not likely to be disturbed, the tops shall be set flush with the adjacent ground.

E. Copper tubing. Care shall be exercised in the placing and laying of copper tubing to be sure that the pipe does not have kinks or sharp bends and to ensure against it being in contact with sharp stones or ledge which would cause damage to the pipe. At least 6-in of selected fill shall be placed adjacent to and above the pipe and no stone shall be placed over the pipe until the depth of backfill above the latter is in excess of 1-ft.

END OF SECTION

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SECTION 02815

AUTOMATIC IRRIGATION SYSTEM

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish design and all labor, materials, equipment, storage, tools, services, transportation, delivery, removal, testing, maintenance, and incidentals required to install a complete fully automatic irrigation system within limits as shown on the Drawings and specified herein.

B. The work shall include, but not necessarily be limited to design, excavation and backfilling, and furnishing all piping, valves, controls and electrical work required. This includes, but is not limited to all permits, bonds, codes and state license where applicable.

C. It shall be the responsibility of the Contractor to test, prove performance, and instruct the Owner in operations and maintenance of any equipment designed and installed, and to obtain written approval from the Owner.

D. It shall be the responsibility of the Contractor to install automatic irrigation system so as to obtain 100 percent overlap coverage under normal wind conditions at this location.

E. Rerouting of pipe over, under and around pavements, pathways, conduits, pipe, trees, or any other obstruction shall be at the expense of the Contractor.

F. The Contractor shall furnish the Owner with a scaled "As-Built" site plan showing sizes, locations and types of all the components of the irrigation systems as constructed. The "As-Built" plan shall be prepared and presented to the Owner prior to final acceptance of the irrigation system.

G. Contractor shall ensure design conforms with current local and state codes for irrigation systems and operations, including, but not necessarily limited to, backflow prevention, metering, and water application rates and times.

1.02 RELATED WORK

A. Site Preparation is included in Section 02100.

B. Loaming and Seeding is included in Section 02930.

1.03 EXAMINATION AND VERIFICATION OF DRAWINGS AND SITE

A. It shall be the Contractor's responsibility to report to the Engineer any conflicts or proposed deviations from the Contract, Drawings, or Specifications. Failure to do so prior to the installing of equipment which results in equipment being replaced, and/or relocated, shall be done at the Contractor's expense.

1.04 REFERENCE STANDARDS

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A. American Society for Testing and Materials (ASTM)

1. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

2. ASTM D256 - Standard Test Methods for Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.

3. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.

4. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between minus 30 Degrees C and plus 30 Degrees C.

5. ASTM D785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.

6. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

7. ASTM D1599 - Standard Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings.

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 SUBMITTALS

A. Submit complete scaled design plans and details, including all manufacturer's product information, for the automatic irrigation system. Irrigation design shall be performed by a Certified Irrigation Designer (CID) as certified by The Irrigation Association (www.irrigation.org) and as approved by the Owner. The CID shall have a minimum of five years experience in the design and installation of similar systems as approved by the Owner. Submit proof of certification.

B. Submittal information shall include, but not be limited to, pipe, fittings, isolation valves, pipe line appurtenances, electrical control valve assemblies, sprinklers, quick coupling valves, swing joint assemblies, controller assembly including electrical components and connections at the controller locations, and point of connection to the main service line.

1.06 QUALITY ASSURANCE

A. The irrigation system shall consist of one complete installation of materials by the same manufacturer wherever possible. "Or equal" materials will be considered if supporting documents are provided that address performance criteria assuring an equal product to that which is specified.

B. The Contractor shall be responsible for providing all testing and training of Owner personnel to ensure a properly functioning system at time of project acceptance as determined by the Owner.

C. Inspections of materials will be made by the Owner/Designer or their representatives after delivery. All materials shall be subject to rejection at any time on account of failure to meet any

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of the Specifications or approved shop drawing requirements. Materials rejected shall be marked for identification and shall be removed from the job immediately.

1.07 CONDUCT OF WORK

A. The Contractor shall coordinate his work with other trades, and in particular the maintenance operations on existing landscaped areas.

B. The Contractor shall confine his operations to the area of work and to the areas allotted him for equipment and materials storage.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials to be included in the design shall include a complete graphic and written description of the new system and how it functions. At a minimum, materials to be drawn, described, submitted, and reviewed for approval by Owner shall include, but not be limited to, the following: analysis and confirmation of existing available water pressure from the city domestic supply, point of connection, backflow prevention device, meter, lockable cabinet enclosure on concrete pad to adequately house above grade backflow preventer and meter, cabinet enclosure for zone delineation and automatic timer system, valves, pressure regulator if required, filters, single outlet emitters (minimum 2 emitters per shrub), sprinklers, rain gauge, mainline and sub-mainline pipes, drip tubes (not buried), stakes for drip tubes, adapters and fittings, and end caps, and an adequate number of quick couplings.

B. Only new materials shall be used. Ensure materials, and product performance warranties and guarantees are up-to-date with the latest technological industry standards of the irrigation industry. Design for the new system shall include all necessary equipment to provide an up-to-date installation.

2.02 DESCRIPTION OF THE SYSTEM

A. The design of the system shall cover the areas as shown on the Drawings.

B. The irrigation system shall be designed to irrigate at the rate of up to 1” per week per zone on the individual landscaped areas, utilizing irrigation devices (spray heads, risers, drip emitters, etc.) as appropriate per industry standards to most effectively and efficiently provide moisture to the specific live media of that zone.

C. The water supply for the irrigation system will be provided at the new concession/restroom building, which will receive a new service from an existing pipe already at a nearby on-site location.

D. Existing water system pressure information will be made available from the Owner.

E. The power supply for the irrigation system will be provided at the new concession/restroom building.

2.03 AUTOMATIC CONTROL SYSTEM

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A. The automatic controller system shall operate the irrigation system effectively and efficiently as designed utilizing a station system controller or controllers sized as appropriate for the number of zones required.

B. The automatic control system shall utilize the latest technology, having the ability to automatically adjust irrigation according to actual plant requirements, allowing input of site specific soil type, solar exposure, slope sprinkler types, desired precipitation rates, plant types and has ability to access weather data and calculate evapotransporation rates. The controller shall be a solid state, multi-station unit sized appropriately for the number of required zones, with 0 to 12 hours timing capability in one (1) minute increments below 2 hours. The controller shall be capable of four programming modes, and have also independent station percent adjust, weekly/interval calendar, valve short indicator/locator, test program, start-up/back-up program, battery back-up or non-volatile memory, valve power switch, internal 120 volt pump circuit and input and output surge protection.

C. The controller shall be installed in the vicinity of the concession/restroom building.

D. All controllers shall contain factory installed and factory recommended lightning protection. The controllers shall be grounded as recommended by the manufacturer.

2.04 AUTOMATIC CONTROL VALVES

A. Remote electric control valves for all sprinkler sections shall be high strength glass-filled plastic body with stainless steel cover bolts. The valve will have a maximum cold water working pressure of 150 PSI. The automatic control valves shall be specified to lose no more than 3 PSI in their specific size and application.

B. Drip valves shall be specially designed for low volume drip applications, and intended to integrate drip irrigation with the automatic irrigation system. The valve shall include a mesh filter, pressure regulator and shut-off valve.

2.05 SERVICE LINE VALVES

A. Curb stops shall be brass water service products manufactured and tested to the requirements of AWWA C800. Curb stops shall be stop and drain valves and have compression fittings.

2.06 QUICK COUPLING VALVES

A. Quick coupling valves shall be one-piece construction with vinyl covers and 1" female pipe outlets. Quick coupling valve assembly shall be connected to the mainline pipe by installing a three way swing joint of Schedule 80 prefabricated PVC fittings and nipples. The swing joint assembly shall contain a brass insert and nipple at the connection point to the quick coupling valve.

B. Provide at least three quick coupling valves in areas as designated by the Owner.

2.07 VALVE BOXES

A. All electric remote control valves shall be encased in plastic valve boxes with covers. Valve boxes shall be set at finish grade.

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B. Provide curb stops with extension type cast iron curb boxes with arch pattern bases and stationary rod. Furnish one (1) curb box key.

2.08 LARGE AND SMALL ROTARY SPRINKLERS

A. All large and small rotary sprinklers shall be of the gear-driven rotary type, capable of covering a full radius circle at the system design pressure and discharge rate. The sprinklers shall be available in both full-circle and adjustable part-circle configurations. The adjustable part circle unit shall be infinitely adjustable from 30 degrees to 360 degrees. Adjustments shall be possible in all phases of installation; i.e., before installation, after installation static and after installation while in operation.

B. The sprinkler shall be equipped with a drain check valve to prevent low head drainage and be capable of checking up to 10 feet in elevation change. The sprinkler shall have a minimum 3-1/2" pop-up stroke to bring the rotating nozzle turret into a clean environment. The sprinkler shall have a rubber cover.

C. The sprinkler body shall be constructed of non-corrosive, heavy-duty ABS. The sprinkler shall carry a five-year over-the-counter exchange warranty.

2.09 SPRAY SPRINKLERS

A. Spray sprinklers shall be pop-up fixed spray type, capable of covering a part circle radius at the system design pressure and discharge rate.

B. The sprinkler shall be equipped with a drain check valve to prevent low head drainage and be capable of checking up to 10 feet in elevation change. The sprinkler shall have a minimum 4" pop-up stroke to bring the nozzle into a clean environment.

C. The sprinkler body shall be constructed of non-corrosive, heavy-duty ABS. The sprinkler shall carry a five-year over-the-counter exchange warranty.

2.10 DRIP EMITTERS

A. Drip emitters shall be designed specifically for use in low water applications and shall be pressure compensating, have built in dust cap protection, and be UV resistant.

2.11 WIRE

A. Wires connecting the remote control valves to the irrigation controller shall be single conductor, Type PE. Construction incorporates a solid copper conductor and polyethylene (PE) insulation with a minimum thickness of 0.045 inches. The wire shall be UL Listed for direct burial in irrigation systems and be rated at a minimum of 30 VAC. Zone wire shall be three different colors, sized at 14 gauge, and common wire shall be white in color and sized at 14 gauge.

B. All power cables shall be type Tray Cable. They shall be UL Listed for direct burial and rated at 600 volts. The cable shall include three conductors which shall be colored per wire industry standards or numbered as 1, 2 and 3. The size of the "hot" and "common" conductors shall be as sized as specified and the size of the "ground" conductor shall be as required by the National Electric Code, or larger. The inner copper conductors shall be covered with high dielectric PVC and Nylon. The outer jacket shall be black PVC and is to be sunlight resistant.

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C. Wire connectors at all 24 volt electrical valve locations and at in-line splices shall utilize wire connector kits. Supply one connector kit per single splice.

2.12 PIPE

A. All main line PVC piping over 2" shall be unplasticized polyvinyl chloride (PVC) conforming to ASTM type 1, Grade 1 meeting CS256-63 with "O"-ring bell joint connections, pressure rating 200 PSI (SDR 21).

B. All PVC lateral piping and main line pipe 2" and under shall be unplasticized polyvinyl chloride (PVC) conforming to ASTM Type 1, Grade 1 meeting CS256-63 with swedged end solvent weld connections, pressure rating 200 PSI (SDR21).

C. All sleeve materials shall be PVC Schedule 40 pipe except where the sleeving material is exposed. In those instances, the sleeving material shall be galvanized rigid steel pipe.

2.13 PIPE FITTINGS

A. All main line PVC fittings to be of an "O"-ring type for connections on sections of main line piping. "O"-ring fittings shall be PVC and have a pressure rating of 250 PSI.

B. All lateral line PVC shall utilize Schedule 40 PVC solvent weld fittings.

C. Solvent weld cement and primer shall be product typically used for forming PVC welds. The Contractor shall take special care to insure that expiration dates of cement and primer have not been reached and that they are stored in heated areas when necessary to prevent them from dropping below recommended storage temperatures.

D. Pipe fittings for copper tubing shall be wrought copper or bronze sweat type. Solder for sweat fittings shall be 95/5. There shall be no soldered joints imbedded within or come in contact with concrete.

2.14 THRUST BLOCKS

A. Thrust blocking prevents the lien from moving and is required primarily with rubber gasket joints. Unequal forces due to water pressure at changes in pipeline alignment result in thrust loads. The thrust block transfers this load from the pipe to a wider load-bearing surface. Thrust blocks are required at the following locations:

1. Where the pipe changed the direction of the water (i.e. ties, elbows, crosses, wyes and tees) and

2. Where the pipe size changes (i.e. reducers, reducing tees and crosses) and

3. At the end of the pipeline (i.e. caps and plugs) and

4. Where there is an in-line valve.

B. The thrust block shall be formed against a solid trench wall that has been excavated by hand. Damage to the bearing surface of the trench wall may result from excavation by mechanical

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equipment. The size and type of thrust block depends on pipe size, line pressure, type of fitting, degree of bend and type of soil. The size and type of thrust block shall be as established by standard industry practice.

C. Side Thrust on Curves - An outward pressure exists on all deflections form a straight line. Generally, good soil properly tamped is sufficient to hold side thrust. If the soil is unstable, blocking should be placed against the pipe on the outside radius on each side of a gasketed coupling. Do not thrust block the coupling itself.

D. Construction of Thrust Block - Thrust blocks are anchors placed between the pipe or fittings and the solid trench wall. The recommended blocking is concrete having a calculated compressive strength of 13.8 MPa (2000 PSI). The concrete mixture is one part cement, two parts washed sand and four parts gravel. Thrust blocks should be constructed to the bearing surface is in direct line with the major force created by the pipe or fitting. The earth bearing surface should be undisturbed with only the simplest of forms required.

PART 3 EXECUTION

3.01 PIPE ROUTING

A. Routing of the pipe shall be in general accord with industry accepted irrigation practices. Necessary changes are allowed to the routing and/or depth of pipe from that shown on the accepted plan in cases where rock or other obstacles may obstruct the intended pipe path or depth. In no event shall field changes of this nature affect the cost of the work.

B. The Contractor, subject to the approval of the Owner, may also adjust the location of any pipe line and/or depth to avoid large rocks, stumps or other obstacles provided that such adjustment does not increase the quantity of pipe and/or labor required and are not in conflict with the intent of the plans.

3.02 GENERAL PIPING REQUIREMENTS

A. Pipe lines shall be installed of the same size shown on the approved plans and/or specifications and of the material and workmanship herein specified. All main line piping, beyond the transition fitting on the discharge side of the backflow preventer, under constant pressure while the system is operating, shall be unplasticized polyvinyl chloride (PVC) conforming to ASTM-Type 1 Grade 1, unplasticized resin meeting CS256-63 with "O" Ring joint connections unless otherwise specified. The pressure rating shall be a minimum of 200psi.

B. All lateral piping, on the discharge side of the backflow preventer, not under constant pressure while system in operation shall be unplasticized polyvinyl chloride (PVC) conforming to ASTM-Type 1 Grade 1, unplasticized resin meeting CS256-63 with pressure rating at a minimum of 200psi.

C. All main line pipe, on the discharge side of the backflow preventer, to be installed in trenches as specified. Lateral line pipe may either be installed as specified above or by pipe vibraplowing. Minimum depth of cover over pipe shall be as follows: zone or lateral line piping downstream of the automatic control valve) up through 2" shall be a minimum of 16" and main line piping up through 4" shall be a minimum of 24".

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D. In all cases where plastic pipe cannot be supported or covered adequately, ductile iron pipe of the same nominal size shall be installed.

3.03 INSTALLING BURIED PIPE AND FITTINGS

A. Plastic Pipe

1. The Contractor shall perform all trenching, excavating and backfilling required for the proper installation of the work with pipe installed at depths as specified.

2. Pipe shall be installed strictly in accordance with the printed recommendations of the manufacturer, including bedding of pipe in bottom of trench and securely thrusting main line fittings at changes in direction of the pipe.

3. Mechanical trench diggers used on the site shall be of an approved type providing trenches with straight sides. Trenches shall be no wider at any point than is necessary to lay and bed the installed pipe properly.

4. Vibratory plows used on the site shall be of an approved type capable of vibraplowing lateral pipeline to depths as specified.

5. 24-volt control valve wire shall be installed in the same trench as the pipe whenever possible. Wire installed in separate trenches will have a minimum of 12" of cover for 24 volt wiring and 18" of cover for 120 volt wiring or as specified by local electrical codes. Wire shall be installed with at least 1% slack and have expansion loops at the end of 500 foot runs.

6. Backfill shall be free from rock, large stones or other unsuitable substances to prevent damage to pipe and wire during and after completion of backfilling operation.

7. Deleterious material shall be dug and hauled off-site. Determination of deleterious material shall be made jointly by the Owner and the Contractor. The cost of deleterious material excavation, removal and replacement shall be considered incidental to pipe lying and shall not be paid as a separate item.

8. All replacement backfill material necessary because of the removal of deleterious material and/or shortages of backfill material to be supplied by the Contractor at the Contractor's expense and in quantities required. All excess backfill material of a deleterious nature will be removed by the Contractor at the Contractors expense. Excess material of a non-deleterious nature shall be removed to a readily accessible location, on site, as designated by the Owner at the Contractor's expense.

9. Backfilling of PVC pipe will be done by hand placing soil under, around and above the pipe so that it is hand tamped to a point 6" above the pipe. Special care should be taken to ensure that this layer is completely free of stone and other deleterious material. The remainder of the trench may be machine backfilled with appropriate soil, having no stones larger than 2" in any dimension. Machine placed backfill shall be compacted to a suitable density by machine tamping and approved rolling to prevent settlement in the trench. At no time shall there be trenches or holes left open over night or on weekends.

10. Compacted trench lines shall be left even with the present grade and be free of rocks,

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stones and other debris. The Contractor shall remove all excess materials, rocks and other debris from the sides of the trenches.

11. If within two (2) years from the date of acceptance of the work, settlement occurs due to improper compaction and an adjustment in pipe, valves, sprinkler heads, sod or paving is necessary to bring the system, sod or paving to the level of the permanent grades, the Contractor, as part of his work under this contract, shall make said adjustments without extra cost to the Owner, unless specific agreement to the contrary has been approved by the Owner, in writing.

12. Throughout the entire work period, it shall be the responsibility of the Contractor to refill any trenches that have settled due to incomplete compaction.

13. All main line piping, including isolation gate valves, shall be thrusted in accordance with the manufacturer's recommendations. On all main line piping, thrust blocks of poured concrete will be used with size and description of thrust blocks as per manufacturer's recommendations and previous instructions. In no case will fieldstone or wood of any form be acceptable for thrusting.

14. All PVC pipe and wire shall be installed in PVC sleeves where pipes and/or wires cross roadways and walkways or other paved surfaces. A separate sleeve is required for each pipe and for the wires.

15. Where pavement is to be crossed, pavement shall be cut before trenching. Any excavation, asphalt removal, etc., shall cause the Contractor to completely restore the roadbed and surfaces to their original condition, in accordance with the project specifications.

3.04 PIPE FITTINGS

A. In PVC main lines over 2" in size, all fittings to be of an "O"-Ring type for the connections of the sections of main line piping. Tapped saddles shall be used for the threaded connection outlets for valves. No field solvent welded fittings to be utilized on the pressure main except at the end of the main line branches.

B. On lateral lines, solvent weld fittings shall be used for connections on PVC lateral piping.

C. No solvent weld connections shall be made when the temperature is below 40 degrees F unless approved by the Owner and only if utilizing cold weather solvent cement.

D. Fitting for copper tubing shall be solder type wrought copper or bronze “sweat” fittings.

3.05 ISOLATION GATE VALVES

A. Isolation gate valves as per size and type as specified. Buried valves and boxes shall be installed in conformance with AWWA C500. Valves shall be set with the operating stem vertically aligned in the center. Valves shall be set on a firm foundation and supported by tamping selected excavated materials under and at the sides of the valves. Valves shall be thrusted as specified.

3.06 REMOTE CONTROL VALVES

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A. All remote control valves shall be mounted in plastic valve boxes set at finish grade with locations as per the approved plan.

3.07 QUICK COUPLING VALVES

A. Quick Coupling valves shall be installed as required. Valves shall be connected to the main line fitting by using a three-way swing joint assembly constructed of Schedule 80 PVC pipe and fittings and a brass insert nipple.

3.08 SERVICE LINE VALVES

A. Install curb stops in accordance with the manufacturer's instructions and AWWA C600. Provide a 2 cubic foot drain pit filled with screened gravel at each curb stop.

3.09 WIRE

A. Electrical power supply wiring to the irrigation system controller shall be sized to meet all applicable electrical codes. Power supply for irrigation system controller shall be matched to meet controller requirements as suggested by the manufacturer.

B. Valve control and common wires from the irrigation system controller to the electric valves shall be single stranded conductor AWG-UF direct burial wire. Control and Common wire sizes to be 14/1. The Control wire shall be three different colors, one for each controller for identification. The Common wire shall be a different color than the control wires for identification. Each controller shall have a separate common and a separate color control wire.

C. All wires shall be spliced to requirements of local minimum regulations, or to the following specifications: All splices shall be made by baring a minimum of 3/4" of copper conductor twisted together, coated and sealed with an approved splice kit. Procedures
recommended by the manufacturer shall be strictly followed. At the splice location, slack shall allow the splice to be raised a minimum of 24" above the splices for inspection. There will be no buried splices of 115 volt wires. Only 24 volt wires will be spliced in the field and only at electric valve locations serviced by the spliced wires.

D. Wire shall be installed in trench line as specified and shall not be yanked, stretched or excessively pulled during installation. Wire shall be laid on a firm, even bed in the trench that shall support the entire length. The Contractor shall take precautions to insure that wires are not cut, scraped or nicked during installation. Wire shall be laid next to the main line pipe, never directly over the pipe. Whenever possible, wire shall be laid on the same side of the trench throughout the entire project.

E. Install all exposed wire in metal conduit inside and outside of buildings and enclosures, etc.

3.10 SPRINKLER HEADS

A. Sprinkler head assemblies shall be connected to the lateral line by installing an ultra swing joint. PVC swing joint risers shall be used for all swing joints.

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3.11 CONTROLLERS

A. All controllers shall be wall mounted in the location as requested by the Owner.

B. All controllers shall contain all factory recommended lightning protective devices for the protection against power surges on the incoming 120 volt supply wires and the 24 volt zone valve wires from the field. Lightning devices shall be installed according to the manufacturer's instructions.

3.12 ELECTRICAL SERVICES

A. The Contractor shall furnish the electrical service necessary for supplying required electrical voltages to the electrical control system at the designated points shown on the plan. The electrical service to consist of all necessary transmission lines, electric meter receptacle, main power panel and the wiring of same. The power requirement for the irrigation system controllers is 120 volt, 60 cycle, 20 amps.

B. All equipment, materials and installation shall comply with the requirement of the National, State and local City Electric Codes.

C. The Contractor shall obtain all necessary permits and pay all fees required for permits and inspections.

D. No electrical service supply wire will be left exposed at the control cabinet. The power supply wire shall be conducted through the concrete slab to the meter connection as shown on the drawing. The Contractor shall install a disconnect after the electric meter, of an approved type, where shown on the drawing.

E. All wire shall be buried in schedule 40 PVC electrical conduit. The wire shall be buried in the same trench as the water main.

F. The system shall be grounded at the required grounding points with #6 bare, stranded copper wire to the a ductile iron water line.

3.13 TESTING

A. The Contractor shall be responsible for all hydraulic pressure testing of main lines and lateral lines. The testing shall be on a continuous basis commencing when the first section of the system is complete and if ready for testing. Final testing of the whole system under full operating conditions to be done following complete installation of all main and lateral piping, valves and sprinkler heads.

B. Testing for the main lines shall consist of a continuous application of water at the designed operating pressure level to the piping for a four hour period without visible evidence of leaks. If a leak is discovered within this period, the Contractor shall immediately expose and repair the break and the system then retested for the period described above.

3.14 ADJUSTING THE SYSTEM

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A. Adjustment of the sprinkler heads, remote control valves and automatic equipment prior to completion of the installation to provide optimum performance and balance throughout the irrigation system. Minor adjustments (cleaning around sprinklers, valve boxes and markers etc. including protection from vandalism) may be made by the Owner after acceptance of the system and during the warranty period.

3.15 AS-BUILT DRAWINGS

A. The Contractor shall provide and keep up to date a complete "As-Built" record set of drawings that shall be corrected as the work progresses, and show every change from the original approved design drawings and specifications and include the actual "As-Built" dimensions and kinds of equipment.

B. These drawings shall also serve as work progress sheets, and the Contractor shall make neat and legible annotations thereon as the work proceeds, showing the work as actually installed. These drawings shall be available at all times for inspection and shall be kept in the Contractor's job site office.

C. Record drawings shall show the locations of all piping, valve boxes, valve markers, air relief valves, controllers, wire trenches, 24 volt and 120 volt wire paths and all pertinent material buried and not visible to the eye. Record drawings shall indicate dimensions from two (2) permanent points of easily identifiable nature, if possible, such as sprinkler heads, permanent markers, concrete pads, corners of buildings, large caliper trees, etc.

D. On or before the date of final acceptance, the Contractor shall produce the final as-built drawings in half- size format (15” x 21”). The Contractor shall laminate this drawing and controller information and securely post this information adjacent to the irrigation controller.

3.16 INSTRUCTIONS

A. Upon completion of the work and acceptance the Owner, the Contractor shall be responsible for the training of the Owner in the operation, maintenance and repair of the system. The Contractor shall furnish, in addition to the As-built plans, operational manuals, copies of all available parts lists, trouble shooting lists, specification and catalog sheets to the Owner's personnel responsible for the operation and maintenance of the irrigation system.

3.17 MAINTENANCE AND SERVICE

A. The Contractor shall keep and maintain the whole of the work in good repair for a period of not less than two years from the date of completion of the entire work. The Contractor shall repair promptly all failures in the construction and operation of such project and appurtenances which may occur before the expiration of such period, and all defects, settlements, and irregularities of the project and appurtenances, other projects and drains, pipes, mains or conduits, curbs, gutters, sidewalks, street surfacing, land, turfing, or of any structures on the line of the project, or adjacent thereto, occurring before the expiration of such period, and caused or affected by work under this contract.

B. Whenever, before the expiration of the above specified maintenance period, the Owner shall give written notice, postage prepaid, to the business address of the Contractor, to

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make such repairs so required and the Contractor shall fail to make any repairs to the satisfaction of the Owner, the Owner shall have the right to employ such other person or persons as he may deem proper, to make the same, and the Owner shall pay the expense thereof out of any money otherwise due to the Contractor. It is however, mutually agreed that the Owner at his discretion, and at the Contractor's expense, may make repairs without notice to the Contractor, in cases where, in his opinion, public safety requires such work to be done at once.

3.18 WINTER BLOW OUT

A. The irrigation system shall be drained by purging with compressed air. The Contractor shall be responsible for winterizing the irrigation system during the two (2) year warranty period and starting up the system the following spring. The system warranty includes two full shutdowns and two full startups.

3.19 WARRANTY

A. For a period of two (2) years from the date of acceptance of the irrigation installation contract, the Contractor will promptly furnish and install, without cost to the Owner, any parts which prove defective due to faulty installation by the Contractor.

B. During the warranty period, the Contractor shall extend to the Owner any and all warranties that apply to equipment found to be defective in either materials or workmanship, as extended by the manufacturer and/or distributor to the Contractor. The limits of this equipment
warranty shall be as expressly stated by the appropriate manufacturer/distributor in writing. No further warranty, expressed or implied in fact or in law, shall be given by the Contractor.

C. The Contractor shall be responsible for the repair and/or replacement of all defective work and materials. He shall not rely on the equipment manufacturers and/or suppliers to perform this work, unless agreed to by the Owner and Architect. All repair work shall be completed in a timely fashion, as specified below.

D. A major failure is on which incapacitates the whole system such as a broken main or a non-operative pump. A minor failure is one which does not incapacitate the whole system such as an electric valve failure or lateral line break.

E. As concerns the warranty, "Promptly" is defined as follows:

1. Within 24 hours of notification of a major failure.

2. Within 48 hours of notification of a minor failure.

F. Should the contractor not respond promptly as defined above, the Owner may take any action he deems necessary to repair the defect and prevent further damage to his property, including the hiring of another contractor, or the repairing of such a defect with material supplied by the Contractor. In this event, the Contractor shall be liable for expenses incurred and property damages suffered by the Owner. The Owner and the Contractor may jointly prepare a schedule of fees for reimbursement to the Owner if any such repairs are handled by the Owner's maintenance personnel.

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END OF SECTION

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SECTION 02830

CHAIN LINK FENCE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary and install the chain link fence and gates, as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

B. Concrete in included in Section 03301.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings showing layout and details of construction and erection of fence and accessories required.

