COPY NO. _____

CITY OF WORCESTER, MASSACHUSETTS
PARKS & RECREATION DEPARTMENT

TECHNICAL SPECIFICATIONS
FOR
SALISBURY POND WATER QUALITY IMPROVEMENTS
INSTITUTE PARK

July 2023

CITY MANAGER

Eric D. Batista

COMMISSIONER OF PUBLIC WORKS & PARKS

Jay J. Fink

ASSISTANT COMMISSIONER OF PARKS & RECREATION DEPARTMENT

Robert C. Antonelli, Jr.

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CDM SMITH INC.
Boston, Massachusetts

CITY OF WORCESTER, MASSACHUSETTS
PARKS & RECREATION DEPARTMENT
INSTITUTE PARK
SALISBURY POND WATER QUALITY IMPROVEMENTS

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SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 LOCATION OF WORK

A. The work of this Contract is located within the confines of Institute Park, bordered by Park Avenue, Salisbury Street and Grove Street in Worcester, Massachusetts.

1.02 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to construct the Salisbury Pond Water Quality Improvements in their entirety as shown on the Drawings and as specified herein.

B. The Work includes, but is not necessarily limited to, the following:

1. Construct and install three particle separators, including new manholes constructed on existing drains, new drains and other appurtenances.

2. Construct and install a sediment forebay at the main inlet to Salisbury Pond, including a new box culvert connected to existing box culverts, headwall, slide gate, riprap, articulated concrete block mat, river rock check dam, black vinyl chain link fence, seeding and planting.

1.03 CONTRACTOR'S USE OF PREMISES

A. Contractor shall limit the use of the premises for his/her Work and for storage with consideration for public use of the park and abutting property owners.

B. Coordinate use of premises with Owner.

C. Contractor shall assume full responsibility for security of all his/her and his/her subcontractors' materials and equipment stored on the site.

D. If directed by the Owner, move any stored items which interfere with operations of Owner or other contractors.

E. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

END OF SECTION

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SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 MAIN INLET SEDIMENT FOREBAY (Included in Total Base Bid)

A. Measurement

1. Measurement for payment for main inlet sediment forebay (included in Total Base Bid) shall be on a lump sum basis.

B. Payment

1. Payment for main inlet sediment forebay shall be made as part of the lump sum bid price under Total Base Bid which price and payment shall be full compensation for all site preparation, cutting, clearing and grubbing, removal, screening and stockpiling of materials to be protected, disposal of materials to be removed, vegetation and tree removal, excavation (except rock and boulder) and backfill, grading including subgrade and topsoil preparation, furnishing, hauling, placing and compacting riprap and bedding, articulated concrete block mat and bedding, rock check dam, erosion control, forebay grading, box culvert and headwall, connections to existing box culverts, including fittings and appurtenances, weirs, slide gate, screened gravel, geotextile filter fabric, removal of excess material and debris, field adjustments to existing adjacent materials and finish grades, seeding, planting, pavement repair, black vinyl chain link fence and gates, and all else incidental thereto for which separate payment is not provided under other items in the Bid Form.

1.02 ROCK AND BOULDER EXCAVATION (Unit Price, Included in Total Base Bid)

A. Measurement

1. When rock is encountered, the material shall be uncovered and the Engineer notified. The Engineer will then take cross sections of the rock surface. If the Contractor fails to uncover the rock, notify the Engineer, and allow ample time for cross sectioning the undisturbed material, the Contractor shall have no right-of-claim to any classification other than that allowed by the Engineer.

2. Measurement of rock excavation in pipe trenches will extend to the width as specified below:

Depth from Ground Surface to Invert of Pipe	Pay Width When Installing One Pipe (Nominal Pipe Diameter)	
	0 - 24-in	over 24-in
0 ft - 12 ft	5 ft-0-in	D+3 ft-0-in
12 ft - 20 ft	7 ft-0-in	D+5 ft-0-in

NOTE: D shall mean nominal pipe diameter or width.

Payment depth for rock which is encountered in a trench shall be no less than three feet (3') when removal can be accomplished only by drilling and blasting or by use of jack (air or hydraulic) hammers.

Payment for rock removed, using the same or equal equipment as utilized for normal trench excavation, shall be limited to the depth removed within the limits established by the Contract Documents.