B. Samples of fence posts, fabric, and appurtenances.

1.04 REFERENCE SPECIFICATIONS

A. Where reference is made to one of the following standards, the revision in effect at the time of the bid opening shall apply. References herein to any technical society, organization, group or body are made in accordance with the following:

1. ASTM American Society for Testing and Materials

   a. A123-Zinc-Coated (Hot-Dip Galvanized) coatings on Iron and Steel Products

   b. A370-Mechanical testing of Steel Products

   c. A392-Zinc Coated Steel Chain Link Fence Fabric

   d. A570-Hot Rolled Sheet and strip, Structural quality

   e. A817-Metallic-Coated Steel Wire for Chain Link fence Fabric

   f. A552-Terminology Relating to Chain Link fabric

   g. F567-Installation of Chain Link Fence

   h. F626-Fence Fittings

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i. F900-Industrial and Commercial Swing Gates

j. F934 Standard Colors for Polymer Coated chain Link Fence Materials

k. F1043-Specifications for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework

l. F1083-Pipe, Steel, Hot-dipped Zinc Coated welded for Fence Structures

2. AWS American Welding Society

3. Commonwealth of Massachusetts, Mass Highway, Standard Specifications for Highways and Bridges, latest edition.

4. Steel Structures Painting Council (SSPC), see Sections 09901 and 09902.

a. SSPC SP-1 – Solvent Cleaning

PART 2 PRODUCTS

2.01 GENERAL

A. Post Anchoring

1. Posts for all fences shall be anchored directly into new concrete footings as shown on the Drawings.

2.02 CHAIN LINK FENCE (BLACK PVC)

A. Furnish fence materials and accessories with class 2b polyvinyl chloride (PVC) coating as defined by ASTM F668 fused and adhered to a primer that is thermally cured onto wire of metallic coated steel, black color, in areas as shown on the Drawings. Painted fittings and accessories are not acceptable unless specifically approved, prior to installation by Engineer**.**

B. Posts, rails, and braces shall also be hot-dipped galvanized steel prior to PVC coating. Pipe materials shall be Type I round, hot-dipped galvanized with a minimum average zinc (Grade E) coating of 1.8 oz/sq ft meeting ASTM F1083 for standard weight (Schedule 40) galvanized pipe. Dimensions shall conform to the following:

1. Fence Posts and Rails

a. Posts shall be of sufficient length to allow for installation depth as shown on the drawings and shall be spaced in the line of fence not further apart than 10 feet on center.

b. All fences shall have a continuous top rail with length not greater than 18-ft and fitted with hot-dipped galvanized steel PVC coated sleeves or couplings for connecting the lengths into a continuous run. Coupling shall not be less than 6-in long with 0.070-in min wall thickness and shall allow for expansion and contraction of the rail.

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c. Boulevard socket-type clamps or other approved means shall be provided for attaching the top rail to each gate, corner, pull, and end post.

d. Bottom rails shall be provided between all posts with means for attaching rail to each post. Center rails shall be provided at approximately mid-height of the fabric on corner, end, pull and gate posts where fabric is 8-ft high. Each corner, pull and end post shall also have a truss consisting of a rod not less than 5/16-in nominal diameter from the line post back to the gate, corner, pull or end post, with a turnbuckle or other equivalent provision for adjustment.

e. Sizes:

Terminal Posts:
4-ft high fence - (2.375 in OD) @ 3.12 lb/ft
6-ft high fence – (2.875 in OD) @ 4.64 lb/ft
10-ft high fence – (2.875 in OD) @ 4.64 lb/ft

Line Posts:
4-ft high fence - (1.905 in OD) @ 2.28 lb/ft
6-ft high fence - (2.375 in OD) @ 3.65 lb/ft
10-ft high fence - (2.375 in OD) @ 3.65 lb/ft

Gate Posts:
4-ft high fence - (2.375 in OD) @ 3.11 lb/ft
6-ft high fence – (2.875 in OD) @ 4.64 lb/ft
10-ft high fence – (2.875 in OD) @ 4.64 lb/ft

Top and Bottom Rails and Braces:
4-ft high fence ** - (1.66 in OD) @ 1.83 lb/lf
6-ft high fence ** - (1.66 in OD) @ 1.83 lb/lf
10-ft high fence - (1.66 in OD) @ 1.83 lb/lf @ 5-ft vertical intervals

** no center rail required

2. Fence Fabric

a. Fence fabric shall be one single continuous unit of specified dimension as shown on the Drawings. Fabric shall be furnished complete with vinyl (PVC) coating color black. Fabric shall be steel chain link conforming to ASTM Designation A392, A817, and F552 and height of fabric shall have a permissible variation of plus or minus one inch.

b. Polyvinylchloride (PVC) Finish: Comply with ASTM F934, with core wire diameter (gauge) measured prior to application of PVC coating.

c. Wire shall be factory coated with a min 0.02-in thick coating of plasticized polyvinyl chloride applied by the fusion method over a thermoset plastic bonding agent. The bond

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shall exhibit equal or greater strength than the cohesive strength of the vinyl. All cut ends shall be coated with vinyl at the factory.

d. Fabric shall have top and bottom selvage knuckled.

e. Each roll shall be clearly identified as to the type and class of metallic coating, the size of mesh, the coated wire diameter, the class of PVC coating, the height and length of fabric in each roll, and the name of the manufacturer.

f. Fence Fabric for all fences shall be as follows:

1. For all 4-ft high and 6-ft high fencing and gates, fence fabric shall be standard heavy duty industrial grade six (6) gauge (0.192) coated steel, 2-inch mesh with zinc coating (Class 20 weight of not less than 2.00 oz/sf of uncoated wire surface, hot-dipped galvanized after fabrication and prior to PVC coating.

2. For all 10-ft high fencing and gates, fence fabric shall be 9 gauge (0.148-in) coated steel; 1 ¾-in mesh with zinc coating (Class 2) weight of not less than 2.00 oz/sf of uncoated wire surface, hot-dipped galvanized after fabrication and prior to PVC coating.

3. Fence Accessories

a. Tension bars shall be 3/16-in by 3/4-in galvanized steel and not less than 2-in shorter than height of fabric to which they are attached, conforming to ASTM A123. Provide one tension bar for each end and gate post and two bars for each corner and pull post.

b. Tension bands and brace bands shall be 7/8-in by 12 gauge beveled, galvanized, sized to fit pipe sizes and furnished with galvanized fasteners and attachment bolts 5/16-in by 1-1/4-in galvanized carriage bolts with nuts.

c. Fittings shall be steel conforming to ASTM A370 and galvanized in conformance with ASTM A123.

d. All line posts shall be permanently fitted with a cast malleable iron top loop, constructed to fit securely over the post and encircle the top rail. End posts and corner posts shall be permanently fitted with a cast malleable iron top cap with permanent boulevard type socket fitting to accommodate rail. The base of each post cap shall carry an apron around the outside of the post.

e. All fences shall have top and bottom rails. Sleeves shall be installed to allow for expansion and contraction of rails, nuts and bolts, and shall be galvanized steel conforming to ASTM A123.

f. Fence fabric shall be fastened to top, bottom and center rails with 9 gauge galvanized steel tie wires, PVC coated black to match fabric color in accordance with ASTM F668 class 2b. Aluminum wire ties are not acceptable for fence fabric fastenings.

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2.03 CONCRETE AND GROUT FOR FENCE POSTS

A. Concrete: Portland cement, 1 in maximum size aggregate and potable water producing concrete with a 3 in slump and a 28 day compressive strength of at least 3000 psi. Packaged Concrete Mix: Mix dry packaged normal weight concrete conforming to ASTM C387 with clean water to obtain a 2 in to 3 in slump.

B. Grout for Fence Posts

1. Grout shall be "Sikadure 32 HiMod" as manufactured by Sika Corporation, Lyndhurst, NJ or approved equal. Grout shall be in accordance with the following:

2. Compressive Properties (ASTM D695) at 28 days.

3. Tensile Properties (ASTM D638) at 14 days.

4. Flexural Properties (ASTM D790) at 14 days.

5. Shear Strength (ASTM D732) at 14 days: 5,000 PSI min.

6. Total Water Absorption (ASTM D570) at 7 days: 1.0% max. (2 hour boil).

7. Bond Strength (ASTM C882) Hardened Concrete to Hardened Concrete.

(1) 2 day (dry cure): 2700 PSI min.
(2) 14 day (moist cure) 2200 PSI min.

8. Deflection Temperature (ASTM D648) at 14 days: 102 deg F min. (fiber stress loading = 264 PSI).

9. Pull-out Strength: In 5000 PSI min. concrete, using Grade 60 steel rebar, embedded 10 bar diameters, in a properly prepared hole having a diameter of the rebar plus 1/4 inch max. Tensile Stress: 90,000 PSI min. (rebar fracture).

PART 3 EXECUTION

3.01 INSTALLATION

A. Post spacing shall be uniform with maximum spacing of 10 feet in fences erected along straight lines. All posts shall be placed plumb and centered in the concrete foundations.

B. Concrete footings for fence posts shall be 4,000 psi concrete cylinders with a min. dia. of 12-in. Crown top of footings to shed water.

C. If solid ledge is encountered without over-burden of soil, posts shall be set into the rock a minimum depth of 12 inches for line posts and 18 inches for terminal posts. Post holes shall be at least 1 inch greater in diameter than the post and the grout shall be thoroughly worked into the hole so as not to leave voids, and shall be crowned at the top to shed water. Where solid rock is

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covered by an overburden, the total setting depth shall not exceed the depths required for setting into earth, and the posts shall be grouted into the rock as described.

D. A change in direction of the fence line of 20 degrees or more shall be considered corners. Pull posts shall be used at any abrupt change in grade.

E. The top rails of chain link fences shall extend through all line posts in a looped top cap to form a continuous brace from end to end of each stretch of fence, be securely fastened at the end of each run, and have joints made with expansion sleeve couplings not less than 6-in long. Bottom and center rails shall be connected to boulevard type socket fittings.

F. There shall be no loose connections or sloppy fits in the fence framework. The fence framework shall withstand all wind and other forces due to weather.

G. Chain link fence fabric shall be stretched taut and tied to posts and rails. The fence fabric shall be installed on the athletic field side of the fence and shall be anchored to the framework so that the fabric remains in tension after pulling force is released. The fence fabric shall be attached to top, bottom and center rails with fabric bands spaced at not more than 12 inch intervals. The fabric shall be securely fastened to all terminal posts with stretcher bars with steel tension bands spaced approximately 12 in apart.

H. All PVC coated surfaces which are damaged shall be repaired as approved by the Landscape Architect/Engineer, using an approved PVC patching compound. Remove damaged material back to sound coating by wire brushing and in accordance with SSPC SP-2 Hand Tool Cleaning. Touch up with three coats of patching compound in accordance with manufacturer's instructions.

I. Chain link fabric shall be placed as noted on drawings. Confirm with Owner/ Engineer prior to installing fabric.

J. Contractor shall stake in the field the center line location of all fences for review and approval by Engineer. All constructed items associated with erection of the fences and concrete mow strip shall be constructed within the site property line as approved by the Owner.

K. Installation shall meet the requirements of ASTM F567.

END OF SECTION

SECTION 02850

SITE IMPROVEMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

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

B. Site improvements include the following items:

1. Basketball Posts, Backboard, Goals and Nets
2. Tennis Equipment
3. Volleyball Equipment
4. Benches
5. Tennis, Basketball, Skatepark, and Volleyball Court Acrylic Color Surfacing
6. Picnic Tables
7. Waste/Recycling Receptacles
8. Collapsible Bollards
9. Handicap Parking Signs
10. Bocce Courts
11. Horsehoe Pits

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

B. Pavements and appurtenances are included in Section 02575.

C. Landscaping is included in Section 02900.

D. Loaming and seeding is included in Section 02950.

E. Concrete is included in Section 03301.

F. Playground and skatepark equipment is included in Section 02860.

1.03 SUBMITTALS

A. Prior to furnishing and installing the materials required by this Section, the Contractor shall submit to the Engineer for approval the following:

1. Certified shop and fabrication drawings showing all important details of construction and dimensions showing the arrangement of the equipment and improvements specified herein.

2. Descriptive literature, bulletins, and/or catalogs of the equipment. Such information shall include painting schedules and sample colors of pavement color surfacing where applicable.

3. A complete and total bill of materials for all equipment.

4. Warranty certificates as required by these Specifications.

5. List of recommended spare parts.

6. In the event that it is impossible to conform to certain details of this Specification due to the different manufacturing techniques, describe completely all nonconforming aspects.

7. Submit complete shop drawings detailing exercise center and pieces of equipment to be installed, types of materials, color, layout, sizes, and methods of attachment. No work or procurement shall commence without the review and approval of these shop drawings by the Engineer.

1.04 CLEAN UP

A. Upon completion of work under this Section, all excess materials and debris resulting from work under this Section which have not previously been cleaned up shall be cleaned up and removed from the Site.

1.05 REFERENCE SPECIFICATIONS

A. Except as otherwise specified herein, the material and construction shall be in accordance with MassDOT, Standard Specifications for Highways and Bridges of the Commonwealth of Massachusetts, (SSHB) latest edition, including all addenda.

B. AISI – American Iron and Steel Institute

PART 2 PRODUCTS

2.01 BASKETBALL POSTS, BACKBOARDS, GOALS AND NETS

A. Basketball posts, backboards, goals and nets shall be from one manufacturer.

B. Posts

1. Furnish schedule 40 6-layer galvanized steel, outdoor gooseneck style, basketball posts. Posts shall be furnished complete with diagonal stabilizers, direct rim mounting system, and no vertical support or plate bars in view of the shooting area. Posts shall be GooseNeck Pole System as manufactured by TrueBounce 194 Riverside Avenue, New Bedford, MA 02746 (866-873-3715), or equal.

C. Backboards

1. Furnish basketball backboards made from ½-in thick polycarbonate, complete with ½-in dia. perforated holes, and enamel painted shot box and perimeter striping, and heavy duty "E" channeled aluminum frame assembled with stainless steel fasteners at all points. Play surface shall be clear polycarbonate with UV inhibitors, solid aluminum frame, stainless steel fasteners, shatterproof, sound/wind/graffiti and scratch resistant materials, with black trim colors. Backboard shall be Recreational XL Series (Outdoor) model XL7036 (36" x 54" x ½" clear) as manufactured by TrueBounce 194 Riverside Avenue, New Bedford, MA 02746 (866-873-3715), or equal.

D. Goals and Nets

1. Furnish basketball goals with front mount 18-in double ring (3/4-in upper and ½-in lower) rim with universal back plate and powder coat finish and chain net. Goal and net shall be Park and Recreation Fixed Goal model RB240 as manufactured by TrueBounce 194 Riverside Avenue, New Bedford, MA 02746 (866-873-3715), or equal.

2.02 TENNIS EQUIPMENT

A. Tennis equipment shall be from one manufacturer.

B. TENNIS POSTS: Tennis posts shall be 3" round 11 gauge steel powder coated black posts with stainless steel internal worm gear winch and self-locking gear mechanism with post welded lacing rods and ground sleeves. Tennis posts shall be Jaypro RTP-300 Deluxe Round Wind Club Tennis Posts and RTPGS-3 Ground Sleeves by Jaypro (www.jaypro.com), and as represented locally by ME O'Brien and Sons Inc (508-359-2817), or approved equal.

C. TENNIS NETS: Tennis nets shall be 39" wide by 42-ft long black polyethylene netting, 3 mm braided construction with quadruple stitched heavy duty polyester web headband with 3/16" diameter vinyl coated steel top net cable, double meshed top five rows, synthetic taped bottom edges and grommeted side pockets with dowels, model number TTN-3, as manufactured by Jaypro (www.jaypro.com) , and as represented locally by ME O'Brien and Sons Inc (508-359-2817), or approved equal.

D. TENNIS CENTER STRAPS AND ANCHORS: Tennis net center straps and anchors shall be a 2" wide adjustable nylon webbing strap with a double snap hoop, model number CS-1, and center strap anchors of all–aluminum construction with stainless steel pin, model number A-2 as manufactured by Jaypro (www.jaypro.com) , and as represented locally by ME O'Brien and Sons Inc (508-359-2817), or approved equal.

2.03 VOLLEYBALL EQUIPMENT

A. All volleyball equipment shall be from one manufacturer who makes volleyball equipment specifically for outdoor use.

B. Furnish and install 1 complete set of outdoor volleyball equipment, including 2 high tensile strength extruded aluminum alloy (6063T6) posts, finished in a durable clean anodized finish specifically made for outdoor use. The pair of posts shall include one reel post and one tie-off post. Each post shall be 4-in square x 10'-10" long to extend a minimum of 2'-0" into concrete footings. Upper end of posts shall be provided with an external cap.

C. Post sections shall be provided with an integral channel/track system to accept net attachment hardware and allow for infinite net height adjustments, for all age group competition settings.

D. Reel post shall have a heavy-duty type net tensioning reel with a removable type handle. Post shall be provided with an adjustable upper pulley assembly. Both the tensioning reel and the pulley assembly shall be secured into the integral channel/track system with allen flat head bolts to prevent tampering by unauthorized individuals. Provide allen tool with each set of uprights.

E. Tie-off post shall beprovided with 2 adjustable d-ring net tie off assemblies which attach to the post identical to the reel post hardware.

F. Volleyball equipment shall be Model # 00591-000, 4-in Square Aluminum Outdoor Volleyball System (Pair) as manufactured by Porter Athletic Equipment Company 2500 South 25th Avenue Broadview, IL 60155 as represented locally by M. E. O'Brien and Sons Inc. (508-359-2817), or approved equal.

G. Furnish outdoor ground sleeve Model # 00444-000 for installation into subsurface concrete footing with cover assembly, anchor pin, and 5/16" hex allen wrench as manufactured by Porter Athletic Equipment Company 2500 South 25th Avenue Broadview, IL 60155 as represented locally by M. E. O'Brien and Sons Inc. (508-359-2817), or approved equal.

H. Furnish outdoor volleyball net Model # 2253 complete with 27'-10" x 3'-3" net, with a 37'-6" double braided ½-in cord top cable as manufactured by Porter Athletic Equipment Company 2500 South 25th Avenue Broadview, IL 60155 as represented locally by M. E. O'Brien and Sons Inc. (508-359-2817), or approved equal. Furnish net with ½-in dowel on each supported end with 3 buckled strap assemblies on each side, with straps threaded through grommets. Perimeter of net shall be edged with bright yellow UV resistant vinyl, PPP free, 0.45mm thick and top and bottom band shall be 3-in wide. Mesh of net shall be constructed of knotless 4-in square black 2.5mm polyester.

2.04 BENCHES

A. Furnish and install steel bar benches, each 6-ft long, with ¼-in x 1 ½-in steel bars, with arms and backrest model: "58-series", and armless and backless model: "92 series", each with shop applied black color powder coated steel in areas shown on the Drawings. Benches shall be as manufactured by DuMor, Inc, Mifflintown, PA 17059 and as represented locally by ME O'Brien and Sons Inc (508-359-2817), or approved equal.

B. Steel bar benches shall be mounted onto concrete slabs, or walk areas or minimum 7-ft long x 30-in wide x 6-in deep cast-in-place concrete pads with ½" x 3 ¾" expansion anchor bolts as provided by the bench manufacturer.

C. Furnish and install 6-ft long backless aluminum plank player's benches, each with galvanized steel legs fabricated for in-ground concrete footing. Player's benches shall be installed at the basketball court, volleyball court, and tennis court as shown on the Drawings. Players benches shall be model: "PD" as manufactured by National Recreation Systems 5120 Investment Drive, Fort Wayne, IN 46808 and as represented locally by ME O'Brien and Sons Inc (508) 359-2817, or approved equal.

2.05 TENNIS, BASKETBALL, SKATEPARK, AND VOLLEYBALL COURT ACRYLIC COLOR SURFACING

A. Provide a non-fading, multi-layer, weatherproof acrylic color sealer and surfacing system for use on cured-in-place plant-mix asphalt pavement. The system shall consist minimally of an acrylic filler coating, an acrylic surface coating and an acrylic line paint. In addition to white color playing line paint on each court surface, the number of colors shall be as follows:

1. Basketball Court: 2 colors as approved by Owner.

2. Volleyball Court: 2 colors as approved by Owner.

3. Tennis Court: 2 colors as approved by Owner.

4. Skatepark: 1 color as approved by Owner..

B. Materials for resurfacer, base coat, top coat and playing lines shall be from one manufacturer. The Acrylic Latex Color System shall be equivalent to:

1. "Plexipave" as supplied by California Products Inc., Cambridge, MA (617) 547-5300

2. "Latexite" as supplied by New England Sealcoating Co., Inc., Hingham, MA (800) 225-4015

3. "Laykold" as supplied by Sportec International, Kenmore, NY (800) 835-0033.

C. Final approval of colors for color court surfacing shall be as approved by Owner based on samples of the manufacturers standard colors submitted for review. The entire area of each court surface and the area of the skatepark, including all paved areas enclosed by fences and gates, shall receive play lines and color coat surfacing.

D. Mixing water shall be potable, free from harmful soluble salts and mixed at a minimum temperature of 50 deg F, 10 deg C.

2.06 PICNIC TABLES

A. All picnic tables shall be from the same manufacturer.

B. Furnish 6-ft long x 5-ft wide (approx.) regular wood picnic tables, and 8-ft long x 5-ft wide (approx.) handicap accessible wood picnic tables on concrete pads. Handicap accessible tables shall have 8-ft (approx.) long table surfaces and 5-ft (approx.) long seats.

C. Tables shall be furnished with ‘C’ and better Douglas Fir KD S4S EE wood surfaces, with all steel members coated w/ manufacturer’s applied zinc rich epoxy then finished with manufacturer’s applied polyester powder coating, and all wood members treated with manufacturer’s applied clear wood preservative. Color shall be from manufacturer’s standard color chart, and as approved by Owner. Tables shall be model 77 series as manufactured by Dumor, Inc, PO Box 142, Mifflinton, PA, and distributed by M.E. O’Brien and Sons 93 West Street Medfield, MA 02052, or equal.

2.07 WASTE/RECYCLING RECEPTACLES

A. Furnish waste/recycling receptacles, each receptacle complete with two, 20 gallon liners with top deposit and shield. Body of receptacle shall be all steel members coated with manufacturer's applied zinc rich epoxy then finished with manufacturer's applied polyester powder coating finish. Color shall be from manufacturer's standard color chart, and as approved by Owner.

B. Furnish completely assembled with ½-in x 3 ¾-in expansion anchor bolts and recycling unit hinge for removal of liners, and installed on top of a concrete pad. Cover top shall have ½ moon and 4-in diameter openings for solid waste and bottles/cans respectively.

C. Waste/recycling receptacles shall be model 436-40SH-0001-RC as manufactured by Dumor, Inc, PO Box 142, Mifflinton, PA, and distributed by M.E. O'Brien and Sons 93 West Street Medfield, MA 02052, or equal.

2.08 COLLAPSIBLE BOLLARDS

A. Collapsible bollards shall be from one manufacturer.

B. Collapsible bollards shall be 30-in high, single post, and designed to collapse to a 4-in clearance, and shall lock in an upright position with lock pin and padlock. Post weight shall not exceed 49 lbs. Furnish one padlock, Masterlock or equal, for each collapsible bollard, and 3 keys per lock, all keyed alike.

C. Collapsible bollards shall be constructed of ASTM A500 steel tubing, with ASTM A36 Steel Plate and 18-8 stainless steel pins, free from surface blemishes, with primed with rust and corrosion resistant, zinc rich primer with 5,000 hour salt spray performance polyester outdoor finish RAL1028 Yellow TGIC Polyester powder outdoor finish. Collapsible bollard shall be a low profile heavy duty hinged bollard, model LPHDHB, with LPHDHB anchor system and CPAS12 collapsible post anchor system assembly consisting of an 18-in diameter x 42-in below grade concrete footing, as manufactured by TrafficGuard Direct, Inc., PO Box 201 Geneva, IL 60134 tel no 877-727-7347, or equal. Furnish complete with concrete, concrete form, and rebar as recommended by the manufacturer.

2.09 HANDICAP PARKING SIGNS

A. Furnish handicap parking signs and posts as shown on the Drawings and as specified herein.

B. Signs shall be model no. 38148 HB by Champion America, Inc. Macedonia, OH tel no 877-242-6709, or equal. Sign shall be 12-in x 18-in .063-in aluminum with non-reflective baked on enamel surface, white lettering and symbol with blue background and predrilled holes for mounting. Lettering shall read "VAN ACCESSIBLE" placed underneath the international symbol of accessibility as shown on the Drawings.

C. Sign support posts shall be U-channel posts, hot rolled high tensile rail steel, perforated with 3/8-in holes on 1-in centers. Each post shall be minimum 10-ft long with galvanized finish with each sign mounted to height above finished grade as shown on the Drawings. Provide corrosion resistant mounting hardware as required an approved.

2.10 BOCCE COURTS

A. Bocce courts shall be constructed of 8" x 8" x 16-ft long timbers of Southern Yellow pine, seasoned and pressure treated, as hereinafter specified. Posts shall be square in section with but

joints between adjacent ends along the sides, ends and corners of the court as approved by the Engineer.

B. All timber shall be select structural grade, surfaced four sides (S4S) and shall conform to the requirements of the American Softwood Lumber Standards under the U. S. Department of Commerce, effective June 2010.

C. All timber shall be pressure treated with American Wood Protection Association (AWPA) water based Alkaline Copper Quaternary (ACQ-D) class UC4A Ground Contact for General Use.

D. Steel pins used to attach timbers shall be double galvanized, ½-in dia. x 16-in long min.

E. Provide ½-in. diameter PVC pipe weep holes in predrilled holes as shown on the Drawings.

F. Provide 4-in dia. subsurface underdrain in locations as shown on the Drawings.

G, Apply 2-in wide painted white line stripes across top and vertically on the inside court side of the timbers in locations as shown on the Drawings. White paint shall be an exterior white primer and finish latex paint, minimum 2 coats.

2.11 HORSESHOE PITS

A. Horseshoe boxes shall be filled with clay as specified in Section 02200.

B. Crossover area, 18-in wide full walk, and the area in front of and behind the pit shall be min. 6-in layer concrete walk as shown on the Drawings. Foul lines shall be 2-in wide yellow painted lines on concrete walk areas as shown on the Drawings.

C. Backstop and posts shall be constructed of natural grain textured plastic lumber planks and posts from high density polyethylene (HDPE) and shall be weather and moisture resistant and contain UV inhibiting pigments and no air pockets, made from a single purified resin with consistent physical properties and consistent elemental resistance, and furnished in nominal dimensionsl lumber sizes. Color shall be the manufacturer's standard weathered wood. Posts shall be structural grade and all materials shall be furnished with a 50-yr warranty covering termites, splinters, staining wood chemicals mold and cracking. Recycled content can be up to 100%. Materials shall be as manufactured by American Plastic Lumber 3867 Dividend Drive Shingle Springs, CA 95682 tel no 877-677-7701, or equal.

D. For each backstop, furnish a complete assembly of 2 vertical posts, each post with a true dimension of 4" x 4" x 5-ft long and 2 horizontal planks. each with a nominal dimension of 2" x 10" x 6-ft long. Planks shall be secured to posts with four, ½-in dia galvanized steel bolts with lock washers and nuts, with nut ends countersunk to prevent removal, and minimum of 2 bolts where each plank touches each post.

E. All steel items and hardware shall be hot-dipped galvanized, fabricated and installed in accordance with the Drawings. Steel pin shall be 1-in dia x 2'-0.5" long.

F. Concrete shall be as specified in Section 03301.

PART 3 EXECUTION

3.01 BASKETBALL POSTS, BACKBOARDS, GOALS AND NETS

A. Install basketball posts, backboards, goals and nets and mounting bracket in the locations shown on the Drawings and obtain Engineer's approval prior to proceeding. Install posts plumb and complete with backboard and goal mounting hardware in accordance with manufacturer's recommendations. Provide shop drawings of mounting method for review by Engineer.

3.02 TENNIS EQUIPMENT

A. Tennis posts, tennis nets, center straps and anchors shall be assembled and installed in the areas as indicated and as detailed and per manufacturer's instructions.

3.03 VOLLERBALL EQUIPMENT

A. Volleyball posts with caps, net, anchors, ground sleeves, and concrete footings shall be assembled and installed in the areas as indicated and as detailed and per manufacturer's instructions.

3.04 BENCHES

A. Install benches at the location and to the lines and grades shown on the Drawings and obtain Engineer's approval prior to proceeding. Install steel bar benches with anchor bolts in concrete slabs and pads in a manner as approved by the bench manufacturer. Install backless aluminum plank player's benches in subsurface concrete footings in a manner approved by the bench manufacturer.

3.05 TENNIS, BASKETBALL, SKATEPARK, AND VOLLEYBALL COURT ACRYLIC COLOR SURFACING

A. Acrylic color surfacing system and layout shall be approved by the Engineer prior to installation.

B. Materials for acrylic color surfacing including binder, patch, resurfacer, color base coat, color top coat and line paint shall be installed by one installer, certified by the manufacturer of the product, to install acrylic color surfacing products.

C. Pavement shall have been in place for sufficient time (min. 10-14 days) or as recommended by the manufacturer, prior to the application of color court surfacing and pavement marking materials.

D. Materials shall be applied only in dry weather when pavement and atmospheric temperatures are 50 deg F or above and are anticipated to remain above 50 deg F and good drying conditions are present and expected for the next 8 hours and in accordance with good painting practices. Do not apply if freezing temperatures are expected for the next 48 hours. The surface shall be dry and free of sand, grease, oil or other foreign substances immediately prior to application.

E. Prior to application of color court materials and pavement markings, sweep area with approved mechanical sweeper and remove and dispose of loose materials from pavement surface including vegetation, soil, dust, oil, grease and stains. Pressure wash paved areas with clean water and let thoroughly dry.

F. After washing the surface, the entire surface shall be flooded, and checked for minor depressions or irregularities. Any puddled areas covering a nickel shall be marked and repaired with a patch binder product recommended by the chosen product manufacturer. Areas to be patched shall receive a tack coat that is allowed to dry thoroughly, as recommended by the manufacturer, prior to patching. After patching, the surface shall not vary more than 1/8 inch in ten feet, measured in any direction.

G. Install surfacing and markings according to manufacturer's instructions and in a manner as approved by the Engineer. Protect all adjacent areas including fences and other items from receiving color court surfacing materials. At a minimum, furnish and apply a four coat system. After surface preparation and pavement is dry, apply one coat of a black acrylic resurfacer as a surface preparation layer to reduce the porous characteristics of pavement areas. In areas where required as described above, apply a patch binder product. Then, apply a minimum of two coats of opaque, non-textured color court top surfacing. Additional coats may be required if finished surface is not completely opaque with new pavement color coat finish.

H. Final appearance of all acrylic color surfacing materials shall have a surface free of streaks, pinholes, uneven distribution of sand, and shall have a uniform color, flat finish, as approved by the Engineer.

I. After a minimum of 4 hours following completion of the color surfacing, lines shall be accurately located, marked and painted as shown on the Drawings. Layout, mask and stripe playing lines using acrylic textured line paint on top of color court surfaces in accordance with dimensions as shown on the Drawings. Prior to line paint application, line paint tape gap filler shall be applied to reduce incidence of fuzzy lines.

J. After drying time is sufficient as recommended by manufacturer, remove masking tape and all glue residuals and clean up general work area.

K. Protect coated areas until coating has dried sufficiently for foot traffic, a minimum of 8 hours.

3.06 PICNIC TABLES

A. Prior to installation, field stake the locations of the picnic tables in areas as shown on the Drawings for review and approval by the Engineer and Owner.

B. Install picnic tables at the locations and to the lines and grades shown on the Drawings and obtain Engineer's approval prior to proceeding.

C. Install picnic tables with surface mount on conc. pads as detailed and in accordance with manufacturer's recommendations.

3.07 WASTE/RECYCLING RECEPTACLES

A. Prior to installation, field stake the locations of the waste/recycling receptacles in areas as shown on the Drawings and in accordance with manufacturer's instructions for review and approval by the Engineer and Owner.

B. Install waste/recycling receptacles at the locations and to the lines and grades shown on the Drawings and obtain Engineer's approval prior to proceeding.

C. Install receptacles with surface mounts and anchors as required in accordance with manufacturer's recommendations on conc. pads as detailed. Slope top of concrete slab to drain.

3.08 COLLAPSIBLE BOLLARDS

A. Collapsible bollards shall be installed in the locations shown on the Drawings and as directed by Engineer.

B. Collapsible bollards shall be set vertically plumb and true to line.

B. Concrete for footing is specified in Division 3.

C. Collapsible bollards shall be installed in a manner as recommended by the manufacturer.

3.09 HANDICAP PARKING SIGNS

A. Install signs, posts, footings and hardware at all locations, and in the manner as shown, on the Drawings.

3.10 BOCCE COURTS

A. For each bocce court, construct crushed stone foundation on top of compacted level subgrade to the elevations as shown on the Drawings.

B. As vertical rows of timbers are constructed, position timbers with a staggered running bond-type joint pattern, butting the wood end-to-end along walls and end-to-side at corners, with lengths being equal along opposite sides and opposite ends. Corners shall have alternated butt joints.

C. Steel pins shall be placed in predrilled holes at 4-ft maximum on center, with a minimum of 2 pins equally spaced into each top timber and along the entire length. Each pin shall be driven completely through and into the timber and ground below. Pins driven into the top timber shall be finish recessed into the top timber by a minimum of ½-in. below the top surface.

D. Construct above grade exposed portions of timbers, and below grade portions of timbers with adjacent materials of clay, stonedust, dense graded crushed stone, crushed stone and pavement in accordance with the Drawings.

E. Surface of bocce court fill materials and top of timbers shall be level. Install 4-in dia. subsurface underdrain as shown on the Drawings and slope underdrain to existing underdrain system. Perimeter grades of timbers shall be sloped at 1% to drain runoff away from timber walls and ends.

F. Provide ½-in. diameter PVC pipe weep holes 6-ft on center maximum and through timbers with inverts ½-in above finished grade as shown on the Drawings.

G. Apply painted line stripes on timbers in accordance with paint manufacturer's instructions. Mask edges of painted lines to ensure straight lines.

3.11 HORSESHOE PITS

A. Surface of horseshoe pit fill materials shall be level. Surface of concrete walk shall be sloped 1% to drain runoff away from center of pit and center length of horseshoe court.

B. For each horseshoe pit, construct recycled plastic backstop with hardware as specified herein.

C. Install concrete block with steel pin, concrete walk, foul line markings, and fill with pit backfill materials as shown on the Drawings.

END OF SECTION

SECTION 02860

PLAYGROUND AND SKATEPARK EQUIPMENT

PART 1 GENERAL

1.10 SCOPE OF WORK

A. Provide all labor, equipment, implements and materials required to furnish, install, construct, perform inspections, and submit certifications complete as shown on Drawings and as specified herein.

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

B. Pavements and Appurtenances are included in Section 02575.

C. Safety Surfacing is included in 02530.

D. Landscaping is included in Section 02900.

E. Concrete is included in Section 03301.

1.03 SUBMITTALS

A. Prior to furnishing and installing the materials required by this Section, the Contractor shall submit to the Landscape Architect/Engineer for approval the following:

1. Certified shop and fabrication drawings showing all important details of construction and dimensions showing the arrangement of the equipment and improvements specified herein.
2. Descriptive literature, bulletins, and/or catalogs of the equipment. Such information shall include painting schedules where applicable.
3. A complete and total bill of materials for all equipment.
4. Warranty certificates as required by these Specifications.
5. List of recommended spare parts.
6. In the event that it is impossible to conform to certain details of this Specification due to the different manufacturing techniques, describe completely all nonconforming aspects.
7. Submit complete stamped shop drawings detailing all structures and equipment to be installed, types of materials, color, layout, sizes, and methods of attachment. No work or procurement shall commence without the review and approval of these shop drawings by the Engineer.
8. Submit certification from the manufacturer that equipment has been installed in accordance with manufacturer's recommendations.

B. Provide written warranty information for all equipment.

1.04 CLEAN UP

A. Upon completion of work under this Section, all excess materials and debris resulting from work under this Section which have not previously been cleaned up shall be cleaned up and removed from the Site.

1.05 REFERENCE SPECIFICATIONS

A. ANSI American National Standards Institute

B. AASHTO American Association of State Highway and Transportation Officials (tests or specifications.

C. ASTM American Society for Testing and Materials

D. Massachusetts Department of Transportation, Standard Specifications for Highways and Bridges of the Commonwealth of Massachusetts, (MADOTSSHB) latest edition, including all addenda.

E. International Play Equipment Manufacturers Association (IPEMA) certified.

F. Handbook for Public Playground Safety. U. S. Consumer Product Safety Commission Publication No. 325 (CPSC).

PART 2 PRODUCTS

2.01 PLAYGROUND EQUIPMENT

A. Contractor shall furnish and install the following individual play elements:

1. One (1) individual play element Model # 152848 Toddlertown Design for 2-5 year olds. Play element shall be as manufactured by Landscape Structures and as represented locally by John Taylor, M.E. O'Brien and Sons, 93F West Street P.O. Box 650, Medfield, MA 02052, (508) 359-4200, or approved equal.

2. One (1) individual play element Model # 176165 Playsense Design for 5-12 year olds. Play element shall be as manufactured by Landscape Structures and as represented locally by John Taylor, M.E. O'Brien and Sons, 93F West Street P.O. Box 650, Medfield, MA 02052, (508) 359-4200, or approved equal.

3. One (1) Swing Set with 4 swings as follows: 2 belt seats Model # 174018 and 2 bucket seats Model 176038 as manufactured by Landscape Structures and as represented locally by John Taylor, M.E. O'Brien and Sons, 93F West Street P.O. Box 650, Medfield, MA 02052, (508) 359-4200, or approved equal.

4. One (1) Single Bobble Spring Rider Model # 164074 as manufactured by Landscape Structures and as represented locally by John Taylor, M.E. O'Brien and Sons, 93F West Street P.O. Box 650, Medfield, MA 02052, (508) 359-4200, or approved equal.

5. Furnish and install age appropriate signage in accordance with IPEMA, CPSC, and manufacturer's recommendations.

B. Colors shall be submitted by the contractor for approval by the Engineer and will be selected from commonly available color schemes from the manufacturer.

2.02 SKATEPARK EQUIPMENT

A. Skatepark furnishings and products shall be modular and come from one commercial manufacturer who specifically makes outdoor (UV and weather resistant) skatepark equipment, including, but not limited to, the skating surface system, vandal resistant nuts and stainless steel fasteners, transition plates and deck frames, guardrails, adjustable foot levers, coping and peg plates, edge protectors, planks and grind edge angle irons, noise dampening features, and corrosion resistant framing.

B. Skatepark equipment shall consist of the following furnishings: **Obstacle 1:** 5' H x 8' W Quarter Pipe, **Obstacle 2:** 3' H x 8' W Bank to Bank/up-across-down Ledge/2' H x 4' W 3-sided Pyramid, **Obstacle 3:** 5' H x 12' W Quarter Pipe drop-in to 3' H x 12' W x 8' L Mid-Deck to Bank/Skate Stairs/Stair Handrail, **Obstacle 4:** Straight Round Grind Rail, **Obstacle 5:** Skate Bench, **Obstacle 6:** Ledge, **Obstacle 7:** Grind Boxes, **Obstacle 8:** 2' H Plaza Deck with Grind Boxes/Ledges/Manual Pad/Straight Jump Ramp, and Miscellaneous Plates for placing between equipment and asphalt, as manufactured by Skatewave Modular Systems by Landscape Structures, 601 7th Street South, Delano, MN 55328, tel. no 866-758-9283, model: Hybrid 1 Modular Park System as represented locally by M. E. O'Brien & Sons, Inc. 93 West Street, Unit F PO Box 650 Medfield, MA 02052 tel. no (800) 835-0056, or equal.

C. Furnish manufacturer's standard 15-yr. limited warranty for all products to be free of defects in workmanship and materials. Warranty shall offer protection of surfacing and all other manufactured materials against structural failure due to corrosion, natural deterioration or manufacturing defects.

2.02 CONCRETE FOOTINGS AND SLABS

A. Play equipment and skatepark footings and slabs shall be concrete as specified herein, dimensions and locations below finished grade as per manufacturer's instructions.

PART 3 EXECUTION

3.01 PLAYGROUND AND SKATEPARK EQUIPMENT

A. Assemble and install individual elements, structures, furnishings and equipment as shown on the Drawings and in accordance with manufacturer's instructions.

B. Prior to installation, stake locations of equipment in the field prior to installation for review and approval by the Engineer. For playground structures, coordinate locations of footings with locations of underdrains to ensure no conflicts, and coordinate locations of structures to ensure 6-ft safe area is in accordance with IPEMA and CPSC standards. For skatepark equipment, coordinate locations and installation of equipment with manufacturer's required asphalt and concrete surface materials, including coordination and installation of manufacturer's materials that require surface mounting with expansion anchors into concrete surfaces.

C. Contractor shall erect and maintain a snow fence of sufficient strength and quality to prohibit unauthorized access into playground and skatepark areas, until the Engineer and Owner's Representative conducts a safety inspection with a representative from the equipment manufacturer, and approves equipment for use.

D. Upon completion of installation, obtain certification from manufacturer that equipment is installed in accordance with manufacturer's instructions.

E. Submit manufacturer's warranty information, and operation and maintenance instructions, including list of spare parts, to Owner.

END OF SECTION

SECTION 02900

LANDSCAPING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The work of this section consists of all labor, materials, equipment, appliances, and services necessary to provide landscaping, as required by the Drawings and as specified herein.

B. The following list of items are to be used as a guide to the scope of landscape work and by no means shall be considered as the total amount of work to be performed under this section.

1. Prepared Planting Mix, Backfill Mixture and Soil Amendments, Planting Mulch, Plant Materials, Planting Locations, Planting Operations, Planting Trees, Maintenance of Plant Material, Guarantee Period and Replacements, Maintenance of Plant Material, Guarantee Period and Replacements, Final Inspection, and Acceptance.

1.02 RELATED WORK

A. Site Preparation is included in Section 02100.

B. Site Improvements are included in Section 02850.

C. Loaming and seeding is included in Section 02930.

1.03 APPLICABLE SPECIFICATIONS AND STANDARDS

A. "STANDARDIZED PLANT NAMES", 1942 Edition, American Joint Committee on Horticultural Nomenclature.

B. "AMERICAN STANDARD FOR NURSERY STOCK", latest edition, American Association of Nurserymen (ANSI 260.1).

C. Commonwealth of Massachusetts, Department of Public Works, Standard Specifications for Highways and Bridges, 1988 or latest edition.

1.04 SAMPLES

A. The following samples shall be submitted:

1. Mulch - Shredded softwood pine bark

2. Stakes

3. Wire

4. Hose

5. Prepared planting mix

6. Bone meal

7. Tree Paint

1.05 TESTING

A. Provide samples for testing as required by the Landscape Architect/Engineer.

1.06 PERSONNEL QUALIFICATIONS

A. The planting shall be done by skilled workers, trained and experienced in accepted nursery practices. The work shall be done under the supervision of a qualified planting foreman.

B. Personnel assigned to perform pruning vegetation shall be subject to the approval by the Superintendent of Trees for the City of Boston, and shall be a state certified arborist qualified to perform American Arborist Association class II pruning. Pruning of new and existing plants shall be as directed by the Superintendent of Trees for the City of Boston.

1.07 PLANTING SEASON

A. Deciduous plants shall be planted only when dormant, that is, before leaves appear in the spring and subsequent to their loss in the fall, unless otherwise directed by the Landscape Architect/ Engineer.

B. If the construction completion date prohibits in-season planting, the Contractor shall complete his work within the project date and prepare himself for out-of-season planting, including wiltproofing and extra watering. Plant guarantee periods remain as stated below. No frozen ground planting will be permitted.

PART 2 PRODUCTS

2.01 PREPARED PLANTING MIX (as approved by Town of Marlborough Arborist)

A. If approved by Arborist the planting mix below may be substituted for CU-structural soil in an area immediately surrounding the rootball – 2ft beyond the limits of the root ball. The remaining excavation shall be CU-Structural soil.

A. The prepared planting soil mix shall consist of the following materials and quantities:

1. Seven parts backfill mixture as specified in these Specifications.

2. One part peat borrow as specified in the Mass. Std. Spec. Ml.06.0.

3. To this mixture add ten (10) pounds of bone meal per cubic yard of mixture. It shall be commercial raw bone meal, finely ground, having a minimum analysis of four percent (4%) nitrogen and twenty percent (20%) phosphoric acid.

2.02 BACKFILL MIXTURE AND SOIL AMENDMENTS

A. Backfill mixture for plant pit backfill material shall be Type I loam as specified in Section 02930, as provided by the Contractor, with soil amendments to achieve quality standards as specified herein. Backfill mixture shall be a fertile, friable, processed screened loam capable of sustaining vigorous plant growth. It shall be free of any admixture of subsoil, stones larger than three-quarter inch (3/4"), clods of hard earth, plant roots, sticks or other extraneous materials.

B. Maximum size shall be three quarter inch (3/4") largest dimension. The maximum retained on the No. 4 sieve shall be 10 percent (10%) by weight of the total sample. Tests shall be combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

C. The organic content shall be between 3.5 and 6.0 percent by weight as determined by loss on ignition of test samples oven-dried to a constant weight at a temperature of 105 degrees, Centigrade. The pH value shall be between pH 5.5 and pH 6.0. It shall contain no toxic materials. Soluble salts shall not be greater than 75 parts per million. Add soil amendments if required at no additional cost to the Owner.

D. At least 1 representative samples of backfill mixture shall be tested after backfill mixture has been stockpiled. The Contractor shall deliver samples to testing laboratory, have testing report sent directly to the Landscape Architect/Engineer, and shall pay all costs.

E. Mechanical and chemical (pH soluble salts) analysis shall be by a public extension service agency or a certified private testing laboratory in accordance with the current "standards" of the "Association of Official Agricultural Chemists".

F. Reports shall be submitted at least one month before any planting is to be done. Soil samples shall be tested for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Aluminum, Soluble Salts and show the acidity of the soil.

G. Fertilizer:

1. Commercial fertilizer, peat, humus or other additives shall be used to counteract soil deficiencies as recommended by the soil analysis and as directed by the Landscape Architect/Engineer.

2. Commercial fertilizer shall be a product complying with the State and United States Fertilizer Laws. Deliver to the site in the original unopened containers which shall bear the manufacturer's certificate of compliance covering analysis which shall be furnished to the Landscape Architect/Engineer. 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:

	Nitrogen	Phosphorous	Potash
For Deciduous trees	10%	6%	4%

3. Ground limestone shall be an approved agricultural dolemite limestone containing not less than 85% of total calcium or magnesium carbonates. Limestone shall be ground to such

fineness that 50% will pass through a 100 mesh sieve and 95 will pass through a 20 mesh sieve.

4. Humus shall be natural humus, reed peat or sedge peat which has been stockpiled for at least one year prior to its use. It shall be free from excessive amounts of zinc, low in wood content, free from hard lumps and in a shredded or granular form. According to the methods of testing of A.O.A.C., latest edition, the acidity range shall be approximately 5.5 pH to 7.6 pH and the organic matter shall be not less than 85% as determined by loss on ignition. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis.

5. Peat moss shall-be composed of the partly decomposed stems and leaves of any or several species of sphagnum moss. It shall be free from wood, decomposed colloidal residue and other foreign matter. It shall have an acidity range of 3.5 pH to 5.5 pH as determined in accordance with the methods of testing of A.O.A.C., latest edition. Its water absorbing ability shall be a minimum of 1,000% by weight on an oven dry basis.

6. Superphosphate: Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 18% available phosphoric acid.

2.03 PLANTING MULCH

A. Shredded softwood pine bark mulch shall be fibrous pliable slices, not exceeding 1/2 inch in width or 3 inches in length. It shall be 98 percent organic matter with the pH range of 3.5 to 4.5 and a moisture content of packaged material not to exceed 35 percent.

2.04 PLANT MATERIALS

A. Selection of the Nursery Stock

1. At least twenty (20) days prior to the expected planting date, the Contractor shall request, in writing, that the Landscape Architect/Engineer provide a representative to select and tag stock to be planted under this Section. This request shall be made ten (10) days prior to the date on which stock selections are to be made. The Contractor shall arrange for and bear the cost of transportation, meals in transit, and overnight accommodations, if necessary, for the Landscape Architect/Engineer's representative during the period of time required to select and tag the required number of sized stock. The letter of request shall also have attached a letter of certification from the supplier attesting to the fact that the stock to be selected is, in fact, in conformance to the Plant List as shown on the Drawings. The Contractor shall supply the necessary tags or seals which shall be durable and capable of accepting weather-resistant ink or an embossed process. The tags or seals shall be attached directly and securely to each selected plant.

B. The Contractor shall furnish and plant all plants shown on the drawings, as specified, and in quantities as listed on the PLANT LIST. No substitutions will be permitted. All plants shall be nursery grown.

C. Plants shall be in accordance with the USDA Standard for Nursery Stock of the American Association of Nurserymen.

D. All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. Trees shall have straight trunks and all abrasions and cuts shall be completely callused over.

E. The root system of each shall be well provided with fibrous roots. All parts shall be sound, healthy, and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs or larvae.

F. All plants must be moved with the root systems as solid units with balls of earth firmly wrapped with burlap. The diameter and depth of the balls of earth must be sufficient to encompass the fibrousroot feeding system necessary for the healthy development of the plant. No plant shall be accepted when the ball of earth surrounding its roots has been badly cracked or broken preparatory to or during the process of planting or after the burlap, staves, ropes or platform required in connection with its transplanting have been removed. The plants and balls shall remain intact during all operations. All plants shall be freshly dug. No plants from cold storage or previously heeled-in will be accepted. All plants that cannot be planted at once must be heeled in by setting in the ground and covering the balls with soil and then watering.

G. The height of the trees (measure from the crown of the roots to the tip of the top branch) shall be not less than the minimum size designated. The caliper measurement six (6) inches above ground level up to and including four (4) inch caliper size and twelve (12) inches above ground level for larger sizes. The branching height for shade trees next to walks shall be seven (7) feet. This may be obtained by pruning after delivery if this does not ruin the shape or form of the trees or cause unsightly scars. All cuts shall be shellacked. The trunk of each tree shall be a single trunk growing from a single unmutilated crown of roots. No part of the trunk shall be conspicuously crooked as compared with normal tress of the same variety. The trunk shall be free from sunscald, frost cracks, or wounds resulting from abrasions, fire or other causes. No pruning wounds shall be present having a diameter exceeding two inches and such wounds must show vigorous bark on all edges. No trees which have had their leaders cut will be accepted.

H. The Contractor shall take note that only tree stock grown specifically for hardiness in Zone 5 of the Hardiness Zones established by the Arnold Arboretum, Jamaica Plain, Massachusetts, will be accepted. The Contractor's suppliers must certify in writing that the stock has actually been grown under Zone 5 conditions and is hardy to the City of Boston or that the stock was asexually propagated from and grafted onto stock from a strain proven hardy to Zone 5 conditions. Trees not so certified will not be accepted.

PART 3 EXECUTION

3.01 PLANTING LOCATIONS

A. All plant locations shall be staked out on the ground and the locations must be approved by the Landscape Architect/Engineer before any excavation is started. If it is necessary to adjust any of the locations, because of unforeseen problems, the changes shall be under the direction of the Landscape Architect/Engineer and there shall be no extra charges for these adjustments.

3.02 PLANTING OPERATIONS

A. Planting shall be done by experienced workmen familiar with planting procedures under the supervision of a qualified foreman.

B. Holes for tree pits shall be at least two times the diameter of the spread of the root ball or root system and at least 12 inches deeper than the depth of the root ball.

C. All plant pits shall be excavated with vertical sides.

3.03 PLANTING TREES

A. The planting excavation shall be filled with enough of the specified planting soil mix to provide a 12 inch depth when firmly tamped.

B. The tree shall be lifted and set in place, being careful to not disturb the root ball and to keep it intact.

C. The tree shall be set to line and grade shown in the Drawings and plumbed straight. The tree shall be set at the same depth as they were previously grown.

D. If the root ball is wrapped in burlap and rope tied, the rope shall be cut off and removed and the burlap shall be laid back and away from the ball half way down the ball. If the ball is in a metal basket, the metal basket shall be cut away and completely removed.

E. The planting pit shall be backfilled with planting soil mix in layers not to exceed eight inches. Each layer is to be firmly tamped. When the pit is approximately 2/3 full, thoroughly water, do not puddle mix but allow water to drain through, undisturbed. Continue backfilling and tamping in eight inch layers until planting mix level is at level plant was grown at. Water thoroughly and adjust soil level.

F. Immediately after planting operations are completed, all tree pits shall be covered with a 3-in layer of the specified mulch.

G. Stake tree and guy as shown in the Drawings being careful so that the stakes are clear of the root ball mass.

3.04 MAINTENANCE OF PLANT MATERIAL

A. Maintenance on all plants, shall begin immediately after each plant is planted. When all planting operations are complete the Contractor shall request an inspection of the work by the Landscape Architect/Engineer and the Owner. If all planting is provisionally accepted by Landscape Architect/Engineer and Owner, a 120 day maintenance period shall begin. The 120 day maintenance period shall occur during the active growing season as specified in Section 02930.

B. Maintenance shall include watering of planted areas, weeding, mulching, tightening and repairing of guys, removal of dead material, resetting plants to proper grades on upright position, edging, repairs of washouts and gullies, repairs to protecting fences and all other necessary works of maintenance.

1. All plants during the maintenance period shall be watered at least twice each week. At each watering the soil around each tree or shrub shall be thoroughly saturated. If sufficient moisture is retained in the soil, as determined by the Landscape Architect/Engineer, the required watering may be reduced. Trees will require a minimum of ten (10) gallons of water each.

2. Stakes shall be kept plumb and neat in appearance. Guys shall be tightened and repaired weekly.

3. Individual plant pits shall be kept free of weeds and mulch shall be replaced as required to maintain a three inch (3") layer of mulch. Beds and individual pits shall be neat in appearance and maintained to the lines originally laid out.

4. Plants that die during the maintenance period shall be replaced as directed by the Landscape Architect/Engineer.

5. Spraying for both insect pests and diseases shall be included during the maintenance period as required and as directed by the Landscape Architect/Engineer.

3.07 GUARANTEE PERIOD AND REPLACEMENTS

A. The guarantee period for plants shall be for (1) years following project acceptance.

B. The guarantee period for all plants, shall start at the date of Project Acceptance.

C. During the guarantee period, the Contractor shall replace, at his/her expense, in accordance with the Drawings and Specifications, any plants that are dead, or in the opinion of the Landscape Architect/Engineer in an unhealthy or unsightly condition and/or have lost their natural shape due to dead branches, excessive pruning, or other cause.

D. All replacements shall be of the same kind and size as specified. Replacement shall be made as soon as weather or seasonal conditions permit. The Contractor shall notify the Landscape Architect/Engineer of the dates of all replacements, at which time the guarantee periods for replacements shall start, provided the Landscape Architect/Engineer decided that the replacement conforms with the Contract requirements.

3.08 FINAL INSPECTION AND ACCEPTANCE

A. At the end of the guarantee period, inspection will be made by the engineer upon written request submitted by the Contractor at least 10 days before the anticipated date.

B. After all necessary corrective work has been completed, the Landscape Architect/Engineer will certify in writing the Final Acceptance of the planting.

C. Remove all stakes, guys, and protective barriers, if existing, weed, and remulch, straighten trees and complete all replacements and repairs and issue maintenance instructions to Owner as a requirement of Final Acceptance.

END OF SECTION

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SECTION 02901

MISCELLANEOUS WORK AND CLEANUP

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform the miscellaneous work not specified in other sections but obviously necessary for the proper completion of the work as shown on the Drawings.

B. When applicable, perform the work in accordance with other related Sections. When no applicable specification exists, perform the work in accordance with the best modern practice and/or as directed by the Engineer.

C. The work of this Section includes, but is not limited to, the following:

1. Crossing existing utilities
2. Restoring driveways and sidewalks
3. Cleaning up
4. Incidental work

D. Submit to the Engineer, in accordance with Article 2.6 of the General Conditions, a breakdown of the lump sum for miscellaneous work and cleanup including the above items as a minimum.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials required for this Section shall be the same quality of materials that are to be restored. Where possible, re-use existing materials that are removed.

PART 3 EXECUTION

3.01 CROSSING AND RELOCATING EXISTING UTILITIES

A. Perform any extra work required in crossing storm drains, gas mains, water mains, electric, telephone, gas and water services and other utilities. This work shall include: bracing, hand excavation, backfill (except screened gravel) and any other work required for crossing the utility or obstruction not included for payment in other items in the Bid Form. Notification of Utility Companies shall be as specified in Section 01046.

B. In locations where existing utilities cannot be crossed without interfering with the construction of the work as shown on the Drawings, remove and relocate the utility as directed by the Engineer or cooperate with the Utility Companies concerned if they relocate their own utility.

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C. At pipe crossings and where designated by the Engineer, furnish and place screened gravel bedding so that the existing utility or pipe is firmly supported for its entire exposed length. The bedding shall extend to the mid-diameter of the pipe crossed. Payment for screened gravel at pipe crossings will be made according to the unit price bid established in the Bid Form.

3.02 RESTORING ROADWAYS AND SIDEWALKS

A. Existing public and private roadways disturbed by the construction shall be replaced. Paved drives shall be repaved to the limits and thicknesses existing prior to construction. Gravel drives shall be replaced and regraded in kind.

B. Existing public and private sidewalks disturbed by the construction shall be replaced with sidewalks of equal quality and dimension.

3.03 CLEANING UP

A. Remove all construction material, excess excavation, equipment and other debris remaining on the job as a result of construction operations and restore the site of the work to a neat and orderly condition. Temporary safety fence shall be rolled up and delivered to the Owner.

3.04 INCIDENTAL WORK

A. Do all incidental work not otherwise specified, but obviously necessary to the proper completion of the work as shown on the Drawings and as specified herein.

3.06 COOPERATION WITH OTHER CONTRACTORS AND CONNECTION TO WORK BY OTHERS

A. At several locations, construction on other contracts may be carried on during the same period as construction under this Contract. It will be necessary for the Contractor to plan his/her work and cooperate with the other Contractor insofar as connections required to each other's work and to prevent any interference and delay for which he/she shall receive no other compensation than that agreed upon for this Item.

3.07 RESTORING PROPERTY

A. Be responsible for all damage to property outside of the limits of disturbance due to the operations. Protect from injury all walls, fences, pavement, underground facilities, such as water pipe, or other utilities which may be encountered during construction. If removal and replacement are required, it shall be done in a workmanlike manner so that replacement is equivalent to that which existed prior to construction.

B. Existing lawn surfaces damaged by construction shall be replaced. Cut and replace the lawn and sod, or restore the areas with an equivalent depth and quality of loam, seed and fertilizer as necessary to produce a stand of grass at least equal to that existing prior to construction. These areas shall be maintained and reseeded, if necessary, until all work under this Contract has been completed and accepted. Any additional work required to restore property to the original condition shall be performed.

C. Existing trees, shrubs, plants and herbaceous materials outside of limit of work shall be fully protected as specified in Section 01046.

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D. The Engineer will inspect all work for provisional acceptance upon the written request received at least 10 days before the anticipated date of inspection.

E. After all necessary corrective work has been completed, the Engineer will certify in writing the provisional acceptance of the planting.

END OF SECTION

SECTION 02930

LOAMING AND SEEDING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and place loam, finish grade, apply lime and fertilizer, hydraulically apply seed and mulch, and maintain all areas as shown on the Drawings and as specified herein, including all areas disturbed by the Contractor.