3. Measurement for depth shall be from the top of the rock formation to the normal grade of the pipe, channel or other facility as shown on the Drawings.

4. The pay limit for rock and boulder removal for manholes and particle separators shall be a maximum of one foot (1 ft) outside the widest dimension of the structure or shall be the connecting pipe trench width, whichever is greater. No allowance will be made for overbreakage.

5. Boulders and concrete fragments exceeding 1 cu yd in volume when encountered in excavation will be measured for payment. Removal of boulders of whatever size will not be paid for when encountered in borrow areas.

6. The quantity of rock and boulder excavation to be paid for shall be the number of cubic yards of rock or boulders measured in place within the limits herein specified.

B. Payment

1. Payment for rock and boulder excavation will be made for the quantities as determined above at the unit price established in the Bid Form. This price and payment shall be full compensation for excavation, drilling and blasting, wedging, sledging, or barring, and disposal of rock and boulder, vibration monitoring, backfilling, and providing borrow for any deficiency of trench backfill and all work incidental thereto, for which payment is not provided under other items.

1.03 MOBILIZATION COSTS (Included in Total Base Bid)

A Measurement and Payment

1. Measurement for payment of all mobilization costs shall be on a lump sum basis but the cost shall not exceed five percent (5%) of the Total Base Bid Price excluding this item itself.

B. Payment

1. Payment of the lump sum price bid included in the Total Base Bid for mobilization costs shall be full compensation for all costs associated with initiating the contract, exclusive of the cost of materials. Payment shall include compensation for all insurance, bonds, project sign, site preparation, furnishing of temporary facilities, and in general the costs associated with establishing the work on-site to assure that it is proceeding in a continuous manner. No additional payment shall be allowed for any re-mobilization costs regardless of the nature of the re-mobilization.

1.04 PARK AVENUE PARTICLE SEPARATOR (Add Alternate No. 1)

A. Measurement

1. Measurement for payment for the Park Avenue particle separator (No. 1) (Add Alternate No. 1) shall be on a lump sum basis.

B. Payment

1. Payment for the Park Avenue particle separator (No. 1) shall be made for the lump sum bid price under Add Alternate No. 1 which price and payment shall be full compensation for all site preparation, erosion control, breaking out existing drain, supporting existing drain in-place, building new cast-in-place bases around existing pipes and new pipes, furnishing and installing precast concrete manholes complete in place with manhole steps, frames and covers, screened gravel subbase, all forms, reinforcing, concrete, brick and masonry materials, top slabs for shallow manholes if used, cored holes where required, sealing, cleaning, testing, furnishing and installing particle separator, furnishing, laying, jointing and cleaning new drains, all excavation (except rock and boulder), trench support including sheeting and bracing, dewatering and drainage, backfilling, removal of excess material and debris, field adjustments to existing adjacent materials and finish grades, seeding, pavement and sidewalk repair, permits and all else incidental thereto, for which separate payment is not provided under other items in the Bid Form.

1.05 BOYNTON STREET PARTICLE SEPARATORS (Add Alternate No. 2)

A. Measurement

1. Measurement for payment for the Boynton Street particle separators (Nos. 2 and 3) (Add Alternate No. 2) shall be on a lump sum basis.

B. Payment

1. Payment for the Boynton Street particle separators (Nos. 2 and 3) shall be made for the lump sum bid price under Add Alternate No. 2 which price and payment shall be full compensation for all site preparation, erosion control, breaking out existing drains, supporting existing drains in-place, building new cast-in-place bases around existing pipes and new pipes, furnishing and installing precast concrete manholes complete in place with manhole steps, frames and covers, screened gravel subbase, all forms, reinforcing, concrete, brick and masonry materials, top slabs for shallow manholes if used, cored holes where required, sealing, cleaning, testing, furnishing and installing particle separators, furnishing, laying, jointing and cleaning new drains, all excavation (except rock and boulder), trench support including sheeting and bracing, dewatering and drainage, backfilling, removal of excess material and debris, field adjustments to existing adjacent materials and finish grades, seeding, pavement and sidewalk repair, permits and all else incidental thereto, for which separate payment is not provided under other items in the Bid Form.

END OF SECTION

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SECTION 01046

CONTROL OF WORK

PART 1 GENERAL

1.01 PLANT

A. Furnish plant and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will complete the work within the Contract Time. If at any time such plant appears to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, Engineer may order the Contractor to increase the efficiency, change the character or increase the plant equipment and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.

1.02 PRIVATE AND PUBLIC LAND

A. Refer to the Project Special Conditions – Work Within a Public Property, Storage, Use of Materials and Equipment/Machinery, and Protection of Existing Facilities.

B. Do not enter or occupy private land outside of easements, except by permission of the land owner.

C. The work of this contract is on public lands. The limit of work area is shown on the Drawings. All construction activities, laydown and storage areas and temporary facilities shall be confined to within these limits.

1.03 NEW FACILITIES

A. Locate the new facilities substantially as indicated on the Drawings. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing utilities or for other reasons.

1.04 OPEN EXCAVATIONS

A. Adequately safeguard all open excavations by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. Provide suitable and safe means for accommodating travel by pedestrians past work areas.

B. Take precautions to prevent injury to the public due to work areas and excavation. Provide adequate light at all excavations, excavated material, equipment, or other obstacles which could be dangerous to the public at night.

1.05 MAINTENANCE OF TRAFFIC

A. Confine all work activities so that vehicular and pedestrian traffic may be maintained at all times. If the construction operations cause traffic hazards, provide temporary ways, or take other measures for safety satisfactory to the Engineer.

1.06 CARE AND PROTECTION OF PROPERTY

A. Be responsible for the preservation of all public and private property and use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, restore such property to a condition similar or equal to that existing before the damage was done, or make good the damage in other manner acceptable to the Engineer.

1.07 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

A. Assume full responsibility for the protection of all park, structures, and public utilities, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables, whether or not they are shown on the Drawings. Carefully support and protect all such structures and utilities from injury of any kind. Immediately repair any damage resulting from the construction operations.

B. The Contractor shall bear full responsibility for obtaining all locations of underground structures and utilities.

C. Notify all utility companies in writing at least 72 hours (excluding Saturdays, Sundays and Legal holidays) before excavating in any public way. Also notify Massachusetts Dig Safe, telephone 1-888-344-7233 at least 72 hours prior to start of work.

1.08 WATER FOR CONSTRUCTION PURPOSES

A. In locations where public water supply is available, the Contractor may be allowed to use water without charge for construction purposes.

B. The express approval of the Owner shall be obtained before water is used. The Contractor shall contact the City Water Department for approval. The Water & Sewer Operations Department will designate which hydrants may be used and the hours the hydrants may be operated. Waste of water shall be sufficient cause for withdrawing the privilege of unrestricted use. Hydrants shall only be operated under the supervision of the Owner's personnel.

1.09 MAINTENANCE OF FLOW

A. Provide for the flow of drains and water courses interrupted during the progress of the work, and immediately cart away and remove all offensive matter. Discuss the entire procedure of maintaining existing flow with the Engineer well in advance of the interruption of any flow.

1.10 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

A. During the course of the work, keep the site of operations as clean and neat as possible. Dispose of all residue resulting from the construction work and, at the conclusion of the work, remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and leave the entire site of the work in a neat and orderly condition.

B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and in other related Sections.

C. Disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. The Contractor will be required to remove the fill and restore the area impacted at no increase in the Contract Price.

END OF SECTION

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SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.

C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked straw bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, and ponds. All erosion control measures shall be in place in an area prior to any construction activity in that area. Specific requirements for erosion and sedimentation controls are specified in Section 02270.

D. Construction shall be achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines, and to review and discuss the proposed techniques with the Worcester Parks & Recreation Department and the Engineer.

E. All phases of sedimentation and erosion control shall comply with and be subject to the approval of the Massachusetts Department of Environmental Protection. Prepare sedimentation and erosion control drawings meeting the requirements for approval by that agency. Upon approval, furnish two copies of the approved Drawing to the Engineer.

1.02 RELATED WORK

A. Erosion and Sedimentation Control is included in Section 02270.

1.03 APPLICABLE REGULATIONS

A. Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

1.04 NOTIFICATIONS

A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. After receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for this purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.05 IMPLEMENTATION

A. Prior to commencement of the work, meet with the Engineer to develop mutual understandings relative to compliance with these provisions and administration of the environmental pollution control program.