1.02 RELATED WORK

A. Site preparation is included in Section 02100.

B. Earthwork is included in Section 02200.

C. Sedimentation and Erosion Control is included in Section 02270.

1.03 SUBMITTALS

A. Submit to the Landscape Architect/Engineer for review in accordance with Division 1 complete shop drawings, materials and equipment furnished under this Section including seed mixtures and product label information.

B. Samples of all materials shall be submitted for inspection and acceptance upon Landscape Architect/Engineer's request.

C. Schedules for seeding and fertilizing must be submitted to the Landscape Architect/Engineer for approval prior to the work.

D. Furnish the Landscape Architect/Engineer with a certified statement as to the number of pounds of hydroseed materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of seeding that can be covered with the quantity of solution in the Contractor's hydroseeder.

E. Schedules for seeding and fertilizing shall be submitted to the Landscape Architect/Engineer for approval prior to the work.

PART 2 PRODUCTS

2.01 EXISTING TOPSOIL

A. Topsoil stripped from on site areas may be reused as loam in all disturbed areas as shown on the Drawings provided topsoil meets the requirements of loam outlined Part 2.02.

B. Topsoil obtained from on site areas shall be fertile, natural soil, screened to be free from large stones, roots, sticks, clay, peat, weeds and sod and shall be processed to create loam. It shall not be excessively acid or alkaline nor contain toxic material harmful to plant growth.

C. Contractor shall be responsible for screening stockpiled topsoil and adding amendments to create suitable loam at his own expense. If necessary, Contractor shall also provide additional loam and additional amendments as required. Contractor shall screen existing topsoil with a 1-in screen prior to reuse or blending to create Loam as specified herein.

E. Topsoil stripped from on site areas shall be only be stockpiled temporarily prior to transporting to areas approved by the Landscape Architect/Engineer.

F. Contractor shall be responsible for adding amendments to existing topsoil to create suitable loam at his own expense. If necessary, Contractor shall also provide additional loam and additional amendments as required to create Loam as specified herein.

2.02 LOAM

A. Analysis

1. Loam Mix shall be classified as a loamy sand by the USDA textural classification system determined by sieve and pipette or hydrometer analysis. The loam shall contain 75% sand by weight. The fine to medium sand fraction (particles less than 0.5 mm and greater than or equal to 0.1 mm in diameter) shall comprise at least 90 percent of the sand fraction (particles less than 2.0 mm and greater than or equal to 0.05 mm in diameter). No more than 3 percent of the soil shall be gravel (particles less than 25.4 mm and greater than or equal to 2.0 mm in diameter). The loam shall be 100 percent finer than 25.4 mm in diameter.

2. Loam shall be free of stumps, roots, heavy or still clay, lumps, coarse sand, noxious weeds, sticks, brush or other litter.

3. The organic matter content shall be between 5.0 and 8.0 percent by weight as determined by loss on ignition of moisture free text samples oven dried to a constant weight at a temperature of 100 degrees, Centigrade. To adjust organic matter content, the soil may be amended, prior to delivery to the site, by the addition of leaf mold or peat moss or other approved organic matter. Use of organic amendments is acceptable only if random sampling indicates thorough incorporation. The pH value shall be between pH 5.5 and pH 6.5. It shall contain no toxic materials. Soluble salts shall not be greater than 75 parts per million. Add soil amendments if required at no additional cost to the Owner.

4. If loam furnished by Contractor is manufactured, additional testing may be required by Landscape Architect/Engineer to insure uniform quality.

2.03 LOAM TESTING PROGRAM

A. Contractor shall be responsible for submitting loam for testing to an approved testing laboratory to ensure that installed loam materials conform to the specifications as stated herein. All costs for testing will be paid for by the Contractor.

B. Additional loam brought onto the site shall be submitted for testing in conformance with the Loam Sampling Program as specified herein. Tests shall be combined hydrometer and wet sieving in compliance with ASTM C422 after destruction of organic matter by ignition.

C. Prior to delivery or spreading, Contractor shall submit a minimum of one test result of loam from each sample location or source.

D. Samples of above shall be taken and submitted to testing laboratory at least 30 days prior to ordering or use if stockpiled on site. Contractor shall deliver samples to Landscape Architect/Engineer and testing laboratory, have testing report sent directly to the Landscape Architect/Engineer, and shall pay all costs. Contractor shall furnish additional amendments of fertilizer, lime and organic matter at his/her own expense. Based on test results, Contractor shall furnish and install additional amendments of fertilizer, lime and organic matter at his/her own expense, if necessary to create suitable loam as required at his own expense.

E. Mechanical and chemical (pH soluble salts) analysis shall be by a public extension service or a certified private testing laboratory in accordance with the current "standards" of the "Association of Official Agricultural Chemists". One pint samples shall be submitted to A&L Eastern Agricultural Laboratories, 7621 Whitepine Road, Richmond, VA 23237, Tel. No. (804) 743-9401 or equal to analysis by test methods S1A, S2, particle size analysis and lead content. Copies of test results shall be provided to the Contractor and Landscape Architect/Engineer at least 30 days prior to anticipated loam delivery and placement.

F. Soil samples shall be tested for Organic Content, Nitrate, Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Aluminum, Soluble Salts and show the acidity of the soil.

G. Based on the test results, the loam shall be identified as acceptable, acceptable with certain fertilizer and limestone applications or unacceptable by the Landscape Architect/Engineer. If the loam is found acceptable, the fertilizer and limestone requirements will be as specified or as recommended by the Landscape Architect/Engineer. If the loam is found unacceptable, the Contractor shall be responsible for identifying another source of loam and shall incur all expenses associated with testing additional samples.

H. All loam incorporated into the site shall match the samples provided to the Landscape Architect/Engineer and tested. Contractor shall provide testing of imported loam at one composite sample for each 500 cy. The Landscape Architect/Engineer may require Contractor to furnish additional testing of loam samples delivered to the site if it does not appear to be consistent with previously tested samples.

2.04 LOAM AMENDMENTS

A. Commercial fertilizer, peat, humus, sand or other additives shall be used to counteract soil deficiencies as recommended by the soil analysis and as directed by the Landscape Architect/Engineer.

B. Fertilizer shall be LESCO 10-10-10 or approved equal for use as a starter fertilizer. It shall be delivered to the site in the original unopened containers each showing the manufacturer's certificate of compliance and guaranteed analysis and shall comply with the State and United States Fertilizer Laws. Store fertilizer so that when used it shall be dry and free flowing. 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 or as recommended by the soil analysis.

C. Lime shall be ground limestone of an approved agricultural dolomite limestone containing not less than 85% of total calcium or manganese carbonates. Limestone shall be ground to such fineness that 50% will pass through a 100 mesh sieve and 95% will pass through a 20 mesh sieve.

D. Humus shall be natural humus, reed peat or sedge peat which has been stockpiled for at least one year prior to its use. It shall be free from excessive amounts of zinc, low in wood content, free form hard lumps and in a shredded or granular form. According to the methods of testing of A.O.A.C., latest edition, the acidity range shall be approximately 5.5 pH to 7.6 pH and the organic matter shall not be less than 85% as determined by loss on ignition. The minimum water absorbing ability shall be 200% by weight on an oven dry basis.

E. Peat moss shall be composed of partly decomposed stems and leaves of any or several species of sphagnum moss. It shall be free from wood, decomposed colloidal residue and other foreign matter. It shall have an acidity range of 3.5 pH to 5.5 pH as determined in accordance with the methods of testing by A.O.A.C., latest edition. Its water absorbing ability shall be a minimum of 1,000% by weight on an oven dry basis.

F. Superphosphate: Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 18% available phosphoric acid.

2.05 SUBGRADE MATERIALS

A. Subgrade fill material used below loam shall be sandy gravel as specified in Section 02200. Additional loam from on site sources may also be utilized as subgrade materials in areas except the athletic field area and under pavements.

2.06 SEED MIXTURES

A. Seed shall be labeled in accordance with the USDA Rules and Regulations under the Federal Seed Act and applicable State seed laws. Seed shall be from the same or previous year's crop, each variety of seed shall have a percentage of germination not less than 90, a percentage of purity not less than 85 and shall have not more than 1 percent weed content and contain no noxious weeds.

B. The natural turf athletic field seed mix area shall consist of seed proportioned by weight as follows:

% by weight	Materials
80%	Kentucky Bluegrass-an equal proportioned blend of the following cultivars: *Princeton 105* *Baritone* *Limousine* or approved equal.
20%	Perennial Ryegrass- an equal proportioned blend of the following cultivars: *Palmer III* *Secretariat* or approved equal.

"Or equal" cultivars shall be rated with a score of 7 or greater for turf quality as determined by the National Turfgrass Evaluation Program (NTEP)

C. Seed Mix for all areas other than the natural turf athletic field shall be a naturalized area mix as follows:

70%	Rebel Jr. Tall Fescue
20%	Palmer II perennial Ryegrass
10%	Jamestown Chewings Fescue

D. The seed shall be furnished in sealed bags or containers bearing the last date of germination, which date shall be within a period of 6 months prior to commencement of planting operations. Seed shall be delivered premixed in the proportions specified above. A manufacturer's certificate of compliance to the specified mixes shall be submitted by the manufacturer for each seed type. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.

E. Prior to the start of work, Contractor shall furnish to the Engineer a certified statement as to the number of pounds of seed to be used at each location. This statement shall also specify the number of square feet of seeding that can be covered with the quantity of seed in the Contractor's slice seeder.

F. Mulch for hydroseed shall be a specially processed cellulose fiber containing no growth or germination-inhibiting factors. It shall be manufactured in such a manner that after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended to form a homogeneous slurry. When sprayed on the ground, the material shall allow absorption and percolation of moisture. Each package of the cellulose fiber shall be marked by the manufacturer to show the air dry weight content and not contain in excess of 10% moisture colored green dye to visual application location referencing.

G. Straw mulch and tackifier shall be as specified in Section 02270.

2.07 EROSION CONTROL BLANKET

A. Erosion control blankets shall be 100 percent agricultural straw fiber matrix, 0.5 lbs per square yard, stitch bonded with degradable thread between two photodegradable polypropylene nettings, such as (Model S150 Double Net Short-Term Blanket (12 months) by North American Green, Evansville, IN), or equal.

F. Prior to start of work, the Contractor shall furnish the Landscape Architect/Engineer with a certified statement as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of seeding that can be covered with the quantity of solution in the Contractor's hydroseeder.

PART 3 EXECUTION

3.01 MATERIALS INSTALLATION

A. Loaming, seeding and conditioning shall only be performed during those periods within the seasons which are normal for such work as determined by the weather and locally accepted

practice, as approved by the Landscape Architect/Engineer. The Contractor shall hydroseed only on a calm day.

B. All areas shall receive site preparation and be seeded according to the manufacturer's written instructions.

C. Contractor shall order seed, and wetland seed mix early to ensure availability at time of scheduled seeding.

D. Schedules for seeding and fertilizing shall be submitted to the Landscape Architect/Engineer for approval prior to the work. Seeding as specified herein shall be accomplished between the period of April 15 to June 1 or August 15 to October 30. Seeding during the period from October 30 to March 31 shall only be undertaken upon approval of the Landscape Architect/Engineer. Seeding during the period from June 2 to August 14 shall only be performed if irrigation is provided.

3.02 SOIL TESTING AND ANALYSIS

A. The Contractor shall be responsible as outlined additional to obtain samples of delivered loam to submit to an approved testing laboratory for testing to ensure that loam conforms with other Sections of this Specification. No loam shall be placed until loam test results are reviewed and approved by the Landscape Architect/Engineer.

3.03 LOAM INSTALLATION

A. Unless otherwise approved by the Landscape Architect/Engineer, loam shall be placed to minimum depths as specified herein.

B. The subgrade of all areas to be loamed and seeded shall be raked and all rubbish, sticks, roots and stones larger than 2-in shall be removed. Subgrade surfaces shall be harrowed, raked or otherwise loosened to a depth of 4-in. large stones and boulders shall be removed or buried 12-in below finished grade. Subgrade shall be inspected and approved by the Landscape Architect/Engineer before loam is placed.

C. Loam shall be placed over all disturbed areas of limits of work, so that after natural settlement and light rolling it will conform smoothly to the lines, grades and elevations shown on the Drawings. No loam shall be spread in water or while frozen or muddy. Topsoil and loam shall not be handled or moved when in a wet or frozen condition.

1. Minimum depth of loam shall be 6-in layer.

2. Loam structure shall not be destroyed through excessive and unnecessary handling or compaction or deterioration of soil structure will result in rejection of loam for use.

D. After loam has been spread, it shall be carefully prepared by scarifying or harrowing and hand raking. All large stiff clods, lumps, brush, roots, stumps, litter and other foreign material equal to or greater than 1-in or larger in every dimension shall be raked up from the loamed areas and removed from the premises by the Contractor. The areas shall also be free of smaller stones, in excessive quantities, as determined by the Landscape Architect/Engineer. The whole surface shall then be raked to a smooth, uniform surface. Finished grading work shall not be done during unsuitable weather. All depressions caused by settlement shall be filled with additional loam and the surface shall be regraded and raked until a smooth and even finished grade is created.

E. There shall be no application of loam without prior approval of the finished subgrade by the Landscape Architect/Engineer.

F. Resupplying of loam to eroded or settled areas to finish grade shall be the responsibility of the Contractor and shall match previously utilized material.

3.04 AMENDMENT INSTALLATION

A. Soil additives shall be spread and thoroughly incorporated into the layer of loam and the upper 1-in of the underlying soil by harrowing or other methods approved by the Landscape Architect/Engineer. The following soil additives shall be incorporated:

1. 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 weeks prior to fertilizer application.

2. Fertilizer (10-10-10) at the rate of 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.

3. Superphosphate at the rate of 20 pounds per 1,000 square feet.

B. Lime and fertilizer shall be spread mechanically rather than in one operation with hydroseeding:

1. After the loam is placed and before it is raked to true lines and rolled, limestone shall be spread evenly over loam surface and thoroughly incorporated with loam by heavy raking to a least on-half depth of loam.

2. Fertilizer shall be uniformly spread and immediately mixed with the upper 2-in of topsoil.

3.05 EROSION CONTROL BLANKETS

A. Erosion control blankets shall be installed onto all exposed slopes to be loamed and seeded that are steeper than 4(Horizontal) to 1(Vertical) as shown on the Drawings. Erosion control blankets shall also be installed in all seeded drainage swales and ditches, and as directed by the Engineer in accordance with manufacturer's instructions.

B. The area to be covered shall be properly prepared, fertilized and seeded with permanent vegetation before the blanket is applied. When the blanket is unrolled, the netting shall be on top and the fibers in contact with the soil over the entire area. The blankets shall be applied in the direction of water flow and stapled.

C. Blankets shall be placed and stapled together in accordance with manufacturer's instructions. Side overlaps shall be 4-in minimum. The staples shall be made of wire, .091-in in diameter or greater, "U" shaped with legs 10-in in length and a 1-1/2-in crown. Commercial biodegradable stakes may also be used with prior approval by the Engineer. The staples shall be driven vertically into the ground, spaced approximately two linear feet apart, on each side, and one row in the center alternately spaced between each size. Upper and lower ends of the matting shall be buried to a depth of 4-in in a trench. In swales and ditches, erosion stops shall be created every

25-ft by making a fold in the fabric and carrying the fold into a silt trench across the full width of the blanket. The bottom of the fold shall be 4-in below the ground surface. Staple on both sides of fold. Where the matting must be cut or more than one roll length is required in the swale, turn down upper end of downstream roll into a slit trench to a depth of 4-in. Overlap lower end of upstream roll 4-in past edge of downstream roll and staple.

D. To ensure full contact with soil surface, roll matting with a roller weighing 100 lbs/ft of width perpendicular to flow direction after seeding, placing matting and stapling. Thoroughly inspect channel after completion. Correct any areas where matting does not present a smooth surface in full contact with the soil below.EC blankets for bottom of swales and along edge of pathways.

3.06 SEED AND MULCH APPLICATION

A. Seed Mix shall be applied at the rate of 8 pounds per 1,000 square feet. Application of straw mulch and tackifier shall be as specified in Section 02270.

B. Mulch shall be fiber mulch applied at the rate of 40 pounds per 1,000 square feet. An additional layer of straw mulch and tackifier applied at the rates specified in Section 02270 shall be applied on all slopes 3:1 or steeper.

C. Erosion Control Blanket shall be utilized in swales and on slopes 3:1 and greater.

D. Seeding shall be done immediately following soil preparation and only when the bed is in a friable condition, not muddy or hard.

E. The soil on which the seed is laid shall be reasonably moist and shall be watered if so directed.

F. All seeded areas shall be watered continuously to maintain moisture in the seed bed until full germination has been achieved. Continue to water throughout the maintenance period as required.

G. After grass has appeared, reseed all areas and parts of areas which fail to show a uniform stand of grass. Reseed repeatedly until all areas are satisfactorily covered. An established seeded area shall have a minimum count of 60 plants per square foot.

H. Seed shall be applied hydraulically at the rates and percentages indicated. The spraying equipment and mixture shall be so designed that when the mixture is sprayed over an area, the grass seed and mulch shall be equal in quantity to the specified rates. Prior to the start of work, the Landscape Architect/Engineer shall be furnished with a certified statement for approval as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of seeding that can be covered with the quantity of solution in the hydroseeder.

I. In order to prevent unnecessary erosion of newly graded slopes and unnecessary siltation of drainage ways the Contractor shall carry out seeding and mulching as soon as he/she has satisfactorily completed a unit or portion of the project. A unit of the work will be defined as not more than 20,000 square feet.

J. When protection of newly graded areas is necessary at a time which is outside of the normal seeding season, the Contractor shall protect those areas by whatever means necessary (such as

straw applied with a tar tack) or by other measures as approved by the Landscape Architect/Engineer.

K. Contractor shall be responsible to protect existing surfaces, edging, fencing and surface utility structures, by placing a temporary cover or other approved method on top of or over protected areas prior to seed application operations to prevent spillage onto areas to be protected.

3.07 MAINTENANCE FOR PROVISIONAL ACCEPTANCE

A. Maintenance shall begin immediately after any area is seeded or and shall continue until final acceptance. In any case, the minimum period of maintenance for all turf areas shall be 12 weeks after all seed is installed. When all areas have been seeded Contractor shall request an inspection of the work by the Landscape Architect/Engineer and Owner. After approval by the Landscape Architect/Engineer the 12 week maintenance period shall begin. Maintenance shall continue in all areas until a uniform turf is established over the entire site.

B. Maintenance shall include reseeding, mowing, watering, weeding and fertilizing.

C. Watering of seeded and planted areas:

1. Contractor shall note that seeded areas are not provided with an automatic subsurface irrigation system. Additional irrigation appurtenances shall be provided by the Contractor to ensure adequate irrigation of the turf areas required for turf termination and establishment.

3. First week: The Contractor shall provide all labor and arrange for all watering necessary for the ground cover and plants to take. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantities to maintain moist soil to a depth of at least 4 inches. Watering shall be done early in the day and should not be done during the heat of the day.

4. Second and subsequent weeks: The Contractor shall water as required to maintain adequate moisture, until final acceptance, in the upper 4 inches of soil.

5. Watering shall be done in such a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply 1 complete coverage to the seeded areas in an 8 hour period for each day.

D. Mowing: The first mowing of seeded areas shall not be attempted until the seed is firmly rooted and secure in place. Not more than 40% of the grass leaf shall be removed by the initial or subsequent mowings. Grass height of the seeded areas shall be maintained between 2 inches and 2 1/2 inches unless otherwise specified. Thereafter, grass shall be maintained at 2 inches until acceptance. Care shall be taken not to damage tree trunks, curbs, fencing, utility and irrigation equipment, etc. when mowing. All damages shall be reported to the Landscape Architect/Engineer, regardless of cause, as soon as possible.

E. Fertilizing: A second application of fertilizer, as specified herein, shall be applied approximately 6 weeks after installation or as directed by the Landscape Architect/Engineer. Fertilizer shall be applied at the rate of 3 pounds per 1,000 square feet.

F. After final acceptance by the Owner, the Contractor will not thereafter be required to do any of the above listed work, except that nothing contained herein shall release the Contractor from his/her obligations under the Contractor.

3.08 PROVISIONAL ACCEPTANCE

A. The Contractor shall keep all seeded areas watered within the work areas and in good condition, reseeding or replanting areas if and when necessary until a good healthy, uniform growth is established over the entire area, and shall maintain all areas in an approved condition until provisional acceptance.

B. The Landscape Architect/Engineer will inspect all work for provisional acceptance at the end of a 12 week maintenance period upon the written request of the Contractor, received at least ten days before the anticipated date of inspection.

C. The maintenance period must occur during the growing season between April 15 and October 30 and shall include a minimum of 6 mowings in Athletic Field Blend Mix and Lawn Area Mix area. Wetland Seed Mix areas shall not be mowed.

D. A satisfactory stand will be defined when the total project area has:

1. No bare spots larger than 4 square inches.

2. No more than 5 percent of total area with bare spots

E. After inspection has occurred but prior to provisional acceptance, a soil test shall be performed to determine if additional soil fertilizing should occur. If necessary, additional fertilizer not to exceed 3 lbs. per 1000 square feet of 32-5-7 shall be applied as directed by the Landscape Architect/Engineer.

F. The Contractor shall furnish full and complete written instructions for maintenance of the seeded areas to the Owner at the time of provisional acceptance.

G. The inspection by the Landscape Architect/Engineer will determine whether maintenance shall continue in any area or manner.

H. After all necessary corrective work and clean-up has been completed, and maintenance instructions have been received by the Owner, the Landscape Architect/Engineer will certify in writing the provisional acceptance of the seeded areas. The Contractor's responsibilities for maintenance of seeded areas shall cease on receipt of provisional acceptance.

END OF SECTION

SECTION 03301

CONCRETE AND REINFORCING STEEL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install all concrete work complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Site Improvements is included in Section 02850.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data. Submittals shall include at least the following:

1. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water cementitious ratio, type and manufacturer of cement.

2. Placing drawings and bar bending details in conformity with the recommendations of ACI 315.

3. Technical data on all materials and components.

4. Material Safety Data Sheets (MSDS) for all concrete admixtures and curing agents.

B. Test Reports

1. Sieve analysis of fine and coarse aggregates.

2. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water cementitious ratio, type and manufacturer of cement, and either a. or b. below.

a. Standard deviation data for each proposed concrete mix based on statistical records.

b. Water cementitious ratio curve for each proposed concrete mix based on laboratory tests. Give average cylinder strength test results at 28 days for laboratory concrete mix designs. Provide results of 7 and 14 day tests if available.

C. Certifications

1. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

2. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain for Concrete Reinforcement.

3. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

4. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

5. ASTM C33 - Standard Specification for Concrete Aggregates.

6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

7. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete

8. ASTM C150 - Standard Specification for Portland Cement

9. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

10. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

11. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

12. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

B. American Concrete Institute (ACI).

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.

2. ACI 301 - Standard Specification for Structural Concrete.

3. ACI 305R - Hot Weather Concreting.

4. ACI 306R - Cold Weather Concreting.

5. ACI 315 - Details and Detailing of Concrete Reinforcement.

6. ACI 318 - Building Code Requirements for Structural Concrete.

C. Concrete Reinforcing Steel Institute (CRSI)

1. MSP - Manual of Standard Practice

D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.

B. Reinforced concrete shall comply with ACI 318.

C. All testing and inspection services required, unless otherwise specified, shall be provided and paid for by the Owner. Testing necessary to establish the concrete mixes shall be performed by and at the expense of the Contractor. Methods of testing shall comply with the latest applicable ASTM standards.

1.06 DELIVERY, STORAGE AND HANDLING

A. Reinforcing steel shall be shipped and stored with bars of the same size and shape in fastened bundles with durable tags, marked in a legible manner with waterproof markings showing the same designations as shown on the submitted placing drawings. Reinforcing steel shall be free from mill scale, loose rust, dirt, grease, or other foreign matter. Store off the ground and protect from moisture, dirt, oil, or other injurious contaminants.

B. Products shall be stored in conformity with the manufacturer's recommendations.

C. Sand, aggregates and cement shall be stored or stockpiled in conformity with the recommendations of ACI 301.

PART 2 PRODUCTS

2.01 GENERAL

A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

B. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance and manufacturer's service.

C. Materials shall comply with this Section and any applicable State or local requirements.

2.02 MATERIALS

A. Cement shall be domestic portland cement conforming to ASTM C150. The type of cement is shown in Table 1. Air entraining cements shall not be used.

B. Fine aggregate shall be washed inert natural sand conforming to the requirements of ASTM C33.

C. Coarse aggregate shall be a well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33, size 57. Limits of Deleterious Substances and Physical Property Requirements shall be as recommended for severe weathering regions.

D. Water shall be potable, clean and free from injurious amounts of oils, acids, alkalis, organic matter, or other deleterious substances.

E. Concrete admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures.

1. Air entraining admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

2. Water reducing admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

3. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Engineer. When allowed, the admixtures shall be retarding or accelerating water reducing admixtures.

F. Reinforcing steel bars shall be deformed, intermediate grade, steel conforming to ASTM A615 Grade 60.

G. Welded steel wire fabric shall conform to ASTM A185.

H. Tie wires for reinforcing steel shall be 16 gauge or heavier, black annealed wire.

I. Precast concrete block bar supports shall conform to CRSI - Manual of Standard Practice (MSP) for Precast Concrete Bar Supports.

2.03 MIXES

A. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce concrete having proper placability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

B. The design of each mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if not available, be developed by independent testing laboratory acceptable to the Engineer engaged by and at the expense of the Contractor. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318. Acceptance of mixes based on laboratory tests shall be based on strengths greater than the specified design strengths specified in Table 1. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the specified design strength. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 1.

C. Compression Tests: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the compression strength requirements in conformity with the above paragraph.

D. Entrained air, as measured by ASTM C231, shall be as shown in Table 1.

E. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 1.

F. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

TABLE 1

Design Strength (1)	Cement ASTM C150	Cement Content (2)	W/C (3)	WR (4)	Slump Inches
4000	Type II	560	0.44 max.	Yes	3-5

Concrete shall have 3.5 to 5 percent air entrainment.

NOTES:

(1) Minimum compressive strength at 28 day
(2) Minimum cement content in lbs/cu yd
(3) W/C is Maximum Water Cement ratio by weight
(4) WR is water reducing admixture

2.04 MEASURING, BATCHING, MIXING AND TRANSPORTING CONCRETE

A. Measuring, batching, mixing and transporting concrete shall conform to ASTM C94 and the requirements herein, or as otherwise approved in writing by the Engineer.

B. Ready-mixed concrete, whether produced by a concrete supplier or the Contractor shall conform to the requirements above. No hand mixing will be permitted.

C. Admixtures shall be dispensed into the batch in conformity with the recommendations of the manufacturer of the admixtures.

D. Concrete shall be mixed until there is uniform distribution of the materials and shall be discharged completely before the mixer is recharged. The mixer shall be rotated at a speed recommended by the mixer manufacturer and mixing shall be continued for at least 1-1/2 minutes after all the materials are in the mixer. Concrete shall be placed within 1-1/2 hours of the time at which water was first added, otherwise it shall be rejected. Concrete which has been remixed or retempered, or to which an excess amount of water has been added, shall also be rejected.

2.05 FORMS

A. Forms shall be free from roughness and imperfections, substantially watertight and adequately braced and tied to prevent motion when concrete is placed. No wooden spreaders will be allowed in the concrete.

B. Wire ties will not be allowed. Metal ties or anchorages which are necessary within the forms shall be so constructed that the metal work can be removed for a depth of at least 1-in from the surface of the concrete without injury to such surface by spalling or otherwise. Forms shall be thoroughly cleaned before using and shall be treated with oil, or other approved material.

C. All exposed edges of the finished concrete shall be chamfered 3/4-in.

PART 3 EXECUTION

3.01 REINFORCING STEEL

A. Reinforcing steel shall be accurately fabricated to the dimensions shown. Bars shall be bent around a revolving collar having a diameter of not less than that recommended in ACI 318. All bars shall be bent cold.

B. Unless otherwise shown, splices in reinforcing steel shall be lapped in conformity with ACI 318 but not less than 24 diameters. All bar splices shall be staggered wherever possible. When splicing bars of different diameters, the length of lap is based on the larger bar.

C. Splices in welded wire fabric shall be lapped not less than 1-1/2 courses or 12-in, whichever is greater. Wire fabric splices shall be tied together with wire ties spaced no more than 24-in on center.

D. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt and other coatings, including ice, that reduce or destroy bond. Where there is a delay in depositing concrete after the reinforcement is in place. Bars shall be reinspected and cleaned when necessary.

E. Reinforcement which is to be exposed for a considerable length of time after being placed shall be given a heavy coat of cement grout.

F. In no case shall any reinforcing steel be covered with concrete until the amount and position of the reinforcement have been checked and permission given to proceed by the Engineer.

3.02 INSPECTION AND COORDINATION

A. The batching, mixing, transporting, placing and curing of concrete shall be subject to the inspection of the Engineer at all times. The Contractor shall advise the Engineer of his/her readiness to proceed at least 24 hours prior to each concrete placement. The Engineer will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing steel, and the alignment, cleanliness and tightness of formwork. No placement shall be made without the inspection and acceptance of the Engineer.

3.03 CONCRETE APPEARANCE

A. Concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If this does not correct the condition, the concrete shall be rejected.