B. Remove temporary environmental control features, when approved by the Engineer and incorporate permanent control features into the project at the earliest practicable time.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EROSION CONTROL

A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, straw check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition.

3.02 PROTECTION OF STREAMS AND SURFACE WATERS

A. Take all precautions to prevent, or reduce to a minimum, any damage to any stream or surface water from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Divert such waters through a settling basin or filter before being directed into streams or surface waters.

B. Do not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.

C. Take all preventative measures to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action plan approved by the Massachusetts Department of Environmental Protection. Submit two copies of approved contingency plans to the Engineer in the event of any spillage.

3.03 PROTECTION OF LAND RESOURCES

A. Restore land resources within the project boundaries and outside the limits of permanent work to a condition, after completion of construction that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.

B. Outside of areas requiring earthwork for the construction of the new facilities, do not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.

C. Before beginning operations near them, protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping or other operations, by placing boards, planks, snow fence, or poles around them. Monuments and markers shall be protected similarly.

D. Any trees or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to their original condition. The Engineer will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.

1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1 in in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.

2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer, shall be immediately removed and replaced with a tree with the same caliper as the tree removed, or with trees with calipers adding to match the caliper of the tree removed.

E. The locations of the Contractor's storage required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and approved by the Engineer and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all temporary storage.

F. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least ten days prior to scheduled start of such temporary work.

1. A layout of all temporary roads, excavations, embankments and drainage to be constructed within the work area.

2. Details of temporary road construction.

3. A landscaping drawing showing the proposed restoration of the area. Indicate the proposed removal of any trees and shrubs outside the limits of existing clearing area. Indicate locations of guard posts or barriers required to control vehicular traffic and protect trees and shrubs to be maintained undamaged. The Drawing shall provide for the removal of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.

G. Remove all signs of temporary construction facilities, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the Engineer. It is anticipated that excavation, filling and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be prepared and seeded as specified and approved by the Engineer.

H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.04 PROTECTION OF AIR QUALITY

A. Burning - The use of burning at the project site for the disposal of refuse and debris will not be permitted.

B. Dust Control - Maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others.

C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited. The use of chlorides may be permitted with approval from the Engineer.

D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

3.05 NOISE CONTROL

A. Make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

3.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

A. Maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

END OF SECTION

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SECTION 01170

SPECIAL PROVISIONS

PART 1 GENERAL

1.01 GENERAL OBLIGATIONS OF THE CONTRACTOR

A. General obligations of the Contractor shall be as set forth in the Contract Documents. Unless special payment is specifically provided in the payment paragraphs of the specifications, all incidental work and expense in connection with the completion of work under the Contract will be considered a subsidiary obligation of the Contractor, and all such costs shall be included in the appropriate items in the Bid Form in connection with which the costs are incurred.

1.02 SITE INVESTIGATION

A. The Contractor shall satisfy himself as to the conditions existing within the project area, the type of equipment required to perform the work, the character, quality and quantity of the subsurface materials to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the Drawings and related Sections. Any failure of the Contractor to acquaint himself with the available information will not relieve him from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusions or interpretation made by the Contractor on the basis of the information made available by the Owner.

1.03 COORDINATION WITH LOCAL AGENCIES

A. Supply the Local Police Department, Fire Department, Conservation Commission and the Public Works & Parks Department with the following information.

1. Location where work will be in progress to be supplied at intervals as required by the Engineer.

2. Immediate notification of any drain, gas, sewer, or water main breaks.

B. Reimburse the Owner for the actual cost of the services of Water & Sewer Operations Department personnel required during other than regular working hours.

1.04 PUBLIC UTILITIES

A. Comply with the requirements of the Commonwealth of Massachusetts Statute - Chapter 82, Section 40, for excavations in public and private property. Compliance shall include the following:

1. Notify public utility companies in writing at least 72 hours (excluding Saturdays, Sundays and legal holidays) but not more than 30 days before excavating in areas where underground utility plant (pipes, cables, manholes, etc) exist.