B. Concrete for the work shall provide a homogeneous structure which, when hardened, will have the required strength, durability and appearance. Mixtures and workmanship shall be such that

concrete surfaces, when exposed, will require no finishing. When concrete surfaces are stripped, the concrete when viewed in good lighting from 10-ft away shall be pleasing in appearance, and at 20-ft shall show no visible defects.

3.04 PLACING AND COMPACTING

A. No concrete shall be placed until forms, condition of subgrade and method of placement have been approved by the Engineer. Before depositing concrete, all debris, foreign matter, dirt and water shall be removed from the forms. The contact surface between concrete previously placed and new concrete shall be cleaned and brushed with cement paste. Concrete, except as indicated on the Drawings, shall not be placed in water or submerged within 24 hours after placing, nor shall running water be permitted to flow over the surface of fresh concrete within 4 days after its placing.

B. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Pumping of concrete will be permitted when an approved design mix and aggregate sizes, suitable for pumping, are used. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials. If the section cannot be placed continuously, place construction joints as specified or as approved. Do not drop concrete more than 4-ft.

C. High frequency mechanical vibrators shall be used to the extent necessary to obtain proper consolidation of the concrete, but not to move or transport concrete in the forms. Care shall be taken to avoid segregation of aggregates by excess vibration. Vibration shall continue until the frequency returns to normal, trapped air ceases to rise and the surface appears liquefied, flattened and glistening. Concrete adjacent to forms and around pipe stubs shall be carefully spaded or rodded.

3.05 CURING AND PROTECTION

A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.

B. All concrete shall be cured in conformity with ACI 301. Concrete shall be cured by either water curing, sheet material curing or liquid membrane curing compound except that liquid membrane curing compound shall not be used on any concrete surface where additional concrete is to be placed or where the concrete surface is to be coated or painted. Water curing shall be by ponding, by continuous sprinkling or by covering with continuously saturated burlap.

C. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

D. Concrete placed during cold weather shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 306R. Salt, manure or other chemicals shall not be used for cold weather protection.

E. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305R. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set or cold joints. Immediately cover plastic concrete with sheet material during hot weather.

3.06 FIELD TESTS

A. Sets of three field control cylinder specimens will be taken by an approved testing company paid for by the Contactor and observed by the Engineer during the progress of the work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set, nor less than one set for each 150 cu yds of concrete nor less than one set for each 5,000 sq ft of surface area for slabs. One cylinder shall be broken at 7 days and two cylinders shall be broken and their strengths averaged at 28 days. When the average 28 day compressive strength of the cylinders in any set falls below the specified compressive strength or below proportional minimum 7 day strengths (where proper relation between 7 and 28 day strengths have been established by tests); the Engineer may reject the concrete represented by the set of cylinders, may require modification of the concrete and/or require modification of the proportions, water content, or temperature conditions of the design mix to achieve the required strengths.

B. Cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through his/her operations and furnishing material and labor required for the purpose of taking concrete cylinder samples. All shipping of specimens will be paid for by the Contractor.

C. Slump tests will be made in the field by an approved testing company paid for by the Contactor and observed by the Engineer during the progress of the work in conformity with ASTM C143.

D. Tests for air content shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173.

3.07 STRIPPING AND FINISHING CONCRETE

A. Forms shall not be stripped before the concrete has attained a strength of at least 30 percent of the specified design strength, unless otherwise approved by the Engineer. This is equivalent to approximately "100 day-degrees" of moist curing.

B. Care shall be exercised to prevent damaging edges or obliterating the lines of chamfers, rustications or corners when removing the forms or doing any other work adjacent thereto.

C. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to the satisfaction of the Engineer.

D. Defective concrete where it occurs shall be cut to a minimum depth of 1-in, thoroughly roughened and neat cement brushed in. The hole shall then be filled with mortar in the proportion of 1 part cement and 2-1/2 parts sand with a minimum of water. Mortar in larger patches shall be applied and allowed to assume a partial set following which it shall be struck off flush with the adjoining surface. Patches shall be kept moist for several days to assure proper curing.

E. Concrete to receive dampproofing and concrete not exposed in the finished work shall have off-form finish with fins and other projections removed and defects filled as specified.

F. Top surface of slabs shall be screeded to the established grades and shall be a true plane with a tolerance of 1/8-in when checked with a 10-ft straightedge. The surface shall be pitched to drain unless otherwise noted on the Drawings. The surface shall be finished to give a smooth, hard,

even surface free from high or low spots or other defects. Concrete subject to pedestrian traffic shall be given a light broom finish. Failure to meet the condition shall be cause for removal, grinding, or other correction as directed by the Engineer

END OF SECTION

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SECTION 13126

PRE-MANUFACTURED CONCRETE BUILDING

ADD ALTERNATE

PART 1 – GENERAL

1.01 SUMMARY

A. Contractor shall furnish a fully functioning pre-manufactured concrete building, complete with all plumbing and electrical fixtures, and all other required appurtenances, to meet all Massachusetts building codes.

B. The building shall be delivered to the site by the building manufacturer and installed by the building manufacturer. The building manufacturer shall provide all lifting hardware that is needed to off-load and safely set the buildings in place on the concrete foundation installed under this contract.

C. The pre-manufactured Restroom/Concession building shall consist of a men's and women's rest room, utility chases for access of the plumbing, a concession stand, and office room, as shown on the drawings. The completed building shall be a 24'-8" wide x 36'-0" long x 10'-6" and shall be assembled on site to appear as one uniform building.

D. The Contractor shall install a concrete foundation necessary to support the new buildings and install all underground piping beneath the buildings.

E. The Contractor shall connect the pre-manufactured concrete building to on-site water, sewer and electric services, including installation of all piping and utilities beneath the building.

1.02 REFERENCE STANDARDS

A. 780 CMR Massachusetts State Building Code, 8th Edition Massachusetts Amendments to the International Building Code 2009.

B. 248 CMR Massachusetts Uniform State Plumbing Code, Amendments to the 2002 Edition of ANSIZ233.1-NPFA 54.

C. 521 CMR Architectural Access Regulations, latest edition.

D. Latest edition of the National Electric Code (NEC).

E. 527 CMR 12.00 Massachusetts Amendments to National Electrical Code, 2011.

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F. International Energy Conservation Code (IECC 2012) with Massachusetts Amendments, latest edition.

G. ACI-318-02, “Building Code Requirements for Reinforced Concrete”. Concrete Reinforcing Institute, “Manual of Standard Practice”.

H. ANSI/ASCE-7-02 “Building Code Requirement for Minimum Design Loads in Buildings and Other Structures”.

I. Concrete Reinforcing Institute, “Manual of Standard Practice”.

J. Fabricator shall be a certified producer/member of The Precast/Prestressed Concrete Institute (PCI), National Precast Concrete Association (NPCA) or equal.

K. Building fabricator shall have a minimum of 10 years of demonstrated experience manufacturing and setting transportable monolithic precast concrete buildings.

L. American Society for Testing and Materials
   1. ASTM C150 Portland Cement
   2. ASTM C33 Concrete Aggregates
   3. ASTM C260 Air-Entraining Admixtures for Concrete
   4. ASTM A185 Steel Welded Wire Fabric for Concrete Reinforcement
   5. ASTM C494 Chemical Admixtures for Concrete
   6. ASTM A615 Deformed and Plain Billet Steel Bars for Concrete Reinforcement

1.03 DESIGN REQUIREMENTS

A. The completed structure shall be in full compliance with all required State of Massachusetts and local municipality codes and requirements.

B. Structural design calculations that are prepared and sealed by a professional engineer, licensed to practice in Massachusetts, shall be submitted after approved layout by Owner.

C. The building shall be designed to meet the following loading requirements:

   1. Roof Live Load – 35 psf
   2. Floor Live Load – 150 psf
   3. Wall Wind Load (130 mph) – 45 psf

D. Building modules shall be constructed of steel-reinforced concrete. Floor and walls shall be produced as a single component. Walls shall be poured on top of floor panel monolithically. Roof shall be attached to walls with welded connections. Panel wall systems will not be allowed for construction of building.

E. The buildings sections shall have a minimum of eight (8) inch floor, ten (10) inch roof and four (4) inch wall thickness. Roof shall be designed to have a 6 to 4 pitch.

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F. The building sections shall be pre-assembled with all materials, fixtures and electrical at the manufacturing facility and shipped as monolithic structures. The building base is to be post tensioned in the field and final assembly of modules in the field with minimum reconnections.

1.04 SUBMITTALS

A. Submit in accordance with Section 01300 and drawings. Shop drawings and engineering calculations shall be designed, detailed, and stamped by a professional engineer of pre-engineered concrete building and of verified experience to design pre-engineered concrete buildings, registered in the State of Massachusetts. The shop drawings submittal shall be suitable for obtaining all necessary building permits within the local municipality.

B. Submit Operations and Maintenance Manual for completed building.

PART 2 – PRODUCTS

2.01 PRE-MANUFACTURED CONCRETE BUILDING

A. Pre-manufactured concrete buildings shall be as manufactured by United Concrete Products, Yalesville, CT; Shea Concrete Products, Wilmington , MA; Oldcastle Precast, Rehoboth, MA; or approved equal.

2.02 GENERAL BUILDING MATERIALS

A. Concrete: Steel-reinforced, 5000 PSI minimum 28-day compressive strength, air-entrained (ASTM C260).

B. Portland Cement shall be Type I, II or III per ASTM specifications.

C. Reinforcing Steel: ASTM A615, grade 60 unless otherwise specified.

D. Welded wire fabric shall meet ASTM specifications.

E. All reinforcement shall be free of loose rust, oil or other items that may reduce bond. If present this material must be removed before placement.

F. Supports for reinforcement shall be chairs, wheels or other apparatus for spacing and securing reinforcing.

G. Post-tensioning Strand: 41K Polystrand CP50, .50, 270 KSI, 7-wire strand, enclosed within a greased plastic sheath, (ASTM A416). Roof and floor shall be each post-tensioned by a single, continuous tendon. Tendon shall form a substantially rectangular configuration having gently curving corners wherein the positioning of the cable member results in a pattern of one or more loops and a bisecting of the loop(s). The cable member starts from one corner of the concrete

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building panel, forms a gentle perimeter loop(s) returning to a point where the cable member entered the concrete building panel. The tendon then turns 90 degrees and follows the cable member(s) to a point midway along the "Y" axis of the concrete building panel and then turns 90 degrees along the "X" axis of the concrete building panel. This bisects the concrete building panel and crosses the opposite parallel portion of the cable member and exits from an adjacent side of the concrete building panel.

H. Watertight roof design:

1. The entire precast concrete roof panel surface must be cleaned and primed with a material that prepares the concrete surface for proper adherence to the coating material.

2. The entire precast concrete roof panel surface shall be sealed with a .060 EPDM continuous membrane cemented to the concrete with a compound designed for this purpose.

H. Caulking: Joint between building and floor slab shall be caulked on the exterior and interior surface of the joints. Caulking shall be SIKAFLEX-1A elastic sealant or equal. Exterior caulk joint shall be 3/8" x 3/8" square so that sides of joint are parallel for correct caulk adhesion. Back of joint shall be taped with bond breaking tape to ensure adhesion of caulk to parallel sides of joint and not the back.

I. Panel Connections: All panels shall be securely fastened together with 3/8" thick steel brackets. Steel is to be of structural quality, hot-rolled carbon complying with ASTM A283, Grade C and hot dipped galvanized after fabrication. All fasteners shall be ½" diameter bolts complying with ASTM A307 for low-carbon steel bolts. Cast-in anchors used for panel connections shall be Dayton-Superior #F-63, or equal. All inserts for corner connections must be secured directly to form before casting panels. No floating-in of connection inserts shall be allowed.

2.03 BUILDING ACCESSORIES RESTROOM/ CONCESSION BUILDING

A. Vents: (4) Four screened aluminum vents shall be cast into the side walls. Vents shall be sized to provide adequate ventilation as required for the finished volume of the interior space.

B. Windows: (2) Two privacy windows shall be cast into the side walls. (2) Two sliding windows shall be cast into the side walls. Windows shall be sized as shown on the drawings.

C. Doors and Frames: Shall comply with Steel Door Institute "Recommended Specifications for Standard Steel Doors and Frames" (SDI-100), and as herein specified.

1. The buildings shall be equipped with (5) Five 3'-0" x 7'-0" x 1-3/4", 18-gauge galvanized/insulated CECO metal doors with (5) Five 16-gauge galvanized frames.

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2. Doors and frames shall be bonderized and painted one coat of rust inhibitive primer and one finish coat of enamel paint; color to be selected by owner.

3. Doors and frames shall be capable of accepting screen door by others.

D. Door Hardware:

1. Hinges: Hager Model # 1191 with non-removable pin 4 ½” x 4 ½” (stainless steel), 3 per door, or approved equal.

2. Lock Set: Arrow model # Q12SR (Satin Stainless Steel finish) with cylindrical function lever, or approved equal.

3. Astragal: A4441/68R, or approved equal.

4. Threshold: National Guard Products #B-97, or approved equal.

5. Door holder men’s / woman’s room, concession stand: (10) Norton series 8501, or approved equal.

6. Door Holder: (1) One utility hook with crash chain to be installed at mechanical utility chase door.

7. Drip Cap: (3) National Guard 15D72, or approved equal.

8. (3) Three 4’-0” x 4’-0” Manual operated coil roll up concession stand door with interior locking latch guard and stainless steel serving counter with stainless steel support brackets fasten to the precast building.

2.04 PLUMBING ACCESSORIES-GENERAL

A. All plumbing fixtures and layout shall comply with the MA state plumbing code, MA Architectural Access Board and all other related codes, and as herein specified.

B. Waste and vent piping shall be cast iron.

C. Water piping shall be type “L” copper tubing. Provide a gate or ball valve at the inlet end of the water line. Water lines shall be sized to provide proper flushing action based on a nominal water pressure of 40 psi.

D. Furnish and install a main shut-off valve and drain in the utility area of each building.

E. Furnish and install a water meter in each building per City of Marlborough standards in the utility.

F. Furnish and install a backflow preventer in each building per City of Marlborough standards in the utility area.

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G. Furnish and install a grease trap per City of Marlborough standards in the utility area of the Rest Room/ Concession Building.

2.05 PLUMBING FIXTURES: RESTROOM/ CONCESSION BUILDING

A. Restroom / Concession Building shall have one (1) Utility Chase as shown on the Drawings. Water service shall be provided underground into this Utility Chase A. Water shall be installed in a manner that allows the system to be completely winterized.

B. Furnish and install the following:

1. (4) Four vitreous china toilets Kohler model Kingston K-4329, or approved equal.

2. (4) Four vitreous china ADA sinks Kohler model Greenwich K-2032, or approved equal.

3. (4) Four Bemis toilet seats model 1955C, or approve equal.

4. (2) Two vitreous china urinal Kohler model K-4960-ER ¾" rear spud, with internal traps, or approved equal.

5. (4) Four manual flush valves with concealed flush-o-meters with push button to be used for toilet fixtures.

6. (2) Two manual flush valves with concealed flush-o-meters with push button to be used for urinal fixtures.

7. (4) Four manually operated faucets with push buttons.

8. (1) One utility sink and faucet to be located in the mechanical chase portion of the building.

9. (1) One Krowne Metal Model No. HS-2 stainless steel wall mount hand washing sink and faucet, or approved equal.

10. (1) One Advance Tabco Model No. FC-3-1818-18RL stainless steel 3-bay sink with two washboards and (2) two Advance Tabco Model No. K-59 gooseneck faucets and drains, or approved equal.

11. (1) One Advance Tabco Model No. K-288R 9-OP-20 26" H stainless steel mop sink and Advance Tabco Model No. K-240 Service faucet and drain, or approved equal.

12. (1) One exterior hose bib with locking lock box.

13. (4) Four vandal-proof mirrors Bobrick B-942 frameless mirror, or approved equal.

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14. (2) Two 42” Bobrick B-6806 grab bars, or approved equal.

15. (2) Two 36” Bobrick B-6806 grab bars, or approved equal.

16. (2) Two 18” Bobrick B-6806 grab bars, or approved equal.

17. (2) Two 29” Bobrick B-4998 swing arm grab bars, or approved equal.

18. (4) Four stainless steel soap dispensers Bobrick B-4112 Contura Series, or approved equal.

19. (4) Four toilet paper dispensers Bobrick B-4288 classic series.

20. (4) Four XI Excel hand dryers model number XL-W, or approved equal.

21. Signage: (1) One handicap male sign; (1) One handicap female signs; (2) two concession signs.

22. Privacy partitions and urinal screen shall be HDPE material as manufactured by Comtec / Capitol Partitions, or approved equal.

23. (4) Four lavatory guards.

24. (2) Two baby changing stations manufactured by Bradley model number #9611, or approved equal.

25. (3) Three 12”x12” passive ventilation louvers with manual crank arm manufactured by Sunvent, or approved equal.

26. (2) Two floor drains with trap primers.

27. (2) Two Concession counters mounted on the outside of the building as shown shall be stainless steel and meet all reach ranges as specified in MAAB and 2010 ADA.

28. (3) Two Concession counter areas shall have a rolling counter door 8’ wide with a 4’ opening height by Cornell Iron Works with counter door extruded assembly model #ESC10 as provided by American Overhead Doors Inc. or approved equal. Pull down pole shall be provided with door.

31. (1) One 24” hole in mechanical chase area for sanitary lines.

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2.06 ELECTRICAL-GENERAL

A. All electrical work and materials shall be in accordance with specification Section 16020, except EMT conduit may be utilized within the structures.

B. EMT conduit and associated fittings use, installation, and construction shall be in accordance with "NEC 2011 Article 358 Electrical Metallic Tubing: Type EMT" and shall be listed for WET locations.

C. Light levels in each area shall match levels recommended by IESNA and power densities shall comply with Massachusetts Building Code and ASHRAE 90.1.

2.07 ELECTRICAL FIXTURES: RESTROOM/ CONCESSION BUILDING

A. Furnish and install the following:

1. (1) One 400 Amp electrical panel 240/120 V
2. (13) Thirteen vapor tight 4' interior vandal resistant light fixtures.
3. (21) Twenty-one 120V 20A GFI receptacles
4. (6) Six light switches.
5. (9) Nine exterior lights w/ photocell.
6. (6) Six emergency LED lights.
7. (4) Four exit signs.
8. (3) Three manual operated vents with manual crank.
9. (1) One exhaust fan.
10. (6) Six junction boxes.
11. 3) Three Condensation heaters, QMark CDF-542 with white CDFSENW surface mount cover, or equal.
12. (1) One 40 gallon hot water heater.
13. (2) Two electric hand dryers non heat.
14. (2) Two call for aid units with beacon and horn.

2.08 FINISHES

A. Excepted as noted in part C below, interior walls of buildings shall be smooth concrete finish. Walls and ceilings shall receive one coat of Thoroseal-Waterproof Cement-Based Coating, or approved equal; and two coats of Sherwin Williams Macropoxy 646 polyamide epoxy coating

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paint, or approved equal. All coatings and products shall be applied per manufacturer's instructions. Colors shall be chosen by the Owner.

B. Excepted as noted in part C below, interior floors shall receive one coat of Sikagard 62-two-component epoxy resin waterproof vapor-barrier coating, or approved equal. Product shall be applied per manufacturer's instructions. Color shall be chosen by Owner.

C. Interior of all service chases and garage bays shall be natural concrete finish on walls and ceilings. Floors shall be broom finish.

D. Exterior finish shall have "Brickface" brick stucco application finish, as approved by Engineer. "Brickface" brick stucco application finish shall be Portland Cement Stucco by California Stucco or approved equal. The pattern shall be 2 ¼" x 7 ¾" bricks with half inch mortar joints arranged in a running bond pattern. Brick finish shall consist of a bonding agent, scratch coat and brown coat applied per manufacturer's recommendations. Completed systems shall receive a Stucco Guard sealer or approved equal. Color shall be chosen by Owner.

E. Exterior roof shall be caulked with Sika flex 1A, or approved equal and receive .060 EPDM roofing system on the entire roof. Work shall be performed by an installer, certified in the installation of EPDM roofing systems, as approved by Engineer.

PART 3 – EXECUTION

3.01 STORAGE, DELIVERY AND HANDLING

A. Buildings shall be stored on proper dunnage at locations to prevent cracking, deformation or other damage.

B. The precast buildings shall be delivered to the jobsite by the Building Manufacturer on flat-bed trailer.

C. The Building Manufacturer shall provide all lifting cables and hardware needed to off-load and set the building.

D. Factory representative shall be present at the time of building set.

3.02 PRE-MANUFACTURED CONCRETE BUILDING

A. Furnish and install all building materials as specified, and to meet all required codes.

B. Furnish and install the pre-manufactured concrete building on the site in the location as indicated on the drawings.

C. Install the pre-manufactured concrete building on a concrete foundation as indicated on the drawings.

E. Make all required utility connections to on-site water, sewer and electric services, including connection of all building floor drains.

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F. The assembled building shall have a .060 EPDM roof installed after assembly on site.

E. Ensure all connections are fully functional.

F. Ensure all building materials and components are in full working operation.

END OF SECTION

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SECTION 16020
ELECTRICAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment required to install complete and make operational, electrical and process instrumentation systems as specified, as shown on the Drawings.

B. The work shall include furnishing and installing the following:

1. Conduit, wire and field connections for all control devices, control panels and electrical equipment furnished under other Divisions of these Specifications.

2. Furnish and install precast handholes and light pole bases.

3. Furnish and install handhole frames and covers.

4. Grounding System

5. Underground System

C. Each bidder or their authorized representatives shall, before preparing their proposal, visit all areas of the existing buildings and structures in which work under this bid is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that they have visited the site, buildings and structures and noted the locations and conditions under which the work will be performed and that they takes full responsibility for a complete knowledge of all factors governing his/her work.

1.02 RELATED WORK

A. Excavation and backfilling, including gravel or sand bedding for underground electrical work is included in Division 2.

B. Cast in place concrete work, including concrete encasements for electrical duct banks, equipment pads, light pole bases and reinforcing steel, is included in Division 3.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, shop drawings for equipment, materials and other items furnished under Division 16.

B. Check shop drawings for accuracy and contract requirements prior to submittal. Shop drawings shall be stamped with the date checked and a statement indicating that the shop drawings conform to Specifications and Drawings. This statement shall also list all exceptions to the Specifications and Drawings. Shop drawings not so checked and noted shall be returned.

C. The Engineer's check shall be for conformance with the design concept of the project and compliance with the Specifications and Drawings. Errors and omissions on approved shop

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drawings shall not relieve the Contractor from the responsibility of providing materials and workmanship required by the Specifications and Drawings.

D. All dimensions shall be field verified at the job site and coordinated with the work of all other trades.

E. Material shall not be ordered or shipped until the shop drawings have been approved. No material shall be ordered or shop work started if shop drawings are marked "APPROVED AS NOTED - CONFIRM," "APPROVED AS NOTED - RESUBMIT" or "NOT APPROVED."

F. Operation and Maintenance Data

1. Submit operations and maintenance data for equipment furnished under this Division, in accordance with Section 01730. The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists, etc., to instruct operating and maintenance personnel unfamiliar with such equipment.

G. Sports Lighting

Tab	Item	Description
A	Letter/ Checklist	Listing of all information being submitted must be included in a cover letter. List the name of the supplier's local representative and his/her phone number. Signed submittal checklist to be included.
B	Equipment Layout	Drawing(s) showing field layouts with pole locations.
C	On Field Lighting Design	Lighting design drawing(s) showing: a. Field Name, date, file number, prepared by, and other pertinent data b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x & y). Illuminance levels at grid spacing specified c. Pole height, number of fixtures per pole, as well as luminaire information including wattage, lumens and optics d. Height of meter above field surface e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance and uniformity gradient; number of luminaries, total kilowatts, average tilt factor; light loss factor. f. Alternate manufacturers shall provide both initial and maintained light scans using a maximum Recoverable Light Loss Factor (RLLF) as specified in section 2.05 F.
D	Life Cycle Cost calculation	Document life cycle cost calculations as defined in the specification. Identify energy costs for operating the luminaires, maintenance cost for the system including spot lamp replacement, and group relamping costs. All costs should be based on 25 years.
E	Luminaire Aiming Summary	Document showing each luminaire's aiming angle and the poles on which the luminaries are mounted. Each aiming point shall identify the type of luminaire.
F	Structural Calculations	Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required).

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Tab	Item	Description
		Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Drawings must be stamped by a structural engineer in the state of Massachusetts.
G	Control and Monitoring System	Manufacturer shall provide written definition and schematics for automated control system to include monitoring. They will also provide examples of system reporting and access for numbers for personal contact to operate the system.
H	Electrical distribution plans	If bidding an alternate system, manufacturer must include a revised electrical distribution plan including changes to service entrance, panels, conduit and wire sizing, Signed by a licensed Electrical Engineer in the Commonwealth of Massachusetts.
I	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the Owner. Light levels must be guaranteed per specification for 25 years.
J	Warranty	Provide written warranty information including insurance carrier's name and address and all terms and conditions.
K	Independent Testing Report	Manufacturer bidding any form of a constant light system is to provide an independent test report certifying the system meets the lumen maintenance control strategy defined in Section 2.05.A.1, verifying the field performance of the system for the duration of the useful life of the lamp based on lamp replacement hours. Report shall be signed by a licensed professional engineer with outdoor lighting experience.
L	Project References	Manufacturer to provide a list of projects where the technology proposed for this project has been installed in the state of Massachusetts. If any form of a constant light system is bid, a minimum of 5 project references completed within the last calendar year is required. For a depreciating light system, a full list of projects completed within the past 3 years is required. Reference list will include project name, project city, and if requested, contact name and contact phone number.
M	Product Information	Complete set of product brochures for all components, including a complete parts list and UL Listings.
N	Delivery	Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.
O	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.

1.04 CONTRACT PERFORMANCE REQUIREMENTS

A. Electric equipment, materials and installation shall comply with the latest edition of the Massachusetts Electrical Code (MEC) and with the latest edition of the following codes and standards:

1. National Electrical Safety Code (NESC)

2. Occupational Safety and Health Administration (OSHA)

3. National Fire Protection Association (NFPA)

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4. National Electrical Manufacturers Association (NEMA)

5. American National Standards Institute (ANSI)

6. Insulated Cable Engineers Association (ICEA)

7. Instrument Society of America (ISA)

8. Underwriters Laboratories (UL)

9. Factory Mutual (FM)

10. National Electrical Testing Association (NETA)

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 PRIORITY OF THE CONTRACT DOCUMENTS

A. If, during the performance of the work, the Contractor finds a conflict, error or discrepancy between or among one or more of the Sections or between or among one or more Sections and the Drawings, furnish the higher performance requirements. The higher performance requirement shall be considered the equipment, material, device or installation method which represents the most stringent option, the highest quality or the largest quantity.

B. In all cases, figured dimensions shall govern over scaled dimensions, but work not dimensioned shall be as directed by the Engineer and work not particularly shown, identified, sized, or located shall be the same as similar work that is shown or specified.

C. Detailed Drawings shall govern over general drawings, larger scale Drawings take precedence over smaller scale Drawings, Change Order Drawings shall govern over Contract Drawings and Contract Drawings shall govern over Shop Drawings.

D. If the issue of priority is due to a conflict or discrepancy between the provisions of the Contract Documents and any referenced standard, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence if they are more stringent or presumptively cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, or codes of any technical society, organization or association, or between Laws and Regulations, the higher performance requirement shall be binding on the Contractor, unless otherwise directed by the Engineer.

E. In accordance with the intent of the Contract Documents, the Contractor accepts the fact that compliance with the priority order specified shall not justify an increase in Contract Price or an extension in Contract Time nor limit in any way, the Contractor's responsibility to comply with all Laws and Regulations at all times

1.06 ENCLOSURE TYPES

A. Unless otherwise specified electrical enclosures shall have the following ratings:

1. NEMA 3R for outdoor non-corrosive or hazardous areas.

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1.07 SERVICE AND METERING

A. The power company serving this project is National Grid. Service will be obtained at 480-Volts, 3-Phase, 4-Wire, 60 Hz from a pole mounted transformer bank furnished and installed by National Grid.

B. The power company will be responsible for the following work:

1. Furnishing and installing the primary overhead conductors and pole line.

2. Furnishing and installing the riser pole, primary cutouts, lightning arresters and grounding.

3. Furnishing and installing primary conduits and cables.

4. Furnish and install the service transformer

5. Termination of underground primary cables at riser pole.

6. Furnishing metering current transformers (CT's), meter and meter wiring.

C. Provide the following coordination, work and materials:

1. Obtain an estimate from the power company for the work described in Paragraph 1.07B above and include the cost of the power company work in the Bid Price.

2. Make all arrangements with the power company for obtaining electrical service, pay all power company charges and furnish all labor and material required for the electrical service.

3. Furnishing secondary conduits and cables.

4. Furnishing and installing a power company approved metering current transformer enclosure.

5. Installing meter base.

6. Furnishing and installing an empty conduit with pull line from the metering CT enclosure to the meter enclosure. Conduit size and type shall be approved by the power company.

D. Submit shop drawings for the following items to the power company for approval:

1. Meter base.

2. Primary cable.

3. Metering instrument and installation.

1.08 CODES, INSPECTION AND FEES

A. Equipment, materials and installation shall comply with the requirements of the local authority having jurisdiction.

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B. Obtain all necessary permits and pay all fees required for permits and inspections.

1.09 TESTS AND SETTINGS

A. Test systems and equipment furnished under Division 16 and repair or replace all defective work and equipment. Refer to the individual equipment sections for additional specific testing requirements.