2. Provide the Utility Companies with a schedule of the activities in areas where the utilities exist.

3. Notify utility companies of any damage to their utilities resulting from construction operations.

B. Notify DIGSAFE at 1-888-344-7233 at least 72 hours before digging, trenching, blasting, demolishing, boring, backfilling, grading, landscaping or other earth moving operations in any public ways, rights-of-way and easements.

1.05 PROGRESS SCHEDULE

A. Submit a progress schedule before starting any work.

B. Review the progress schedule with the Engineer on a monthly basis or more frequently as required by the Engineer.

1.06 PERMITS

A. Obtain all necessary permits required for proper execution of the project. Fill out all forms and furnish all drawings required to obtain the permits. A copy of each permit shall be submitted to the Engineer. All fees associated with permits shall be paid by the Contractor as part of the work. Work shall not commence on any phase of the work requiring a permit until the permit is obtained.

B. Obtain required street opening permits for excavations within streets or sidewalk areas.

C. Abide by any permit requirements imposed in the wetlands Order of Conditions appended.

D. Prepare and submit a Notice of Intent (NOI) and Notice of Termination (NOT) for a Construction General Permit as outlined in Section 02200.

E. Obtain required City of Worcester drain permit.

1.07 CONSTRUCTION VIDEOS

A. See Section 01300 Submittals for requirements of the construction videos.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

A. The Project Special Conditions Section specifies the general methods and requirements of submissions applicable to Shop Drawings. This Section specifies additional submittal requirements. Detailed submittal requirements are specified in the technical sections.

B. All submittals shall be clearly identified by reference to Section Number, Paragraph, Drawing Number or Detail as applicable. Submittals shall be clear and legible and of sufficient size for presentation of data.

1.02 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

A. Shop Drawings

1. Shop drawings as specified in individual Sections include custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shop work manufacturing instructions, custom templates and coordination drawings, as applicable to the work.

2. All shop drawings submitted by subcontractors shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.

3. Check all subcontractors' shop drawings regarding measurements, size of members, materials and details to make sure that they conform to the intent of the Drawings and related Sections. Return shop drawings found to be inaccurate or otherwise in error to the subcontractors for correction before submission thereof.

4. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure, and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.

B. Product Data

1. Product data as specified in individual Sections include standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended product warranties, as applicable to the work.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:

1. Field measurements

2. Field construction criteria

3. Catalog numbers and similar data

4. Conformance with related Sections

B. Each shop drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor: "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements." Shop drawings and product data sheets 11-in x 17-in and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package. Provide to the Resident Project Representative a copy of each transmittal sheet for shop drawings, product data and samples at the time of submittal to the Engineer.

C. The Contractor shall attach to each submittal a completed submittal cover sheet.

D. Notify the Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.

E. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from the responsibility for the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility therefor.

F. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

G. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

1.04 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the Work or in the work of any other contractor.

B. Each submittal, appropriately coded, will be returned within 30 calendar days following receipt of submittal by the Engineer.

C. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

D. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.

2. The Project title and number.

3. Contractor identification.

4. The names of:

a. Contractor

b. Supplier

c. Manufacturer

5. Identification of the product, with the section number, page and paragraph(s).

6. Field dimensions, clearly identified as such.

7. Relation to adjacent or critical features of the work or materials.

8. Applicable standards, such as ASTM or Federal Standards numbers.

9. Identification of deviations from Contract Documents.

10. Identification of revisions on resubmittals.

11. An 8-in by 3-in blank space for Contractor and Engineer stamps.

12. Where calculations are required to be submitted by the Contractor, the calculations shall have been checked by a qualified individual other than the preparer. The submitted calculations shall clearly show the names of the preparer and of the checker.

1.05 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES

A. The review of shop drawings and data will be for general conformance with the design concept and Contract Documents. They shall not be construed:

1. as permitting any departure from the Contract requirements;

2. as relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;

3. as approving departures from details furnished by the Engineer, except as otherwise provided herein.

B. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.

C. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or Contract Time, the Engineer may return the reviewed drawings without noting an exception.

D. Submittals will be returned to the Contractor under one of the following codes.

Code 1 - "APPROVED" is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.

Code 2 - "APPROVED AS NOTED" - This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.

Code 3 - "APPROVED AS NOTED/RESUBMIT" - This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. The resubmittal is to address all comments, omissions and non-conforming items that were noted. An additional box is checked to indicate whether the resubmission is for the complete package, or for parts of the package. If no box is checked, a complete resubmittal shall be provided. Review code may designate if a partial or full submittal is required. If full submittal is required, a complete resubmittal package addressing all comments shall be provided. If a partial submittal is designated, resubmittal shall only include information pertaining to those items noted in review comments requiring clarification and any portions of submittal impacted as a result of the response. Resubmittal is to be received by the Engineer within 30 calendar days of the date of the Engineer's transmittal requiring the resubmittal.

Code 4 - "REJECTED" - This code is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the requirements of the Contract Documents.

Code 5 - "RECEIPT ACKNOWLEDGED (Not subject to Engineer's Approval)" - This code is assigned to acknowledge receipt of a submittal that is not subject to the Engineer's approval. This code is generally used with submittals involving the Contractor’s means and methods of construction work plans, and health and safety plans.

E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall identify all revisions made to the submittals, either in writing on the letter of

transmittal or on the shop drawings by use of revision triangles or other similar methods. The resubmittal shall clearly respond to each comment made by the Engineer on the previous submission. Additionally, the Contractor shall direct specific attention to any revisions made other than the corrections requested by the Engineer on previous submissions.

F. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor and will be considered "Rejected" until resubmitted. The Engineer may at his option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.

G. Repetitive Review

1. Shop drawings and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the Engineer and at the Contractor's expense, based on the rates described in the Project Special Conditions Section. The Contractor shall reimburse the Owner for all such fees invoiced to the Owner by the Engineer. Submittals are required until approved.

2. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time.

H. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least 7 working days prior to release for manufacture.

I. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

1.06 DISTRIBUTION

A. Distribute electronic copies of approved shop drawings and of approved product data and samples, where required, as directed by the Engineer.

1.07 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

A. If specifically required in other related Sections, submit a P.E. Certification for each item required, in the form attached to this Section, completely filled in and stamped.

1.08 CONSTRUCTION VIDEOS

A. Prior to the excavation in any street or cross-country area, the Contractor shall document existing conditions using a digital video recorder. The video recordings shall be submitted on CD-ROM or thumb drive, or by uploading to web-based Project management software site.

B. The recordings shall be of sufficient detail to accurately and clearly show the existing preconstruction conditions of the entire work area. Each video shall include an audio description of the area being video recorded with special attention given to areas which could be involved in disputes after completion of construction.

C. Each CD-ROM or thumb drive shall be labeled with the following:

1. Contractor’s name

2. Contract title

3. CD-ROM or thumb drive No. and date taken

4. Drawings included on video

5. Name of person making video

D. The videos shall be retained in a secure location by the Contractor throughout the duration of the Project and shall then be turned over to the Owner. A copy of the videos shall be provided to the Owner upon request prior to completion of work.

1.09 GENERAL PROCEDURES FOR SUBMITTALS

A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work of other related Sections, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.

END OF SECTION

P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the Commonwealth of Massachusetts and that he/she has been employed by

_____ to design
(Name of Contractor)

_____
(Insert P.E. Responsibilities)

in accordance with Section _____ for the

_____.
(Name of Project)

The undersigned further certifies that he/she has performed the design of the _____

_____, that said design is in conformance
Name of Project)

with all applicable local, state and federal codes, rules, and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the

_____
(Insert Name of Owner)

or Owner's representative within seven days following written request therefor by the Owner.

_____	_____
P.E. Name	Contractor's Name
_____	_____
Signature	Signature
_____	_____
Address	Title
	_____
	Address

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SECTION 01500

TEMPORARY FACILITIES

PART 1 GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

A. The Project Special Conditions Section specifies temporary facilities requirements. This Section specifies additional temporary facilities requirements.

1.02 TEMPORARY HEAT

A. Provide all heat as may be necessary for thawing out and heating the ground or materials and for proper execution, protection and drying out the work.

1.03 FIRE EXTINGUISHERS

A. Provide portable UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide portable UL-rated Class ABC dry chemical extinguishers or a combination of NFPA recommended Classes for the exposure. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

END OF SECTION

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SECTION 01510

MAINTENANCE OF FLOW IN EXISTING DRAINS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. As required in Paragraph 1.09 of Section 01046, Control of Work, the Contractor shall be responsible for maintaining storm drainage flow in all public and private channels and pipes during construction. All bypass pumping systems shall be manned by the Contractor during non-working hours, 7 days per week.