B. Make adjustments to the systems and instruct the Owner's personnel in the proper operation of the systems.

C. In addition to the specific testing requirements listed in the individual sections, the following minimum tests and settings shall be performed.

1. Mechanical inspection, testing and settings of circuit breakers, disconnect switches, control circuits and equipment for proper operation.

2. Check power and control power fuse ratings. Replace fuses if they are found to be of the incorrect size.

3. Verify all terminations at transformers, equipment, panels and enclosures by producing a 1, 2, 3 rotation on a phase sequenced motor when connected to "A," "B" and "C" phases.

4. Test the grounding system using the three point fall in potential method.

5. Test all 600 Volt wire insulation with a meg-ohm meter after installation. Make tests at not less than 500V. Submit a written test report of the results to the Engineer.

D. Testing shall be scheduled and coordinated with the Owner at least two weeks in advance. Provide qualified test personnel, instruments and test equipment.

1.10 SIZE OF EQUIPMENT

A. Investigate each space in the structure through which equipment must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.

B. The equipment shall be kept upright at all times during storage and handling. When equipment must be tilted for passage through restricted areas, brace the equipment to insure that the tilting does not impair the functional integrity of the equipment.

1.11 RECORD DRAWINGS

A. As the work progresses, legibly record all field changes on a set of project contract drawings, hereinafter called the "record drawings."

B. Record drawings shall accurately show the installed condition of the following items:

1. One-line Diagram(s).

2. Raceways and pullboxes.

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3. Conductor sizes and conduit fills.

4. Panel Schedule(s).

5. Control Wiring Diagram(s).

6. Lighting Fixture Schedule(s).

7. Lighting fixture, receptacle and switch outlet locations.

8. Underground raceway and duct bank routing.

9. Plan view, sizes and locations of switchgear, distribution transformers, and panelboards.

1.12 EQUIPMENT INTERCONNECTIONS

A. Review shop drawings of equipment furnished under other Divisions of this Specification and prepare coordinated wiring interconnection diagrams or wiring tables. Submit copies of wiring diagrams or tables with Record Drawings.

B. Furnish and install all equipment interconnections.

1.13 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be new.

B. Material and equipment of the same type shall be the product of one manufacturer and shall be UL listed.

C. Warrant all equipment furnished under Division 16. Refer to individual equipment sections for additional warranty items.

1.14 EQUIPMENT IDENTIFICATION

A. Identify equipment (disconnect switches, separately mounted motor starters, control stations, etc.) furnished under Division 16 with the name of the equipment it serves. Motor control centers, control panels, panelboards, switchboards, switchgear, junction or terminal boxes, transfer switches, etc., shall have nameplate designations as shown on the Drawings.

B. Nameplates shall be engraved, laminated plastic, not less than 1/16-in thick by 3/4-in by 2-1/2-in with 3/16-in high white letters on a black background.

C. Nameplates shall be screw mounted to NEMA 1 enclosures. Nameplates shall be bonded to all other enclosure types using an epoxy or similar permanent waterproof adhesive. Two sided foam adhesive tape is not acceptable. Where the equipment size does not have space for mounting a nameplate the nameplate shall be permanently fastened to the adjacent mounting surface.

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1.15 INTERPRETATION OF DRAWINGS

A. Unless specifically stated to the contrary, the Drawings are not intended to show exact locations of conduit runs. Coordinate the conduit installation with other trades and the actual supplied equipment.

B. Install each 3 phase circuit in a separate conduit unless otherwise shown on the Drawings.

C. Unless otherwise approved by the Engineer, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.

D. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be provided for a complete raceway installation. Where home-runs indicate conduit is to be installed concealed or exposed the entire branch circuit shall be installed in the same manner. Unless otherwise indicated install branch circuit conduits exposed in process/industrial type spaces and concealed in finished spaces.

E. Verify the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.

F. Except where dimensions are shown, the locations of equipment, fixtures, outlets and similar devices shown on the Drawings are approximate only. Exact locations shall be determined by the Contractor and approved by the Engineer during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

G. The sports lighting system was designed around Musco Lighting. Redesign of electrical or mechanical work, which is required due to the Contractor's use of an alternate item, arrangement of equipment and/or layout other than specified herein, shall be done by the Contractor at his/her own expense. Redesign and detailed stamped plans shall be submitted to the Engineer for approval. No additional compensation will be provided for changes in the work, either his/her own or others, caused by such redesign.

H. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown.

I. Redesign of electrical or mechanical work, which is required due to the Contractor's use of an alternate item, arrangement of equipment and/or layout other than specified herein, shall be done by the Contractor at his/her own expense. Redesign and detailed plans shall be submitted to the Engineer for approval. No additional compensation will be provided for changes in the work, either his/her own or others, caused by such redesign.

J. Raceways and conductors for low voltage (120 Volts) thermostats controlling HVAC unit heaters, exhaust fans and similar equipment are not shown on the Drawings. Provide raceways and conductors between the thermostats, the HVAC equipment and the motor starters for a complete and operating system. Raceways shall be installed concealed in all finished space and may be installed concealed or exposed in process spaces. Refer to the HVAC Drawings for the locations of the thermostats.

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K. It is the intent of these Specifications that the Electrical Systems shall be suitable in every way for the service required. All materials and all work that may be implied as being incidental to the work of this Section shall be furnished at no additional cost to the Owner.

L. Raceways and conductors for lighting, switches, receptacles and other miscellaneous low voltage power and signal systems as specified are not shown on the Drawings. Raceways and conductors shall be provided as required for a complete and operating system. Homeruns, as shown on the Drawings, are to assist the Contractor in identifying raceways to be run exposed and raceways to be run concealed. Raceways shall be installed concealed in all finished spaces and may be installed exposed or concealed in all process spaces. Raceways installed exposed shall be near the ceiling or along walls of the areas through which they pass and shall be routed to avoid conflicts with HVAC ducts, cranes hoists, monorails, equipment hatches, doors, windows, etc. Raceways installed concealed shall be run in the center of concrete floor slabs, above suspended ceilings, or in partitions as required.

1.16 SEISMIC RESTRAINTS

A. Seismic restraints shall be provided for all electrical systems including but not limited to conduits, busways, cable trays, pull boxes, free standing or wall mounted panels and cabinets, motor control centers, switchboards, switchgear, transformers, disconnect switches, individually mounted motor starters, variable frequency drives, power factor correction capacitors, lighting fixtures, emergency battery units and other similar electrical equipment installed under Division 16.

B. Use seismic criteria, Tables and standard restraint details found in the latest edition of the SMACNA Seismic Retraining Manual for the seismic restraints. The restraints shall be selected from the Tables that represent the highest seismic hazard class or level possible within the State, Commonwealth or District in which the project resides. Where materials other than steel are specified, members of equal strength to those in the standards shall be provided.

C. Materials of construction for seismic restraints shall be same as those specified for the equipment supports and area classifications. However, all bolts shall be stainless steel regardless of the locations.

PART 2 PRODUCTS

2.01 CONDUITS AND FITTING

A. Rigid Steel Conduit

1. Rigid steel conduit interior and exterior shall be hot-dipped galvanized and be as manufactured by the Allied Tube and Conduit Corp.; Wheatland Tube Co.; Western Tube & Conduit Corporation, or equal.

B. PVC Coated Rigid Steel Conduit

1. PVC coated rigid steel conduit shall have a minimum 0.040-in thick, polyvinyl chloride coating permanently bonded to hot-dipped galvanized steel conduit and an internal chemically cured urethane or enamel coating. The ends of all couplings, fittings, etc., shall have a minimum of one pipe diameter in length of PVC overlap. PVC conduit and fittings

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shall be manufactured by Occidental Coating Company; "Plasti-Bond Red" as manufactured by Robroy Industries; “Ocal” by Thomas & Betts Inc., Perma-Cote, or equal.

C. Rigid Aluminum Conduit

1. Rigid aluminum conduit shall be 6063 alloy and shall be as manufactured by American Conduit by SAPA, Wheatland Tube, AFC Co., or equal.

D. Intermediate Metal Conduit

1. Intermediate metal conduit shall be hot-dipped or electro-galvanized steel as manufactured by Allied Tube and Conduit Corp.; Triangle PWC Inc.; Wheatland Tube Co., or equal.

E. Rigid Nonmetallic Conduit

1. PVC conduit shall be rigid polyvinyl chloride schedule 40 and 80 as manufactured by Carlon; An Indian Head Co.; Kraloy Products Co., Inc.; Highland Plastics Inc., or equal.

F. Liquidtight Flexible Metal Conduit, Couplings and Fittings

1. Liquidtight flexible metal conduit shall be Sealtite, Type UA, manufactured by the Anaconda Metal Hose Div.; Anaconda American Brass Co.; American Flexible Conduit Co., Inc.; Universal Metal Hose Co., or equal.

2. Fittings used with liquidtight flexible metal conduit shall be of the screw-in type as manufactured by the Thomas & Betts Co.; Crouse-Hinds Co., or equal.

G. Flexible Couplings

1. Flexible couplings shall be type ECGJH as manufactured by the Crouse-Hinds Co.; Appleton Electric Co.; Killark Electric Manufacturing Co., or equal.

H. Boxes and Fittings

1. Pressed steel switch and outlet boxes shall be hot-dipped galvanized as manufactured by the Raco Manufacturing Co.; Adalet Co.; O.Z. Manufacturing Co., or equal.

2. For use in NEMA 1 areas, terminal boxes, junction boxes, pull boxes etc, shall be galvanized sheet steel with continuously welded seams. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. Covers shall be gasketed and fastened with stainless steel screws. Terminal boxes shall be furnished with hinged doors, terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20 Amps, 600 Volt. Boxes shall be as manufactured by Hoffman Engineering Co.; Lee Products Co.; Keystone/Rees, Inc., or equal.

3. NEMA 3R terminal boxes, junction boxes, pull boxes, etc, shall be sheet stainless steel unless otherwise shown on the Drawings. Boxes shall have continuously welded seams and mounting feet. Welds shall be ground smooth. Boxes shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. Covers shall have a continuous gasket on all four sides and be

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fastened with stainless steel clamps. Terminal boxes shall be furnished with hinged doors, terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20 Amp, 600 Volt. Boxes shall be as manufactured by Hoffman Engineering Co.; Lee Products Co.; Keystone/Rees, Inc., or equal.

4. Steel elbows and couplings shall be hot-dipped galvanized. Elbows and couplings used with PVC coated conduit shall be furnished with a PVC coating bonded to the steel, the same thickness as used on the coated steel conduit.

5. Conduit hubs shall be as manufactured by Myers Electric Products, Inc. or equal.

6. Conduit wall and floor seals for sleeved openings shall be type CSMI as manufactured by the O.Z./Gedney Co.; or equal.

7. Conduit sealing bushings shall be O.Z./Gedney Type CSB or equal.

8. Combination expansion-deflection fittings embedded in concrete shall be Type XD as manufactured by Crouse-Hinds Co.; Type AXDX as manufactured by O.Z./Gedney Co. Type DF as manufactured by Appleton Electric Co., or equal.

9. Combination expansion-deflection fittings installed exposed shall be Type XD as manufactured by Crouse-Hinds Co.; Type AXDX as manufactured by O.Z./Gedney Co. Type DF as manufactured by Appleton Electric Co., or equal.

I. Conduit Mounting Equipment

1. In dry indoor areas, hangers, rods, backplates, beam clamps, channel, etc. shall be galvanized iron or steel.

2. PVC coated steel channel with stainless steel hardware shall be used in areas designated "WET" and "CORROSIVE" on the Drawings and in outdoor locations. Fiberglass channel shall be resistant to the chemicals present in the area in which it is used.

J. Cold Galvanizing Compound

1. Cold galvanizing compound shall be as manufactured by ZRC Products Company, a division of Norfolk Corp., or equal.

2.02 WIRE, CABLE AND ACCESSORIES

A. Wires and cables shall be of annealed, 98 percent conductivity, soft drawn copper.

B. All conductors shall be stranded, except that lighting and receptacle wiring may be solid.

C. Except for control, signal and instrumentation circuits, wire smaller than No. 12 AWG shall not be used.

D. Wire for lighting, receptacles and other circuits not exceeding 150 Volts to ground shall be MEC Type XHHW-2 as manufactured by Okonite Co.; Southwire Co.; Pirelli Corp., or equal.

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E. Wire for circuits over 150 Volts to ground shall be NEC type XHHW-2 for sizes up to No. 4/0 AWG and Type RHW-2 for sizes greater than No. 4/0 AWG as manufactured by Okonite Co.; Southwire Co., or equal.

F. Wire for control, status and alarm circuits shall be No.14 AWG NEC type THHN/THWN, stranded as manufactured by the Okonite Co.; Carol Cable Co. Inc. West; Pirelli Cable Corp., or equal.

G. Splices for power wiring shall be compression type connectors insulated with a heat shrink boot or outer covering and epoxy filling. Splice kits shall be as manufactured by Raychem; Ideal Industries; 3M Co., or equal.

H. Termination connectors for control wiring shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.

I. Splices for control wiring shall be insulated compression type connectors of the expanded vinyl insulated parallel or pigtail type as manufactured by Ideal Industries; 3M Co.; Panduit Corp,. or equal.

J. Termination connectors for shielded instrumentation wiring shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp., or equal.

K. Wire markers shall be "Omni-Grip" as manufactured by the W.H. Brady Co.; Thomas & Betts Co.; 3M Co., or equal.

L. Wire and cables with diameters exceeding the capacity of the "Omni-Grip" shall be marked with pre-printed, self-adhesive vinyl tapes as manufactured by the W.H. Brady Co.; Panduit Corp., or equal.

2.03 WIRING DEVICES

A. Wall switches shall be heavy duty, specification grade, toggle action, flush mounting quiet type. All switches shall conform to the latest revision of Federal Specification WS 896. Wall switches shall be of the following types and manufacturer:

1. Single pole, 20 Amp, 120/277 Volt - Arrow-Hart, Catalog No. 1991, or equal by Harvey Hubbell, Inc.; Pass & Seymour, Inc., or equal.

B. Receptacles shall be heavy duty, specification grade of the following types and manufacturer or equal. Receptacles shall conform to Federal Specification WC596-F.

1. Ground fault interrupter, duplex, 20 Amp, 125 Volt, 2P, 3W, GFCI feed thru type with "test" and "reset" buttons. Arrow-Hart, Catalog No. GF5342 or equal by Harvey Hubbell, Inc.; Pass & Seymour, Inc., or equal.

C. Device Plates

1. Plates for indoor surface mounted device boxes shall be cast metal of the same material as the box, Crouse-Hinds, No. DS23G and DS32G, or equal.

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2. Oversized plates shall be installed where standard plates do not fully cover the wall opening.

3. Engraved device plates shall be provided where required.

4. Weatherproof, gasketed cover for GFI receptacle mounted in a FS/FD box shall be Arrow-Hart, Catalog No. 4501-FS or equal by Harvey Hubbell, Inc.; Pass & Seymour, Inc., or equal.

2.04 MISCELLANEOUS EQUIPMENT

A. Disconnect Switches

1. Disconnect switches shall be heavy-duty, quick-make, quick-break, visible blades, 600 Volt, 3 Pole with full cover interlock, interlock defeat and flange mounted operating handle.

2. NEMA 12 enclosures shall be stainless steel.

3. Switches shall be as manufactured by the Square D Co.; Cutler Hammer Co.; General Electric Company; Siemens Company, or equal.

B. Circuit Breakers

1. Provide thermal magnetic circuit breaker in NEMA Type 12 Enclosure with externally operated handle. Circuit breakers shall be fully rated for 65,000 Amps RMS symmetrical.

2. Circuit breakers shall be manufactured by Cutler Hammer Co.; General Electric Company; Siemens Company, or equal.

C. Transformer-Panel Assembly

1. Manufacturers
   a. Cutler-Hammer, Mini-Power Center
   b. Square D, Mini-Power Zone
   c. General Electric, Servicenter

2. Ratings
   a. kVA and voltage ratings shall be as shown on the Drawings.
   b. Units shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.
   c. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self-cooled ratings.

3. Construction
   a. Each TPA shall include a main primary breaker, an encapsulated dry-type transformer, and a secondary panelboard with main breaker.
   b. Main primary, secondary, and feeder breakers shall be enclosed with a padlockable hinged door.

4. Bus

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a. Panelboard bus shall be copper sized to NEMA 65 degrees C rise.

5. Wiring/Terminations
   a. All interconnecting wiring between the primary breaker and transformer, secondary main breaker and transformer, and distribution section shall be factory installed.
   b. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring.

6. Main Devices
   a. Each TPA shall include a main primary breaker with an interrupting rating of 22 kA at 480 Volts; and a secondary panelboard with main breaker rated 10 kA interrupting rating at 240 Volts.

7. Feeder Devices
   a. The secondary distribution section shall accommodate one inch, plug-in breakers with 10 kA interrupting capacity.

8. Enclosure
   a. The enclosure shall be made of heavy-gauge steel and the maximum temperature of the enclosure shall not exceed 90 degrees C.
   b. The enclosure shall be totally enclosed, non-ventilated, NEMA Type 3R, with lifting eyes.

D. Surge Protection Device

1. SPD unit shall be a hybrid device utilizing a linear array of balanced MOV (Metal Oxide Varistors) and a series assembly of silicon avalanche diodes.

2. The SPD unit shall be tested and labeled in accordance with the following standards: ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits, Category C; ANSI/IEEE C62.45, Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits; NEMA LS-1 (1992), Low-Voltage Surge Protective Devices; UL 1449-Third Edition - UL Standard for Safety for Surge Protective Devices; UL 1283 for noise attenuation devices and NEC Article 285.

3. Unit shall have:
   a. Parallel Line-Neutral, Line-Ground and Neutral-Ground connection configuration.
   b. One Nanosecond or less response time.
   c. Extend noise filtration with a 10 kHZ to 100 MHZ range.
   d. Fused internal disconnect switch with 60 Amps, 300,000 AIC rating.
   e. Surge current rating of 100,000 Amps per mode at service entrance
      Surge current rating of 100,000 Amps per mode at distribution panels
      Surge current rating of 100,000 Amps per mode at branch panels
   f. LED indications
   g. Six digit surge counter
   h. Form C output contacts
   i. System voltage shall be as indicated on the Drawings
   j. NEMA 12 enclosure (steel type)
   k. The Maximum Continuous Operating Voltage (MCOV) for all voltage configurations shall be 125 percent of nominal or greater.

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l. The fusing system shall be capable of allowing the rated maximum surge current to pass through without fuse operation.
m. SPD devices at distribution panels or switchboards shall be mounted externally to the equipment with leads as short as possible.
n. SPD devices at branch panels shall be direct bus-to-bus connected with leads as short as possible (not to exceed 24-in).

E. Main Circuit Breaker and Meter Socket

1. Thermal magnetic molded case circuit breaker 480 Volt, 3 Pole, 65,000 AIC/400 Amps. Main circuit breaker type shall obtain 65,000 Amps withstand/closing.

2. Provide meter socket as required by power company.

F. Photocells

1. The photocells shall be suitable for power duty with individual fixtures or for pilot duty with contactors as detailed on the Drawings. Enclosure shall be NEMA 3R or 4. The unit shall turn on at 1.5 footcandles and off at 5.5 footcandles.

2. Photocells shall be TORK, Model 2101, or equal.

G. Lighting Contactor

1. Lighting contactor shall be of the electrically operated, mechanically held type mounted in NEMA 1, enclosures (except where noted otherwise on the Drawings) with number of poles as noted on the Drawings. Operating coils shall be rated for 120 Volts unless otherwise indicated on the Drawings and shall be for momentary operation. Provide with "Hand Off-Auto" switch on cover.

2. Contactors shall be rated for 20 Amps, 600 VAC and shall be Automatic Switch Co., Bulletin 917 RC, similar by Square D Co.; Eaton Electrical, or equal.

H. Pedestal Cabinet

1. Pedestal cabinet shall be outdoor weatherproof type suitable for mounting on a concrete pad as shown on the Drawings. Dimensions shall be based on equipment actually furnished.

2. The pedestal cabinet shall be constructed of heavy gauge sheet steel and shall be weatherproof.

3. Cabinet shall have full size backboard of powder coat steel.

4. Interior and exterior paint finish shall be baked enamel over a rust resistant primer. Color shall be black.

5. Each door shall have three point latch and pin tumbler type door lock or provisions for padlocking. Furnish six keys.

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6. Pedestal cabinet shall have an internally mounted fan with thermostat control and door mounted baffled louvers.

7. Pedestals shall be complete with all mounting hardware and accessories required for installation as shown on the Drawings. Center post for double door cabinets shall be removable.

8. Pedestal cabinet shall be furnished with a thermostatically controlled electric heater. Heater shall be 120V, single phase, 100W, with protective cover and integral thermostat. Heater shall be Model D-AH1001A as manufactured by Hoffman Co.; Chromalox; Berko, or equal.

9. Pedestal cabinet shall be as manufactured by Erpel, Inc; Tri-County Enclosures, Inc; Bison ProFab Engineering & Fabrication, or equal.

2.05 SPORTS LIGHTING

A. Lighting Performance

1. Performance Requirements: Playing surfaces shall be lit to an average constant light level and uniformity as specified in the chart below. Light levels shall be held constant for 25 years. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Average illumination level shall be measured in accordance with IESNA LM-5-04. Light levels shall be guaranteed from the first 100 hours of operation for the maximum warrantee period.

Area of Lighting	Average Constant Light Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Football Field	50 footcandles	2.0:1.0	72	30’ x 30’
Football Practice	25 footcandles	2.5:1.0	72	30’ x 30’
VB/TE/BB/Skate	30 footcandles	5.0:1.0	337	10’ x 10’
Soccer	50 footcandles	2.0:1.0	84	30’ x 30’
Walking Track	5 footcandles	11.89:1.0	92	20’ x 20’

2. Lumen maintenance control strategy: A constant light system shall use automatic power adjustments to achieve a lumen maintenance control strategy as described in the IESNA Lighting Handbook 10th Edition, Lighting Controls Section, page 16-8: "Lumen maintenance involves adjusting lamp output over time to maintain constant light output as lamps age, and dirt accumulation reduces luminaire output. With lumen maintenance control, either lamps are dimmed when new, or the lamp's current is increased as the system ages.”

3. Independent Test Report: Manufacturers bidding any form of a constant light system must provide an independent test report certifying the system meets the lumen maintenance control strategy above and verifying the field performance of the system for the duration of the useful life of the lamp based on lamp replacement hours. Report shall be signed by a licensed professional engineer with outdoor lighting experience. If report is not provided at least 10 days prior to bid opening, the manufacturer shall provide the initial and maintained designs called for in this specification under Alternate Manufacturers, section 1.7.

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4. Project References: Manufacturers bidding any form of a constant light system must provide a minimum of five (5) project references within the state of MA that have been completed within the last calendar year utilizing this exact technology. Manufacturer will include project name, project city, and if requested, contact name and contact phone number for each reference.

5. Mounting Heights: To ensure proper aiming angles for reduced glare and to provide better playability, the pole mounting heights from the playing field surface shall be 70'.

B. Life Cycle Costs

1. Energy Consumption: The average kWh consumption for the field lighting system shall be 75 or less.

2. Complete Lamp Replacement: Manufacturer shall include all group lamp replacements required to provide 25 years of operation based upon 400 usage hours per year.

3. Preventative and Spot Maintenance: Manufacturer shall provide all preventative and spot maintenance, including parts and labor for 25 years from the date of equipment shipment. Individual lamp outages shall be repaired when the usage of any field is materially impacted. Owner agrees to check fuses in the event of a luminaire outage.

4. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The manufacturer shall notify the owner of outages within 24 hours, or the next business day. The controller shall determine switch position (Manual or Auto) and contactor status (open or closed).

5. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

6. The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields, to only having permission to execute "early off" commands by phone.

7. Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage

8. Management Tools: Manufacturer shall provide a web-based database of actual field usage and provide reports by facility and user group.
   a. Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.
      1) Cumulative hours: shall be tracked to show the total hours used by the facility
      2) Current lamp hours: shall be tracked separately to reflect the amount of hours on the current set of lamps being used, so relamping can be scheduled accurately

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9. Communication Costs: Manufacturer shall include communication costs for operating the controls and monitoring system for a period of 25 years.

10. 25-Year Life Cycle Cost: Manufacturer shall submit 25-year life cycle cost calculations as follows. Equipment price and total life cycle cost shall be entered separately on bid form.

11.

a.	**Luminaire energy consumption** # luminaires x __kW demand per luminaire x .19 kWh rate x 400 annual usage hours x 25 years		
b.	**Demand charges, if applicable**	+	
c.	**Cost for spot relamping and maintenance over 25 years** Assume 7.5 repairs at $ 500 each if not included with the bid	+	
d.	**Cost to relamp all luminaires during 25 years** 400 annual usage hours x 25 years / 2100 hours x $125 lamp & labor x # fixtures if not included with the bid	+	
e.	**Extra energy used without base bid automated control system** $ Energy consumption in item a. x 10% if control system not included with the bid	+	
	TOTAL 25-Year Life-cycle Operating Cost	=	

C. Warranty and Guarantee

1. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years. Warranty shall guarantee light levels; lamp replacements; system energy consumption; monitoring, maintenance and control services, spill light control, and structural integrity. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty may exclude fuses, storm damage, vandalism, abuse and unauthorized repairs or alterations. Group lamp replacements for constant light systems must occur in accordance with the independent test report provided by the manufacturer; alternate systems must relamp every 2100 hours.

D. Delivery Timing

1. Equipment On-Site: The equipment must be on-site 4-6 weeks from receipt of approved submittals and receipt of complete order information.

E. Pre-Bid Submittal Requirements

1. Approved Product: Musco's Green Generation Lighting® sports lighting system is the approved product. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs

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2. Design Approval: The owner / engineer will review pre-bid shop drawings from the manufacturers to ensure compliance to the specification. If the design meets the design requirements of the specifications, a letter will be issued to the manufacturer indicating approval for the specific design submitted.

F. Alternate System Requirements

1. Compliance to Specifications: Acceptance of a bid alternate does not negate the contractor and lighting manufacturer's responsibility to comply fully with the requirements of these specifications. Any exceptions to the specifications must be clearly stated in the prior approval submittal documents.

2. Light Level Requirements: Manufacturer shall provide computer models guaranteeing light levels on the field over 25 years. If a constant light level cannot be provided, a maximum Recoverable Light Loss Factor and maintenance/group relamping schedule shall be provided in accordance with recommendations in the Pennsylvania State University report "Empirical Light Loss Factors for Sports Lighting", presented at the 2009 IESNA Annual Conference.

3.

Lamp Replacement Interval (hours)	Recoverable Light Loss Factor (RLLF)
2100	0.69

For alternate systems, scans for both initial and maintained light levels are required.

Area of Lighting	Average Initial Light	Average Target/Maintained Light Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Football		50 footcandles	2.0:1.0	72	30' x 30'
FB Practice		25 footcandles	2.0:1.0	72	30' x 30'
VB/TE/BB/Skate		30 footcandles	5.0:1.0	337	10' x 10'
Walking Track		5 footcandles	11.89:1.0	92	20' x 20'
Soccer		50 footcandles	2.0:1.0	84	30' x 30'

4. Revised Electrical Distribution: Manufacturer shall provide revised electrical distribution plans to include changes to service entrance, panel, and wire sizing.

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G. Lighting system construction

1. System Description: Lighting system shall consist of the following:
   a. Galvanized steel poles and crossarm assembly. All poles will be new LSG poles, fixtures and bases.
   b. Pre-stressed concrete base embedded in concrete backfill allowed to cure for 12-24 hours before pole stress is applied. Alternate may be an anchor bolt foundation designed such that the steel pole and any exposed steel portion of the foundation is located a minimum of 18 inches above final grade. The concrete for anchor bolt foundations shall be allowed to cure for a minimum of 28 days before the pole stress is applied.
   c. All luminaires shall be constructed with a die-cast aluminum housing or external hail shroud to protect the luminaire reflector system.
   d. Manufacturer will remote all ballasts and supporting electrical equipment in aluminum enclosures mounted approximately 10' above grade. The enclosures shall include ballast, capacitor and fusing for each luminaire. Safety disconnect per circuit for each pole structure will be located in the enclosure.
   e. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
   f. Controls and Monitoring Cabinet to provide on-off control and monitoring of the lighting system, constructed of NEMA Type 4 aluminum. Communication method shall be provided by manufacturer. Cabinet shall contain custom configured contactor modules for 30, 60, and 100 amps, labeled to match field diagrams and electrical design. Manual Off-On-Auto selector switches shall be provided.
   g. Each pole base (i.e., S1, S2, S3 and S4) to have (1) GFCI Duplex Receptacle with in-use wet location lockable cover. Receptacle and cover shall be in compliance with these specifications.

2. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, ballast and other enclosures shall be factory assembled, aimed, wired and tested.

3. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel of 18-8 grade or better, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the crossarms, pole, or electrical components enclosure.

4. Enhanced corrosion protection package: Due to the potentially corrosive environment for this project, manufacturers must provide documentation that their products meet the following enhanced requirements in addition to the standard durability protection specified above:
   a. Exposed carbon steel horizontal surfaces on the crossarm assembly shall be galvanized to a five (5) mil minimum average thickness.

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b. Exposed carbon steel horizontal surfaces on the crossarm assembly shall be galvanized to a five (5) mil minimum average thickness.
c. Exposed extruded aluminum components shall be Type II anodized per MIL-STD-8625 and coated with high performance polyester.

5. Lightning Protection: Manufacturer shall provide integrated lightning grounding via concrete encased electrode grounding system as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A. If grounding is not integrated into the structure, the Manufacturer shall supply grounding electrodes, copper down conductors and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be not less than 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

6. Safety: All system components shall be UL Listed for the appropriate application.

7. Electric Power Requirements for the Sports Lighting Equipment:
   a. Electric power: 480 Volt, 3 Phase
   b. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

H. Structural Parameters

1. Support Structure Wind Load Strength: Poles and other support structures, brackets, arms, bases, anchorages and foundations shall be determined based on the 2009 edition of the IBC Building Code, wind speed of 120, exposure category C. Luminaire, visor, and crossarm shall withstand 150 mph winds and maintain luminaire aiming alignment.

2. Structural Design: The stress analysis and safety factor of the poles shall conform to AASHTO 2009 (LTS-5) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

3. Soil Conditions: The design criteria for these specifications are based on soil design parameters as outlined in the geotechnical report. If a geotechnical report is not provided by the owner, the foundation design shall be based on soils that meet or exceed those of a Class 5 material as defined by 2009 IBC, Table 1804.2

4. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole.

I. Field Quality Control

1. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA LM-5-04.

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2. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles, uniformity ratios, and maximum kilowatt consumptions are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer or Contractor shall be liable to any or all of the following:
   a. Manufacturer shall at his expense provide and install any necessary additional fixtures to meet the minimum lighting standards. The Manufacturer or Contractor shall also either replace the existing poles to meet the new wind load (EPA) requirements or verify by certification by a licensed structural engineer that the existing poles will withstand the additional wind load.
   b. Manufacturer shall minimize the Owner's additional long term fixture maintenance and energy consumption costs created by the additional fixtures by reimbursing the Owner the amount of $1,000.00 (one thousand dollars) for each additional fixture required.
   c. Manufacturer shall remove the entire unacceptable lighting system and install a new lighting system to meet the specifications.

2.06 UNDERGROUND SYSTEM

A. Excavation and backfilling, including gravel and sand bedding, are included in Division 2 .

B. Raceways shall be polyvinyl chloride conduit encased in concrete except that rigid steel conduit shall be used for 600 Volt shielded wire and data highway wiring.

C. Handholes

1. Handholes shall be constructed of polymer concrete and reinforced with heavy weave fiberglass, green finish, open bottom and minimal dimensions of 32-in long by 19-in wide by 30-in deep.

2. Handhole cover shall be heavy duty type, green finish with stainless steel penta head bolts. Covers shall be marked "Electrical". Covers shall have a service load of 15,000 pounds over a 10-in square.

3. Handholes and covers shall be as manufactured by Quazite; Oldcastle; Easton Pre-Cast or equal.

2.07 GROUNDING

A. Ground rods shall be 3/4-in by 10-ft copper clad steel and constructed in accordance with UL 467. The minimum copper thickness shall be 0.25 mm. Ground rods shall be Copperweld, or equal.

B. Grounding conduit hubs shall be malleable iron type similar to Thomas & Betts Co.; Cat No. 3940 (3/4-in conduit size) by Burndy; O.Z./Gedney Co., or equal, and of the correct size for the conduit.

C. Buried grounding connections shall be by Cadweld process, or equal exothermic welding system.

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PART 3 EXECUTION

3.01 SLEEVES AND FORMS FOR OPENINGS

A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.

B. Exact locations are required for stubbing-up and terminating concealed conduit. Obtain shop drawings and templates from equipment vendors or other subcontractors and locate the concealed conduit before the floor slab is poured.

C. Where setting drawings are not available in time to avoid delay in scheduled floor slab pours, the Engineer may allow the installations of such conduit to be exposed. Requests for this deviation must be submitted in writing. No additional compensation for such change will be allowed.

D. Seal all openings, sleeves, penetration and slots.

3.02 CUTTING AND PATCHING

A. Cutting and patching shall be done in a thoroughly workmanlike. Sawcut concrete and masonry prior to breaking out sections.

B. Core drill holes in concrete floors and walls as required.

C. Install work at such time as to require the minimum amount of cutting and patching.

D. Do not cut joists, beams, girders, columns or any other structural members.

E. Cut opening only large enough to allow easy installation of the conduit.

F. Patching to be of the same kind and quality of material as was removed.

G. The completed patching work shall restore the surface to its original appearance or better.

H. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed.

I. Remove rubble and excess patching materials from the premises.

J. When existing conduits are cut at the floor line of wall line, they shall be filled with grout of suitable patching material.

3.03 INSTALLATION

A. Any work not installed according to the Specifications shall be subject to change as directed by the Engineer. No extra compensation will be allowed for making these changes.

B. Electrical equipment shall be protected at all times against mechanical injury or damage by water. Electrical equipment shall not be stored outdoors. Electrical equipment shall be stored in dry permanent shelters. Do not install electrical equipment in its permanent location until structures are weather-tight. If any apparatus has been subject to possible injury by water, it

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shall be thoroughly dried out and tested as directed by the Engineer, or shall be replaced at no additional cost at the Engineer's discretion.

C. Equipment that has been damaged shall be replaced or repaired by the equipment manufacturer, at the Engineer's discretion.

D. Repaint any damage to factory applied paint finish using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted per the field painting specifications in Section 09902 at no additional cost to the Owner.

E. Coordinate the conduit installation with other trades and the actual supplied equipment.

F. Install each 3 phase circuit in separate conduit unless shown otherwise on drawings.

G. Unless otherwise approved by the Engineer, conduit installed interior to the building shall be installed exposed; conduit installed exterior to the building shall be concealed.

H. Verify the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.

I. Exact locations of electrical equipment shall be determined by the Contractor and approved by the Engineer during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

3.04 BOXES AND FITTINGS

A. Except where otherwise specified, all wiring shall be in rigid steel conduit.

B. Rigid steel conduit shall be used at all locations (underground and within structures) exposed.

C. PVC conduit shall be used for all underground power feeds to sports lighting, concession stand, parking area and walkway lighting.

D. All boxes shall be metal.

E. Exposed switch, receptacle and lighting outlet boxes and conduit fittings shall be cast or malleable iron, except that cast aluminum shall be used with aluminum conduit.

F. Terminal boxes, junction boxes and pull boxes shall have NEMA ratings suitable for the location in which they are installed.

G. Conduit wall seals shall be used where underground conduits penetrate walls.

H. Conduit sealing bushings shall be used to seal conduit ends exposed to the weather.

I. No conduit smaller than 3/4-in electrical trade size shall be used, nor shall any have more than the equivalent of three 90 degree bends in any one run. Pull boxes shall be provided as required or directed.

J. No wire shall be pulled until the conduit system is complete in all details.

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K. The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction.

L. Conduit supports, other than for underground raceways, shall be spaced at intervals of 8-ft or less.

M. All conduits shall be run at right angles to and parallel with the surrounding wall and shall conform to the form of the ceiling. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduits shall be run perfectly straight and true.

N. Conduit terminating in pressed steel boxes shall have double locknuts and insulated bushings.

O. Conduit terminating in NEMA 3R, and 12 enclosures shall be terminated with Myers type conduit hubs.

P. Conduits containing equipment grounding conductors and terminating in sheet steel boxes shall have insulated throat grounding bushings.

Q. Conduits shall be installed using threaded fittings.

R. PVC conduit to non-metallic box connections shall be made with PVC socket to male thread terminal adapters with neoprene O-ring and PVC round edge bushings.

S. Conduit ends exposed to the weather shall be sealed with conduit sealing bushings.

T. PVC conduit shall be supported with non-metallic clamps, non-metallic racks and stainless steel hardware.

U. PVC boxes, conduit fittings, etc. with integral hubs shall be solvent welded directly to the PVC conduit system.

V. Non-metallic boxes with field drilled or punched holes shall be connected to the PVC conduit system with threaded and gasketed PVC Terminal Adapters.

W. All conduit entering or leaving a motor control center, switchboard or other multiple compartment enclosure shall be stubbed up into the bottom horizontal wireway or other manufacturer designated area, directly below the vertical section in which the conductors are to be terminated.

X. All conduit which may under any circumstance contain liquids such as water, condensation, liquid chemicals, etc, shall be arranged to drain away from the equipment served. If conduit drainage is not possible, conduit seals shall be used to plug the conduits.

Y. Where no type or size is indicated for junction boxes, pull boxes or terminal cabinets, they shall be sized in accordance with the requirements of N.E.C. Article 370.

Z. Miscellaneous steel for the support of fixtures, boxes, transformers, starters, contactors, panels and conduit shall be furnished and installed.

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AA. Steel channels, flat iron and channel iron shall be furnished and installed for the support of all electrical equipment and devices, where required, including all anchors, inserts, bolts, nuts, washers, etc. for a rigid installation.

BB. Conduits passing from heated to unheated spaces, exterior spaces, refrigerated spaces, cold air plenums, etc., shall be sealed with "Duxseal" as manufactured by Manville or seal fitting to prevent the accumulation of condensation.

CC. Rigid galvanized steel conduits which have been field cut and threaded shall be painted with cold galvanizing compounds.

DD. Conduit expansion and deflection fittings shall be installed on all conduits crossing building expansion joint. Where conduits are installed outdoors provide expansion and deflection fittings on all conduits crossing expansion joints or at 200 foot intervals which ever is the least dimension.

3.05 WIRE, CABLE AND ACCESSORIES

A. Uniquely identify all wires, cables and each conductor of multi- conductor cables (except lighting and receptacle wiring) at each end with wire and cable markers.

B. Use lubrications to facilitate wire pulling. Lubricants shall be UL approved for use with the insulation specified.

C. All wire shall be color coded or coded using electrical tape in sizes where colored insulation is not available. Where tape is used as the identification system, it shall be applied in all junction boxes and other accessible intermediate locations as well as at each termination.

D. The following coding shall be used:

System	Wire	Color
240/120 Volts	Neutral	White
1-Phase, 3-Wire	Line 1	Black
Line 2	Red	
480Y/277 Volts	Neutral	White
3-Phase, 4-Wire	Phase A	Brown
Phase B	Orange	
Phase C	Yellow	

E. Power conductors: Terminations shall be die type or set screw type pressure connectors as specified. Splices (where allowed) shall be die type compression connector and waterproof with heat shrink boot or epoxy filling. Aluminum conductors (where specified) shall employ terminations and splices specifically designed for aluminum conductors.

F. Control Conductors: Termination on saddle-type terminals shall be wired directly with a maximum of two conductors. Termination on screw type terminals shall be made with a maximum of two spade connectors. Splices (where allowed) shall be made with insulated compression type connectors.

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G. Except where permitted by the Engineer no splices will be allowed in manholes, handholes or other below grade located boxes.

H. Splices shall not be made in push button control stations, control devices (i.e., pressure switches, flow switches, etc.), conduit bodies, etc.

3.06 WIRING DEVICES

A. Switch and receptacles outlets shall be installed flush with the finished wall surfaces in areas with stud frame and gypboard construction, in dry areas with cement block construction or when raceways are concealed.

B. Do not install flush mounted devices in areas designated DAMP, WET or WET/CORROSIVE. Provide surface mounted devices in these areas.

C. Provide weatherproof devices covers in areas designated WET or WET/CORROSIVE.

3.07 PANELBOARDS

A. Mount boxes for surface mounted panelboards so there is at least 1/2-in air space between the box and the wall.

B. Connect panelboard branch circuit loads so that the load is distributed as equally as possible between the phase busses.

C. Type circuit directories giving location and nature of load served. Install circuit directories in each panelboard.

D. Install markers on the front cover of all panelboards which identify the voltage rating. Markers shall be made of self sticking B-500 vinyl cloth printed with black characters on an Alert Orange background, 2-1/4-in high by 9-in wide, Style A as manufactured by W.H. Brady Co., or equal.

E. Install a 1-in by 3-in laminated plastic nameplate with 1/4-in white letters on a black background on each panelboard. Nameplate lettering shall be as shown on the Drawings. Nameplates shall be stainless steel screw mounted.

3.08 UNDERGROUND SYSTEM

A. Install raceways to drain away from buildings.

B. Reinforce raceway banks when conduits pass over newly excavated pipes.

C. The minimum cover for raceway banks shall be 24-in unless otherwise permitted by the Engineer.

D. Swab all raceways clean before installing cable.

E. Plug spare raceways and seal them watertight at all manholes, buildings and structures.

F. Seal the ends of raceways and make watertight at all handholes, buildings and structures.

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3.09 GROUNDING

A. Run grounding electrode conductors in rigid steel conduits. Bond the protecting conduits to the grounding electrode conductors at both ends. Do not allow water pipe connections to be painted. If the connections are painted, disassemble them and re-make them with new fittings.

B. Install equipment grounding conductors with all feeders and branch circuits.

C. Ground transformer neutrals to the nearest available grounding electrode with a conductor sized in accordance with NEC Article 250-94.

D. Seal exposed connections between different metals with No-Oxide Paint Grade A or equal.

E. Lay all underground grounding conductors slack and, where exposed to mechanical injury, protect by pipes or other substantial guards. If guards are iron pipe, or other magnetic material, electrically connect conductors to both ends of the guard. Make connections as specified herein.

F. Care shall be taken to ensure good ground continuity, in particular between the conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.

G. All grounding type receptacles shall be grounded to the outlet boxes with a No. 12 THW green conductor connected to the ground terminal of the receptacle and fastened to the outlet box by means of a grounding screw.

H. Test the grounding system. Resistance to ground testing shall be performed during dry season. Submit test results in the form of a graph showing the number of points measured (12 minimum) and the numerical resistance to ground.

I. Testing shall be performed before energizing the distribution system.

J. Notify the Engineer immediately if the resistance to ground for any building or system is greater than five ohms.

END OF SECTION

APPENDIX A

GEOTECHNICAL INVESTIGATIONS

City of Marlborough
Ward Park Renovation
Marlborough, MA

Table 1
Summary of Geotechnical Index Test Results

Exploration Number	Sample Number	Sample Depth (ft)	Strata	USCS Classification [1]	Grain Size Analysis [2]							Organic Content[3] (%)	Moisture Content [4] (%)
					Gravel (%)		Sand (%)			Fines (%)			
					Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
CDM-1	S - 3	4 - 6	Silty Sand	SM	0	21.6	7.3	9.3	17.0	40.1	4.7	-	13.3
CDM-3	S - 3	4 - 6	Silt	ML	0	0.5	1.0	2.5	9.3	77.0	9.7	-	31.8
CDM-3	S - 6	14 - 16	Silty Sand	SM	11.4	21.5	7.6	14.1	20.9	24.5		-	11.2
CDM-6	S - 2	2 - 4	Silty Gravel	GM	12.8	26.9	10.3	13.0	12.8	24.2		-	12.8
CDM-6	S - 1	0 - 0.5	Topsoil	-	-	-	-	-	-	-		4.8	29.7
CDM-9	S - 3	4 - 6	Silty Sand	SM	0	12.5	6.9	14.0	17.0	43.3	6.3	-	49.5
CDM-13	S - 1	0 - 0.5	Topsoil	-	-	-	-	-	-	-		3.4	20.5
CDM-14	S - 2	2 - 4	Silty Sand	SM	14.1	3.7	6.4	17.1	21.7	37.0		-	21.5

Notes:

1. USCS classifications were performed in accordance with ASTM D2488.
2. Grain size tests were performed in accordance with ASTM D422.
3. Organic content tests were performed in accordance with ASTM D2974
4. Moisture content tests were performed in accordance with ASTM D2216.
5. - test not performed

Abbreviations:

ML Low Plasticity Silt
SM Silty Sand
GM Silty Gravel

CDM Smith

PW:\\PW_XM1\Documents\1438\103837\04 Design Services NM_50%\13 Geotechnical\CADD Figures and Graphics\01 Working\Y11500WS.dwg
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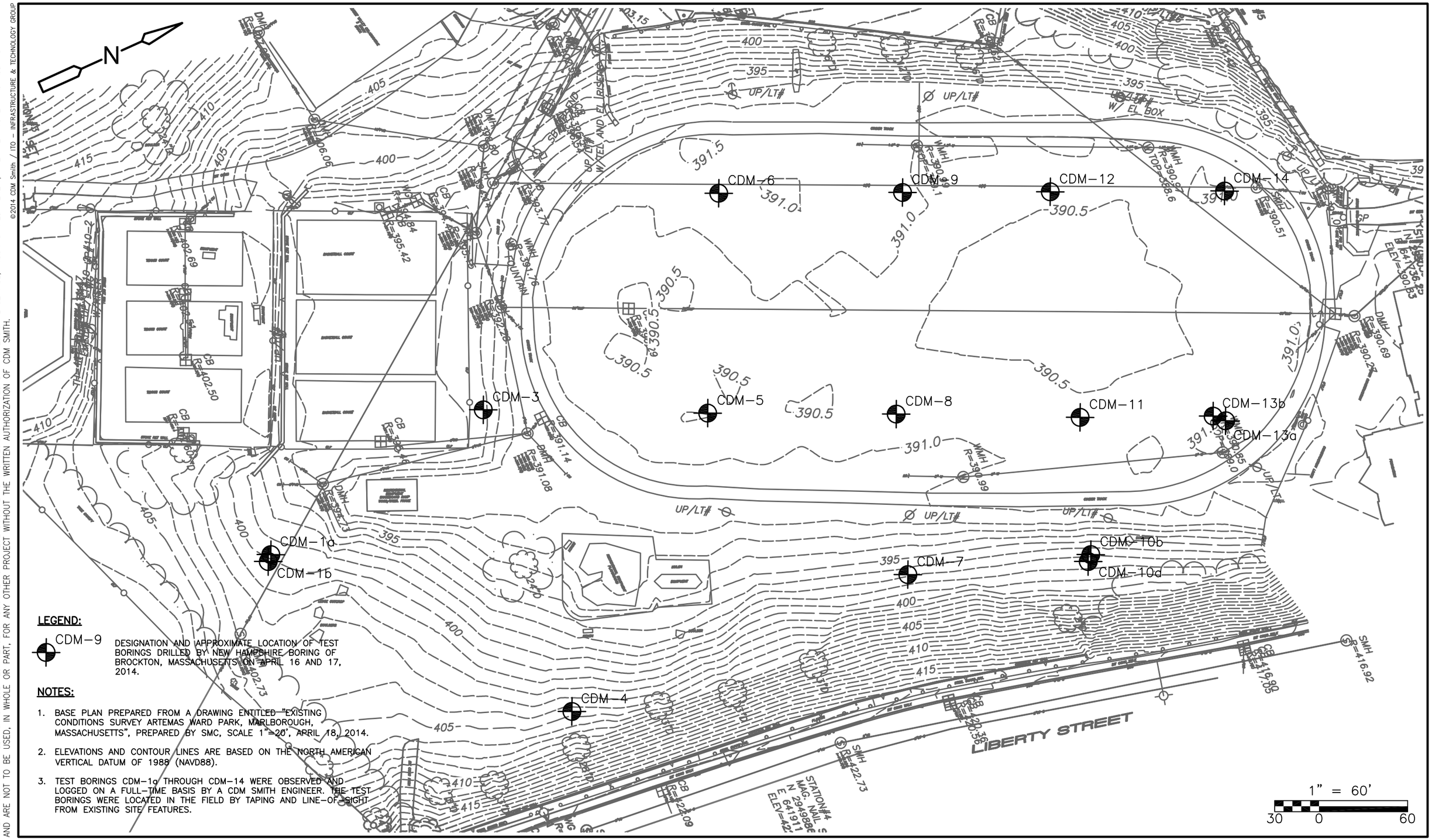


LEGEND:

CDM-9 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORINGS DRILLED BY NEW HAMPSHIRE BORING OF BROCKTON, MASSACHUSETTS ON APRIL 16 AND 17, 2014.

NOTES:

1. BASE PLAN PREPARED FROM A DRAWING ENTITLED "EXISTING CONDITIONS SURVEY ARTEMAS WARD PARK, MARLBOROUGH, MASSACHUSETTS", PREPARED BY SMC, SCALE 1"=20', APRIL 18, 2014.
2. ELEVATIONS AND CONTOUR LINES ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. TEST BORINGS CDM-1a THROUGH CDM-14 WERE OBSERVED AND LOGGED ON A FULL-TIME BASIS BY A CDM SMITH ENGINEER. THE TEST BORINGS WERE LOCATED IN THE FIELD BY TAPING AND LINE-OF-SIGHT FROM EXISTING SITE FEATURES.

CDM Smith

CITY OF MARLBOROUGH, MASSACHUSETTS

WARD PARK

SUBSURFACE EXPLORATION LOCATION PLAN
FIGURE 1

Boring Number: CDM - 1a

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/17/2014 **End:** 4/17/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 7.3
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0									5" Topsoil	
	SS	S-1	24	2 4 7 7	12	11		Topsoil	Moist, medium dense, dark brown, fine to medium SAND, some silt	
	SS	S-2	24	6 11 21 48	19	32		Sand	Moist, dense, light brown to gray, fine to coarse SAND, some fine to coarse gravel, some silt	
5	SS	S-3	24	40 51 36 40	21	87			Moist, hard, brown to gray, Clayey SILT, some fine to coarse sand, some fine gravel	Rig chatter from 4 to 6 ft bgs.
	SS	S-4	16	23 52 51/4"	7	>100			Moist, very dense, brown, fine to coarse SAND and GRAVEL, trace silt	Auger refusal at 7.3 ft bgs, boring offset 5 ft.
									Auger refusal at 7.3 feet bgs.	
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):

V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%

moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 1a**

Boring Number: CDM - 1b

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/17/2014 **End:** 4/17/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 8.5
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0								Topsoil		
								Sand		Strata change based on auger cuttings.
5									No Recovery	Rig chatter 5 to 8 ft bgs.
	SS	S-5	5	90/5"	0	>100				
									Spoon refusal at 8.5 feet bgs	
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 1b**

Boring Number: CDM - 3

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/17/2014 **End:** 4/17/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 19.75
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0								Topsoil	6" Topsoil	
	SS	S-1	24	3 5 2 2	15	7		Silty Sand	Moist, loose, brown, fine to medium SAND, some silt, trace fine to coarse gravel	
	SS	S-2	24	4 2 3 2	15	5			Moist, loose, brown, fine to medium SAND and Clayey SILT, trace fine gravel	
5	SS	S-3	24	WOH 1 10 14	20	11			Moist, stiff, dark brown to grey, Clayey SILT, little fine to medium sand, trace fine gravel	
	SS	S-4	24	9 16 17 22	17	33			Moist, dense, light grey to tan, fine to medium SAND, some silt	Rig chatter 6 to 10 ft bgs
	SS	S-5	24	17 16 22 26	6	38		Sand	Moist, dense, light grey to tan, fine to coarse SAND, some silt, little fine to coarse gravel	
10										
15	SS	S-6	24	15 29 35 44	16	64			Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, some silt	Heavy rig chatter from 15 ft to 17.75 ft bgs
	SS	S-7	24	30 40 35 34	13	75			Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, some silt (weathered rock) Boring terminated at 19.75 feet bgs.	Auger refusal at 17.75 feet bgs

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 3**

Boring Number: CDM - 4

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/16/2014 **End:** 4/16/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 6
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0									5" Topsoil	
	SS	S-1	24	5 8 5 4	18	13		Topsoil	Moist, medium dense, light brown, fine to medium SAND, some clayey silt	
	SS	S-2	24	7 15 20 24	11	35		SAND	Moist, dense, light brown, fine to medium SAND, some clayey silt, little fine gravel	
5	SS	S-3	24	27 17 20 26	15	37			Wet, dense, light brown, fine to coarse SAND, some clayey silt, little fine gravel	
									Boring terminated at 6 feet bgs.	
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 4**

Boring Number: CDM - 5

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/17/2014 **End:** 4/17/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 20
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0								Topsoil	7" Topsoil	
	SS	S-1	24	2 2 2 3	14	4		Sand	Moist, very loose, dark brown, fine to medium SAND, some silt	
	SS	S-2	24	3 2 2 1	14	4			Wet, very loose, dark brown, fine to coarse SAND, some silt	
5	SS	S-3	24	WOH WOH 1 4	10	1			Moist, very loose, dark grey to dark brown, fine to medium SAND and SILT	
	SS	S-4	24	4 4 5 6	19	9			Moist, loose, dark grey to tan to red, fine to medium SAND, some silt	
	SS	S-5	24	1 3 10 11	21	13			Wet, medium dense, tan, fine to coarse SAND, some silt	
10										
15	SS	S-6	24	11 15 15 17	22	30			Wet, medium dense, tan, fine to coarse SAND, some silt, little fine to coarse gravel, trace roots	
	SS	S-7	24	14 12 13 12	20	25			Wet, medium dense, tan to light brown, fine to coarse SAND, some silt, little fine gravel	
									Boring terminated at 20 feet bgs.	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):

V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%

moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 5**

Boring Number: CDM - 6

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/16/2014 **End:** 4/16/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 6
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0				1				Topsoil	9" Topsoil	
	SS	S-1	24	1 3 4	14	4		Gravel	Moist, very loose, dark brown, fine to medium SAND, some silt	
	SS	S-2	24	19 11 27 35	14	38			Moist, dense, gray, fine to coarse GRAVEL and fine to coarse SAND, some silt	
5	SS	S-3	24	40 48 52 45	16	100			Wet, very dense, gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
									Boring terminated at 6 feet bgs.	
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):

V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%

moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 6**

Boring Number: CDM - 7

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/16/2014 **End:** 4/16/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 6
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0									4" Topsoil	
	SS	S-1	24	2 6 27 13	13	33		Topsoil	Moist, dense, dark brown, fine to medium SAND, some silt	
	SS	S-2	24	10 9 16 10	12	25		Clayey Sand	Moist, medium dense, light brown, fine to medium SAND and CLAY, trace fine to coarse gravel	
5	SS	S-3	24	15 26 21 25	18	47		Clayey Sand	Moist, dense, tan to red, fine to medium SAND, some clayey silt, trace fine to coarse gravel	
									Boring terminated 6 feet bgs.	
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 7**

Boring Number: CDM - 8

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/17/2014 **End:** 4/17/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 20
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0								Topsoil	6" Topsoil	
	SS	S-1	24	1 4 9 7	13	13		Silty Sand	Moist, medium dense, dark brown, fine to medium SAND, some silt	
	SS	S-2	24	4 3 4 2	12	7			Moist, loose, brown, fine to coarse SAND and SILT	
5	SS	S-3	24	2 5 6 3	24	11			Moist, medium dense, gray to brown, fine to medium SAND and SILT	
	SS	S-4	24	4 4 6 8	16	10			Moist, medium dense, gray to brown, fine to medium SAND and SILT	
	SS	S-5	24	2 4 2 3	16	6			Moist, loose, dark brown to black, fine to medium SAND and SILT	
10										
15	SS	S-6	24	WOH 3 4 5	21	7			Wet, loose, dark gray, fine SAND and Clayey SILT, trace plant matter	
	SS	S-7	24	3 6 7 7	21	13			Wet, medium dense, dark gray, fine SAND and Clayey SILT	
									Boring terminated at 20 feet bgs.	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):

V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%

moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 8**

Boring Number: CDM - 9

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/16/2014 **End:** 4/16/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 6
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0									4" Topsoil	
	SS	S-1	24	2 4 7 6	17	11		Topsoil	Moist, medium dense, brown to gray, fine to coarse SAND, some silt, trace fine gravel	
	SS	S-2	24	4 3 3 4	15	6		Clayey Silt	Moist, medium stiff, brown, to black, Clayey SILT, some fine to coarse sand	
5	SS	S-3	24	3 3 15 19	19	18		Clayey Silt	Moist, very stiff, light brown to black, Clayey SILT and fine to coarse SAND, little fine gravel	
									Boring terminated at 6 feet bgs.	
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 9**

Boring Number: CDM - 10a

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/16/2014 **End:** 4/16/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 2.83
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0				2				Topsoil	8" Topsoil	
	SS	S-1	24	3 4 6	13	7		Sand and Clay	Moist, loose, dark brown, fine to medium SAND and CLAY	
	SS	S-2	10	5 79/4"	0	>100			Spoon refusal at 2.83 feet bgs.	Boring was offset 3 ft north and attempted again.
5										
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 10a**

Boring Number: CDM - 10b

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/16/2014 **End:** 4/16/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 5.33
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0								Topsoil	8" Topsoil	
	SS	S-2	24	8 17 15 18	10	32		Sand	Moist, dense, tan to gray, fine to coarse GRAVEL and fine to medium SAND, some clay	Boring was offset from CDM - 10a, drilled from 0 - 2 ft bgs.
	SS	S-3	16	24 23 88/4"	12	>100			Moist, very dense, light brown to red to gray, fine to medium SAND, some clay, trace fine gravel	
5									Spoon refusal at 5.33 feet bgs.	
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4
Loose: 4-10
M. Dense: 10-30
Dense: 30-50
V. Dense: >50

Fine Grained (Clay):
V. Soft: <2
Soft: 2-4
M. Stiff: 4-8
Stiff: 8-15
V. Stiff: 15-30
Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 10b**

Boring Number: CDM - 11

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/17/2014 **End:** 4/17/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 5
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0	SS	S-1	24	1 4 6 11	13	10		Topsoil	4" Topsoil	
									Moist, medium dense, dark brown, fine to medium SAND, some silt, little fine to coarse gravel	
	SS	S-2	24	3 4 5 3	8	9		Sand	Moist, loose, dark brown, fine to medium SAND, some silt	
	SS	S-3	12	1 99/6"	7	>100			Moist, very dense, dark brown to dark gray, fine to coarse SAND, some silt, little fine to coarse gravel	
5									Spoon refusal at 5 feet bgs.	
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 11**