B. Provide all labor, equipment, power and materials necessary to maintain flow in existing drains and manholes, and handle existing stormwater flows. Construct and maintain all temporary bypass drains and be responsible for all bypass pumping of drainage that may be required to prevent backing up of drainage during installation of all new pipe and manhole structures and to allow proper inspection and testing of the new Work. The Contractor shall immediately remove and dispose of all offensive matter spilled during the bypass pumping at his own expense. Note that some drains listed have a continuous base flow which must be handled.

C. When bypass pumping is required, the Contractor shall supply pumps, conduits, power, and other equipment to divert the flow of drainage around the section in which work is to be performed. The bypass system shall be equal to the existing pipe capacity as listed in the table at the end of this Section.

D. The Contractor shall be required to repair at his own expense any damage to property, public or private, caused by his operations.

E. Should damage of any kind occur to the existing drains, the Contractor shall at his own expense make repairs to the satisfaction of the Engineer.

F. The Contractor shall not be permitted to overflow, bypass, pump or by any other means convey drainage to any brook or water course without permission of the Engineer.

G. All procedures for maintaining flows must meet the approval of the Engineer and the Contractor shall be required to submit to the Engineer, for approval, a detailed written plan of all methods of flow maintenance ten (10) days in advance of flow interruption.

REQUIRED BYPASS CAPACITIES
(BY PUMPING OR BY GRAVITY FLOW)

Location	Particle Separator Number	Existing Pipe Size	Capacity (gpm)	Full Pipe/ Channel Pipe Has Base Flow*
Park Avenue	1	10" Drain	2,250	No
Boynton Street	2	18" Drain	4,940	No
Boynton Street	3	24" Drain	7,180	No
Main Inlet to Salisbury Pond	--	Twin 11'x6' Box Culvert Drains	408,500**	Yes

*Requires dry-weather flow handling.
**Assumed pipe slope equals 0.002; no invert elevation information available.

END OF SECTION

SECTION 01576

POLICING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. When, in the opinion of the Owner, or the Engineer, public safety or convenience requires the services of police, the Engineer may direct the Contractor to provide manpower to direct traffic within the location of work under this Contract as specified in the Project Special Conditions section.

B. When so directed and at the Contractor’s expense, make all arrangements in obtaining the manpower for policing.

C. The intent is to provide public safety by police direction of traffic. Police are not to serve as watchmen to protect the Contractor's equipment and materials, or to warn pedestrians of such hazards as open trenches.

D. Nothing contained herein shall be construed as relieving the Contractor of any of his/her responsibilities for protection of persons and property under the terms of the Contract.

END OF SECTION

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SECTION 01601

CONTROL OF MATERIALS

PART 1 GENERAL

1.01 APPROVAL OF MATERIALS

A. Unless otherwise specified, only new materials and equipment shall be incorporated in the work. All materials and equipment furnished shall be subject to the inspection and approval of the Engineer. No material shall be delivered to the work without prior approval of the Engineer.

B. Submit, in accordance with Section 01300, data relating to materials and equipment proposed to be furnished for the work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications.

C. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, submit additional samples or materials for such special tests as may be necessary to demonstrate that they conform to the requirements specified herein. Such samples shall be furnished, stored, packed and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for the tests.

D. Any delay of approval resulting from the Contractor's failure to submit samples or data promptly shall not be used as a basis of a claim against the Owner or the Engineer.

E. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes and surfaces, provide such samples of workmanship or finish as may be required.

F. The materials and equipment used on the work shall correspond to the approved samples or other data.

1.02 HANDLING AND STORAGE OF MATERIALS

A. All materials and equipment to be incorporated in the work shall be handled and stored by the manufacturer, fabricator, supplier and Contractor before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting and any injury, theft or damage of any kind whatsoever to the material or equipment.

B. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous, reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease and in a position to prevent accumulations of standing water and to minimize rusting. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking and spalling to a minimum.

C. All materials which, in the opinion of the Engineer, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the work and no compensation shall be given for the damaged material or its removal.