Boring Number: CDM - 12

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/16/2014 **End:** 4/16/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 6
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0	SS	S-1	24	2 3 5 7	7	8		Topsoil	5" Topsoil	
								SAND	Moist, loose, brown, fine to medium SAND, some silt	
	SS	S-2	24	5 5 6 4	5	11			Moist, medium dense, brown, fine to coarse SAND, trace silt	
5	SS	S-3	24	7 20 9 10	15	29		Clay	Moist, very stiff, dark gray to black, CLAY and SILT, some fine sand	
									Boring terminated at 6 ft bgs.	
10										
15										

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample	HP - Hydro Punch	Granular (Sand):		Fine Grained (Clay):		and 35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some 20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little 10-20%
NQ - 2" Rock Core	WS - Wash Sample	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace <10%
	GP - Geoprobe					moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 12**

Boring Number: CDM - 13a

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/17/2014 **End:** 4/17/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 3.5
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0				2				Topsoil	7" Topsoil	
	SS	S-1	24	9 21 16	12	30		Sand	Moist, medium dense, dark brown, fine to medium SAND, some silt	
	SS	S-2	17	7 7 92/5"	2	>100			Moist, very dense, dark brown to gray, fine to medium SAND, some silt, trace fine to coarse gravel, trace grass, trace roots	Boring was offset 4 ft south.
									Spoon refusal at 3.5 feet bgs.	
5										
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):

V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%

moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 13a**

Boring Number: CDM - 13b

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/17/2014 **End:** 4/17/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 3.5
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0								Topsoil	7" Topsoil	
								Sand		
									Auger refusal at 3.5 feet bgs.	
5										
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 13b**

Boring Number: CDM - 14

Client: City of Marlborough
Project Location: Marlborough, MA

Project Name: Ward Park Renovation
Project Number: 1438-103837

Drilling Contractor/Driller: New Hampshire Boring / Mike Wilkey
Drilling Method/Casing/Core Barrel Size: HSA / 3.25 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/16/2014 **End:** 4/16/2014

Surface Elevation (ft.): NR
Total Depth (ft.): 6
Depth to Initial Water Level (ft):

Depth	Date	Time
NR	NR	NR

Abandonment Method: Backfilled with cuttings
Logged By: JFT

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0				2				Topsoil	6" Topsoil	
	SS	S-1	24	3 20 27	13	23		Sand	Moist, medium dense, brown, fine to medium SAND, some silt,	
	SS	S-2	24	2 3 3 2	8	6			Moist, loose, brown, fine to coarse SAND and Clayey SILT, little fine to coarse gravel	
5	SS	S-3	24	4 10 15 21	20	25			Moist, medium dense, brown to black, fine SAND and SILT	
									Boring terminated at 6 feet bgs.	
10										
15										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):

V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

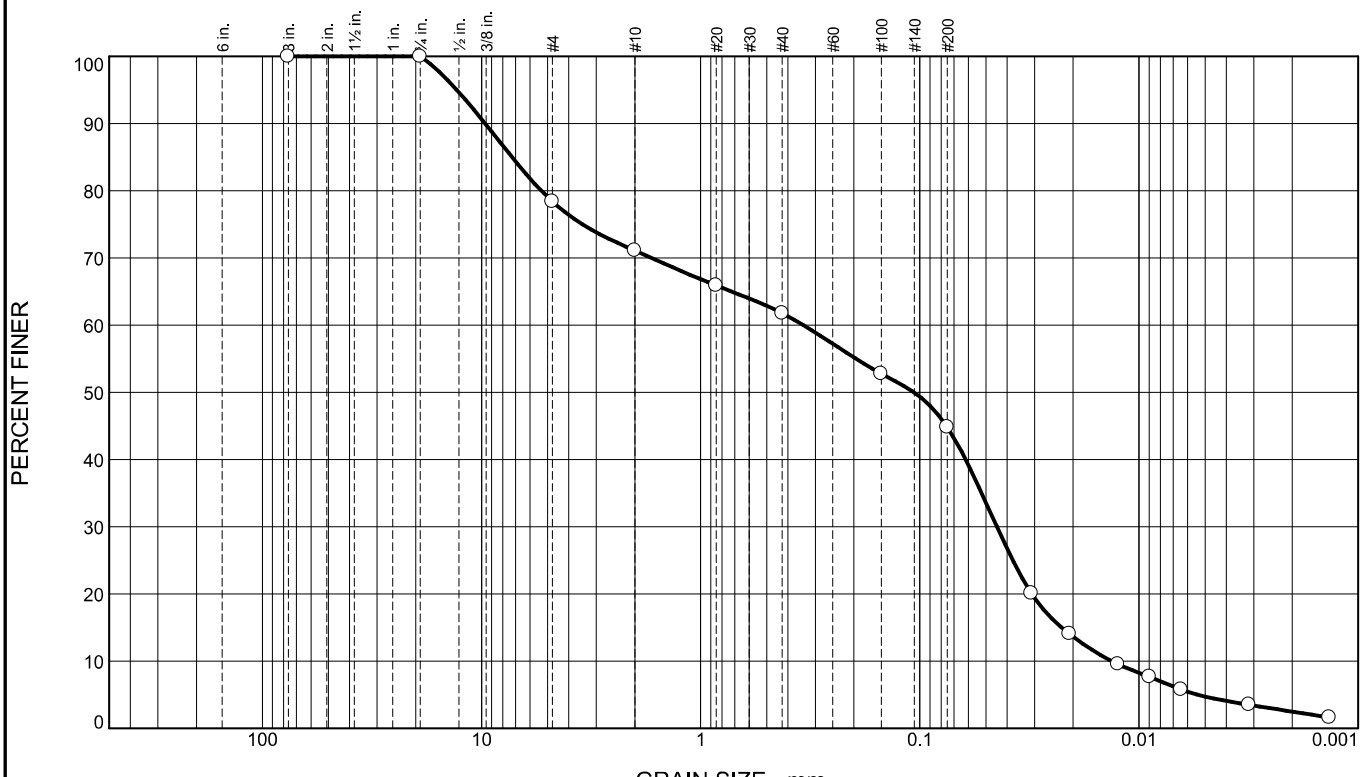
Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%

moisture, density, color

Reviewed by: **Date:** **Boring Number: CDM - 14**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	21.6	7.3	9.3	17.0	40.1	4.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	78.4		
#10	71.1		
#20	65.9		
#40	61.8		
#100	52.8		
#200	44.8		

* (no specification provided)

Material Description

Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 9.6254 D_{85}= 7.2529 D_{60}= 0.3397
D_{50}= 0.1063 D_{30}= 0.0445 D_{15}= 0.0225
D_{10}= 0.0133 C_u= 25.54 C_c= 0.44

Classification

USCS= SM AASHTO=

Remarks

As received moisture content=13.3%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-1 **Depth:** 4-6
Sample Number: S-3 **Date:** 4/17/2014

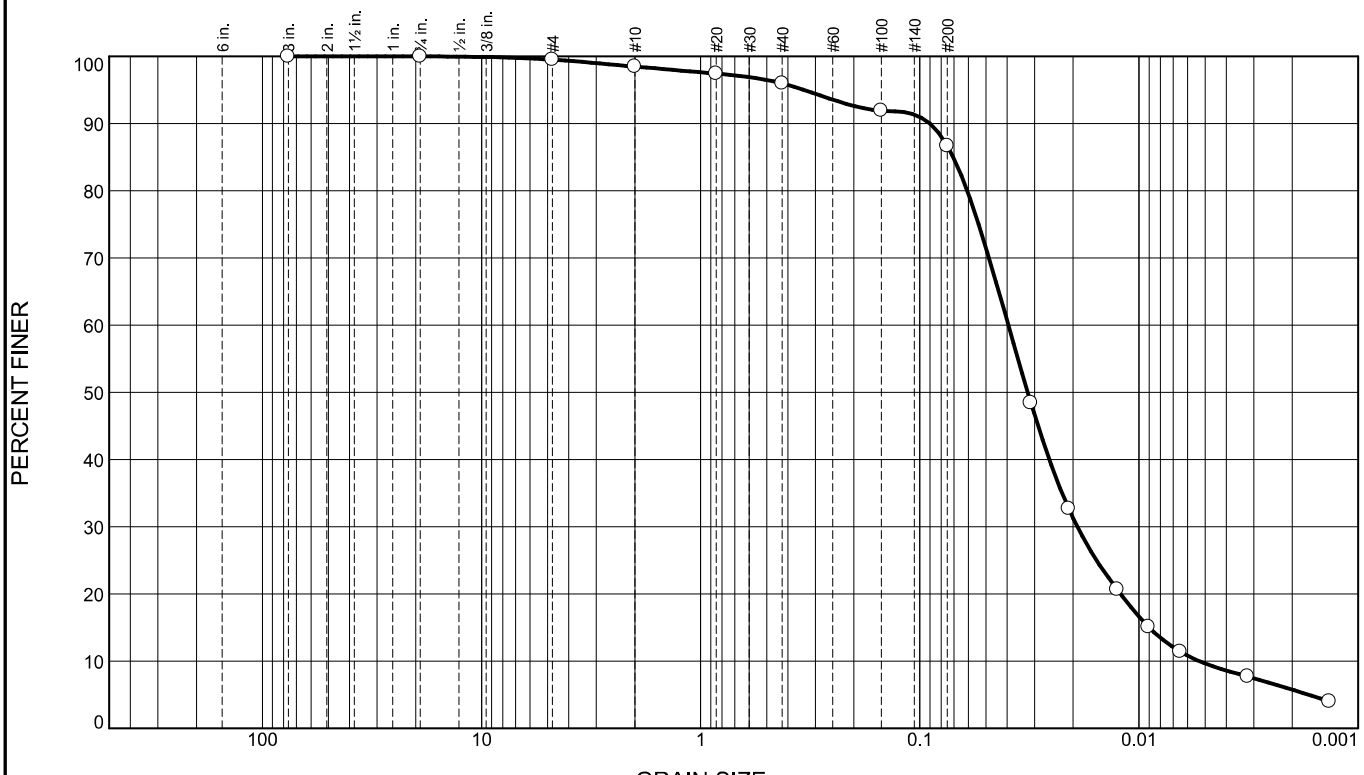
CDM Smith

Cambridge, Massachusetts

Client: City of Marlborough
Project: Ward Park Renovation
Project No: 1438-103837 **Figure**

Tested By: NE **Checked By:** AT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	1.0	2.5	9.3	77.0	9.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	99.5		
#10	98.5		
#20	97.4		
#40	96.0		
#100	91.9		
#200	86.7		

* (no specification provided)

Material Description

Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0902 D_{85}= 0.0705 D_{60}= 0.0395
D_{50}= 0.0322 D_{30}= 0.0191 D_{15}= 0.0090
D_{10}= 0.0053 C_u= 7.45 C_c= 1.74

Classification

USCS= ML AASHTO=

Remarks

As received moisture content=31.8%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-3 **Depth:** 4-6
Sample Number: S-3 **Date:** 4/17/2014

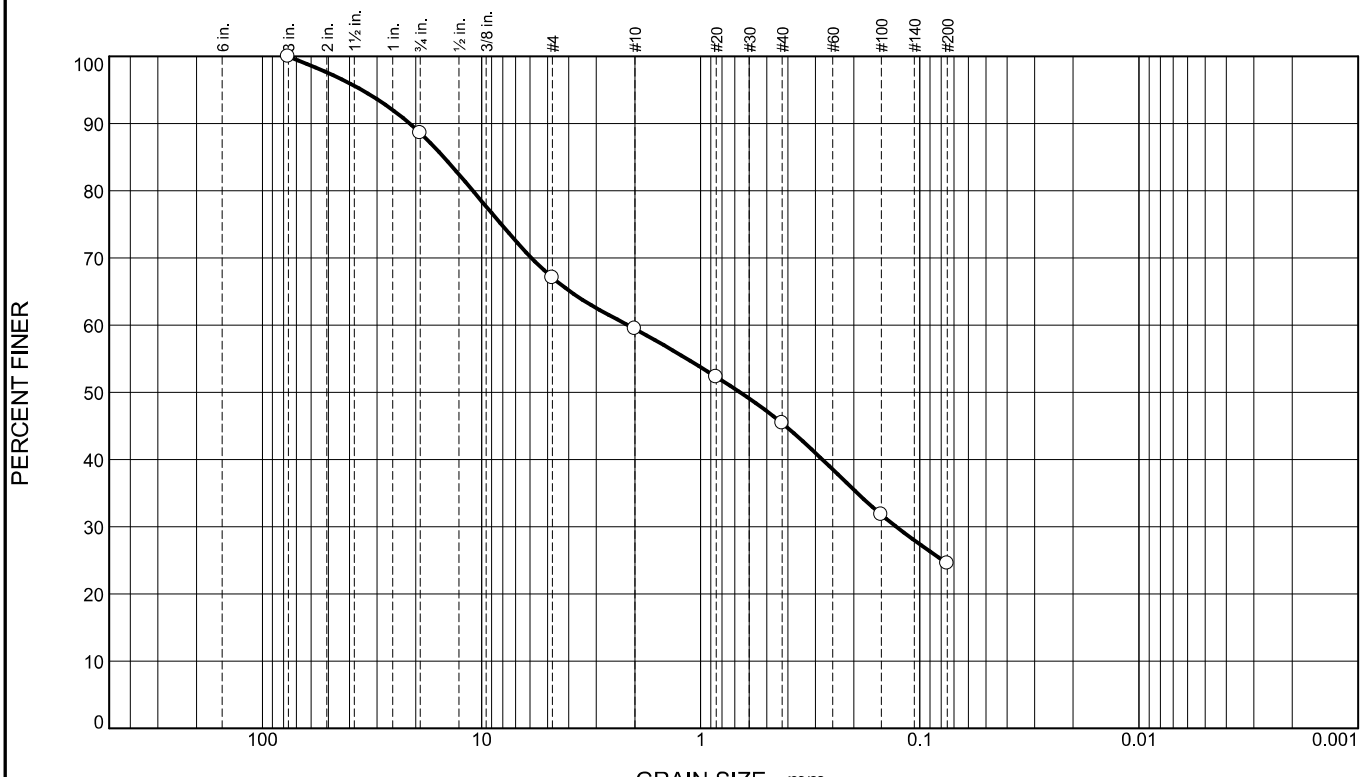
CDM Smith

Cambridge, Massachusetts

Client: City of Marlborough
Project: Ward Park Renovation
Project No: 1438-103837 **Figure**

Tested By: NE **Checked By:** AT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.4	21.5	7.6	14.1	20.9	24.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	88.6		
#4	67.1		
#10	59.5		
#20	52.3		
#40	45.4		
#100	31.8		
#200	24.5		

* (no specification provided)

Material Description

Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 21.2470 D_{85}= 14.8618 D_{60}= 2.1448
D_{50}= 0.6602 D_{30}= 0.1281 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

As received moisture content=11.2%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-3 **Depth:** 14-16
Sample Number: S-6 **Date:** 4/17/2014

CDM Smith

Cambridge, Massachusetts

Client: City of Marlborough
Project: Ward Park Renovation
Project No: 1438-103837 **Figure**

Tested By: NE **Checked By:** AT

CDM Smith

Geotechnical Engineering Laboratory

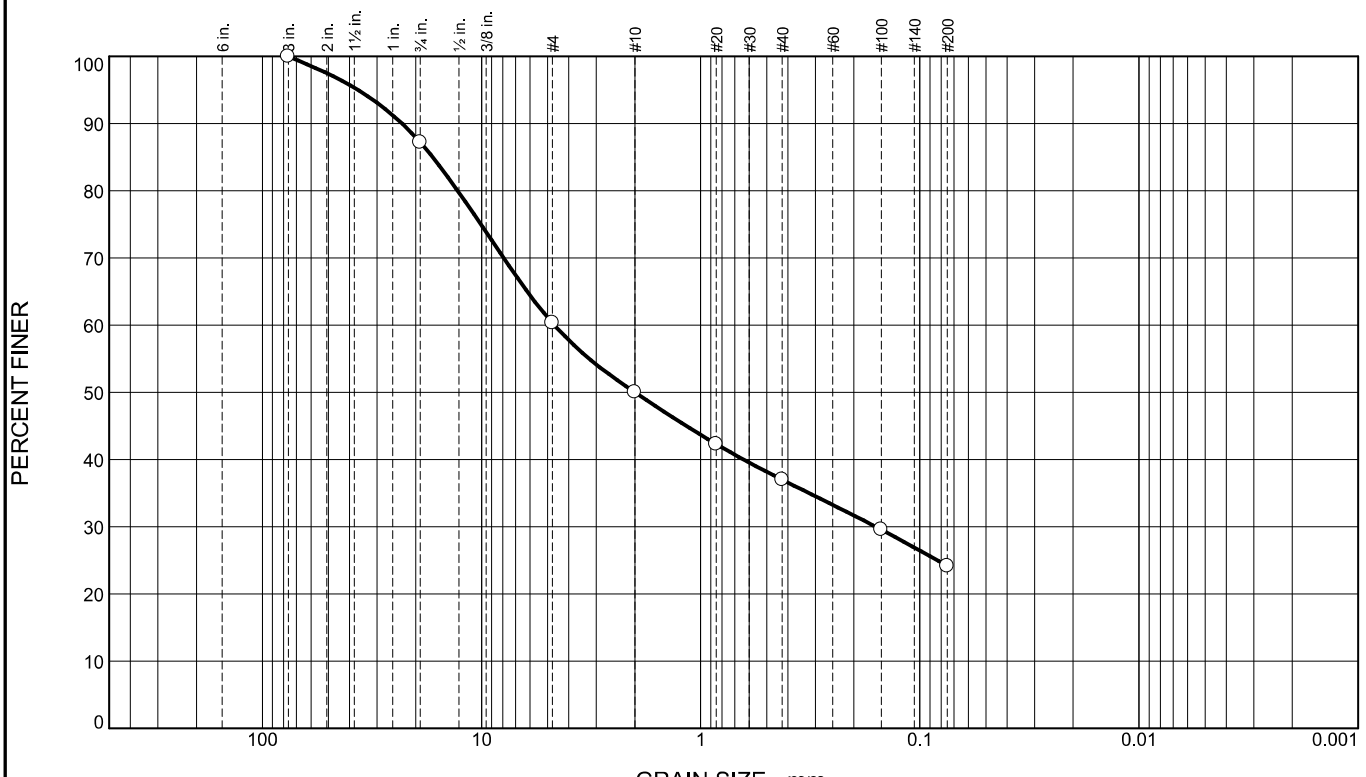
Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client:	City of Marlborough		
Project Name:	Ward Park Renovation	Tested By:	NE
Project Location:	Marlborough, MA	Test Date:	5/15/2014
Project Number:	1438-103837		
Sample Number:	S-1	Procedure:	C
Sample Location:	CDM-6	Temperature:	440 C
Sample Depth (ft):	0-0.5		
Sample Date:	4/16/2014		
Lab ID Number:			

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	98.23
Wet Mass of Sample & Tin (g)	188.70
Dry Mass of Sample & Tin (g)	167.98
Mass of Water (g)	20.7
Mass of Dry Soil (g)	69.8
Moisture Content (%)	29.7

ASH CONTENT	
Porcelain Dish Mass (g)	98.2
Porcelain Dish + Oven Dried Soil (g)	168.0
Mass of Oven Dried Soil (g)	69.8
Mass of Dish & Burned Soil (g)	164.6
Mass of Burned Soil (g)	66.4
Mass of Organic Material (g)	3.4
Ash Content (%)	95.2
Organic Content (%)	4.8

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.8	26.9	10.3	13.0	12.8	24.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	87.2		
#4	60.3		
#10	50.0		
#20	42.3		
#40	37.0		
#100	29.6		
#200	24.2		

* (no specification provided)

Material Description

Silty gravel with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 23.0615 D_{85}= 16.7037 D_{60}= 4.6490
D_{50}= 1.9910 D_{30}= 0.1584 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO=

Remarks

As received moisture content=12.8%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-6 **Depth:** 2-4
Sample Number: S-2 **Date:** 4/16/2014

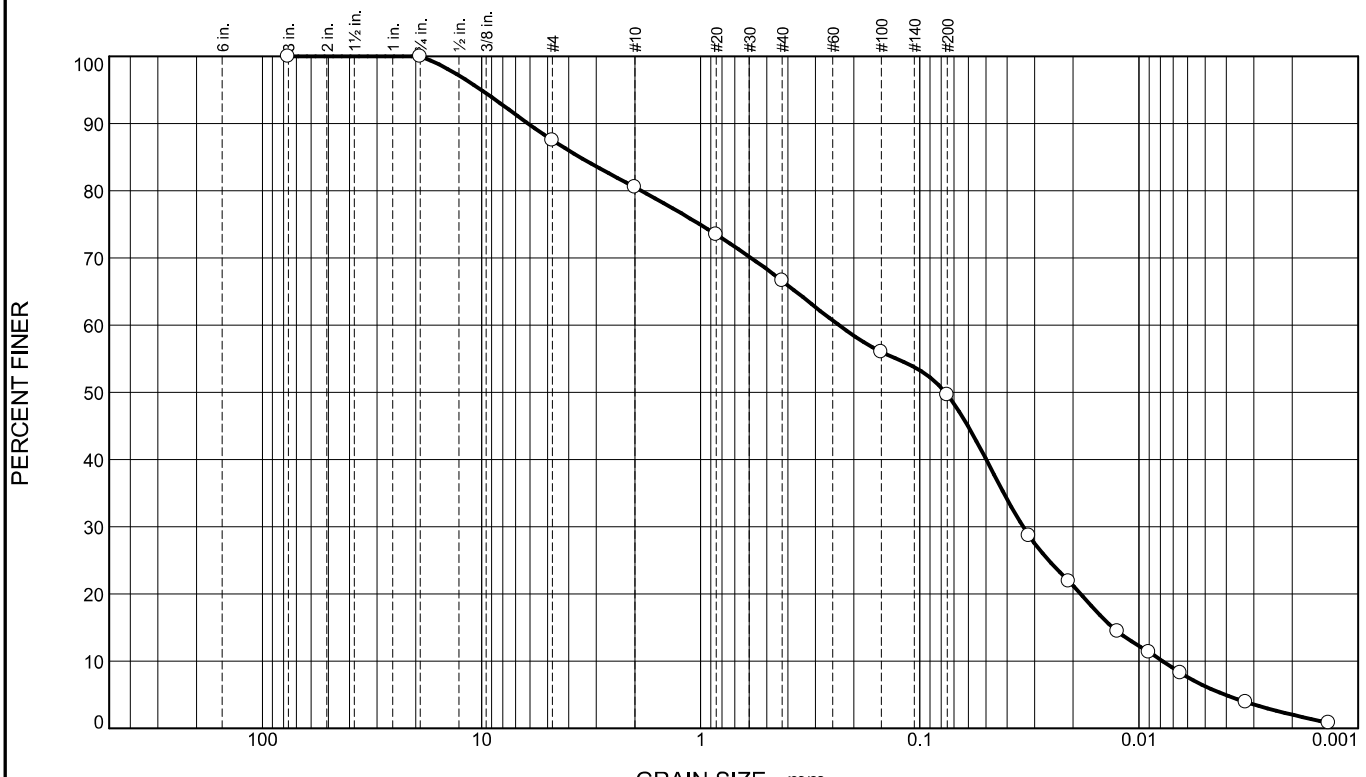
CDM Smith

Cambridge, Massachusetts

Client: City of Marlborough
Project: Ward Park Renovation
Project No: 1438-103837 **Figure**

Tested By: NE **Checked By:** AT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.5	6.9	14.0	17.0	43.3	6.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	87.5		
#10	80.6		
#20	73.5		
#40	66.6		
#100	56.0		
#200	49.6		

* (no specification provided)

Material Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 6.1256 D_{85}= 3.5572 D_{60}= 0.2341
D_{50}= 0.0766 D_{30}= 0.0338 D_{15}= 0.0131
D_{10}= 0.0078 C_u= 30.04 C_c= 0.63

Classification

USCS= SM AASHTO=

Remarks

As received moisture content=49.5%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-9 **Depth:** 4-6
Sample Number: S-3 **Date:** 4/16/2014

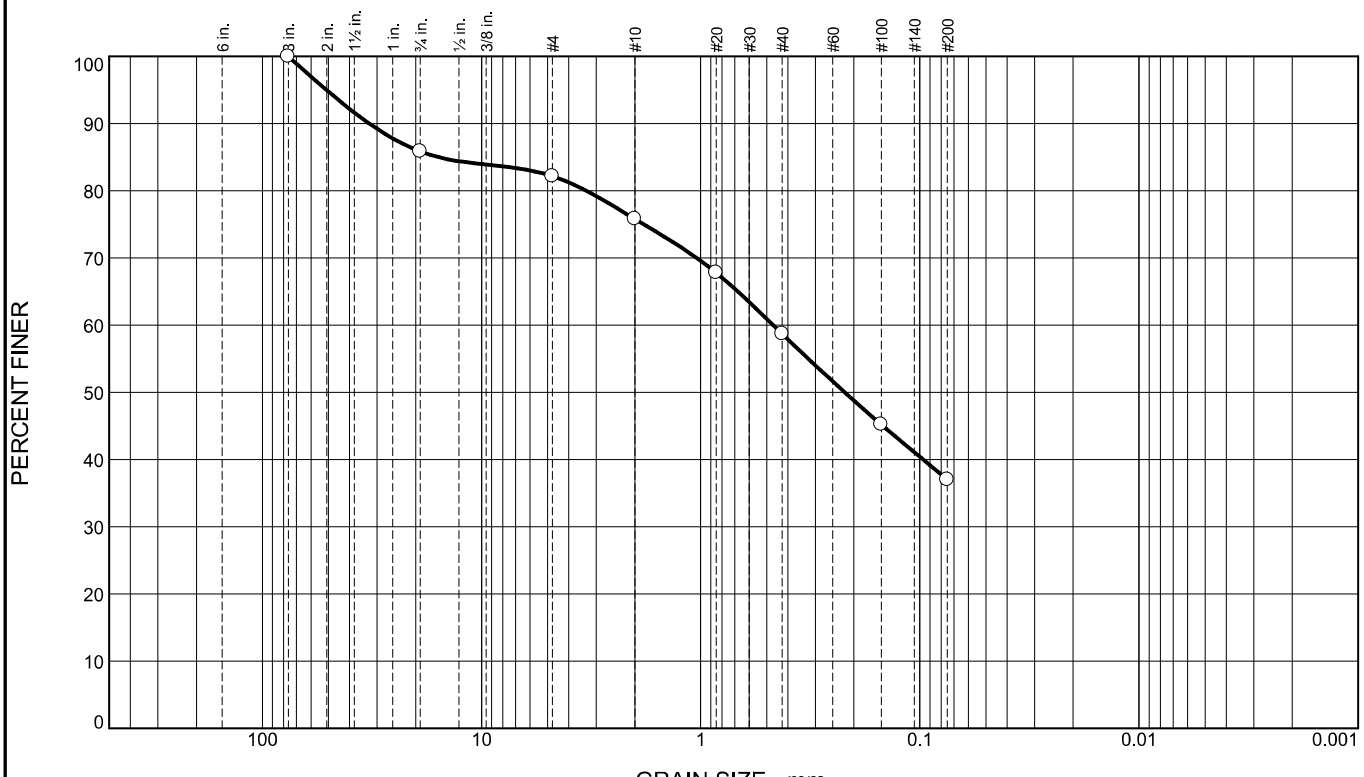
CDM Smith

Cambridge, Massachusetts

Client: City of Marlborough
Project: Ward Park Renovation
Project No: 1438-103837 **Figure**

Tested By: NE **Checked By:** AT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.1	3.7	6.4	17.1	21.7	37.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	85.9		
#4	82.2		
#10	75.8		
#20	67.8		
#40	58.7		
#100	45.2		
#200	37.0		

* (no specification provided)

Material Description

Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 32.4799 D_{85}= 15.6661 D_{60}= 0.4669
D_{50}= 0.2199 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

As received moisture content=21.5%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-14 **Depth:** 2-4
Sample Number: S-2 **Date:** 4/16/2014

CDM Smith

Cambridge, Massachusetts

Client: City of Marlborough
Project: Ward Park Renovation
Project No: 1438-103837 **Figure**

Tested By: NE **Checked By:** AT

CDM Smith

Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client:	City of Marlborough		
Project Name:	Ward Park Renovation	Tested By:	NE
Project Location:	Marlborough, MA	Test Date:	5/15/2014
Project Number:	1438-103837		
Sample Number:	S-1	Procedure:	C
Sample Location:	CDM-13	Temperature:	440 C
Sample Depth (ft):	0-0.5		
Sample Date:	4/17/2014		
Lab ID Number:			

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	97.35
Wet Mass of Sample & Tin (g)	174.06
Dry Mass of Sample & Tin (g)	161.01
Mass of Water (g)	13.1
Mass of Dry Soil (g)	63.7
Moisture Content (%)	20.5

ASH CONTENT	
Porcelain Dish Mass (g)	97.4
Porcelain Dish + Oven Dried Soil (g)	161.0
Mass of Oven Dried Soil (g)	63.7
Mass of Dish & Burned Soil (g)	158.8
Mass of Burned Soil (g)	61.5
Mass of Organic Material (g)	2.2
Ash Content (%)	96.6
Organic Content (%)	3.4