END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment required and perform all site preparation, complete as shown on the Drawings, as specified herein, and as specified in the Project Special Conditions.

B. Refer to the Project Special Conditions – Demolition, Site Excavation and Preparation for protocol for handling and disposal of wood-based materials within the Project Area, related to the Asian long-horned beetle infestation.

C. Obtain all permits required for site preparation work prior to proceeding with the work, including clearing, tree removal.

D. The areas to be cleared, grubbed and stripped within public areas and utility easements shall be minimized to the extent possible for the scope of work and in consideration of the actual means and methods of construction used. No unnecessary site preparation within these areas shall be performed.

1.02 RELATED WORK

A. Environmental Protection is included in Section 01110.

B. Earthwork is included in Section 02200.

C. Loaming and Seeding is included in Section 02930.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, copies of all permits required prior to clearing, grubbing, and stripping work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CLEARING

A. Cut and remove all trees, stumps, brush, shrubs, roots, grass, weeds, rubbish and any other objectionable material resting on or protruding through the surface of the ground.

B. Preserve and protect trees and other vegetation designated on the Drawings or directed by the Engineer to remain as specified below.

3.02 GRUBBING

A. Grub and remove all stumps, roots in excess of 1-1/2-in in diameter, matted roots, brush, timber, logs, concrete rubble and other debris encountered.

B. Refill all grubbing holes and depressions excavated below the original ground surface with suitable materials and compact to a density conforming to the surrounding ground surface in accordance with Section 02200.

3.03 STRIPPING

A. Strip topsoil from all areas designated within the limit of work.

B. Topsoil shall be free from brush, trash, large stones and other extraneous material and shall meet the requirements of Section 02930. Avoid mixing topsoil with subsoil.

C. Stockpile topsoil in a location as directed by the Engineer and protect any topsoil meeting the requirements above until it is used in landscaping, loaming and seeding operations. Dispose of surplus topsoil after all work is completed.

3.04 DISPOSAL

A. Dispose of material and debris from site preparation operations by hauling such materials and debris to an approved offsite disposal area. No rubbish or debris of any kind shall be buried on the site.

C. Burning of cleared and grubbed materials or other fires for any reason will not be permitted.

3.05 PROTECTION

A. Trees and other vegetation designated on the Drawings or directed by the Engineer to remain shall be protected from damage by all construction operations by erecting suitable barriers, guards and enclosures, or by other approved means. Conduct clearing operations in a manner to prevent falling trees from damaging trees and vegetation designated to remain and the work being constructed, and to provide for the safety of employees and others.

B. Maintain protection until all work in the vicinity of the work being protected has been completed.

C. Do not operate heavy equipment or stockpile materials within the branch spread of existing trees.

D. Immediately repair any damage to existing tree crowns, trunks, or root systems. Roots exposed and/or damaged during the work shall immediately be cut off cleanly inside the exposed or damaged area.

E. Restrict construction activities to those areas within the limits of construction designated on the Drawings, within public rights-of-way, and within easements provided by the Owner. 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.

3.06 TREE PRUNING

A. Existing trees to be pruned shall be protected by suitable barricades, barrier fences, or other devices at locations within and around the drip line of the tree canopy. The type, amount, locations, and duration of such devices will be as directed by the Engineer. No additional compensation will be made for protective devices. This work will be considered as incidental to the item of work to which it pertains.

B. Existing trees to be pruned shall be pruned by a Massachusetts Certified Arborist subject to the approval of the Engineer. Arborist shall be a member in good standing of the International Society of Arboriculture. If another Arborist Association is proposed, it must receive the approval of the Engineer before it will be considered or accepted. Arborist shall have at least 5 years experience in the care and pruning operations for mature trees, and shall submit at least three Massachusetts references, including name and telephone contact information to the Engineer for review and approval.

C. Tree pruning shall conform to ANSI A300 American National Standard for Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices for Standard Pruning (Class II) with emphasis on removing dead, dying, diseased, crossing, and conflicting branches. Trees shall also receive selective thinning, primarily for weight reductions to prevent breakage, and hazard reduction pruning. Perform this work as indicated on the Contract Drawings.

END OF SECTION

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SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all excavation, backfill, fill and grading required to complete the work as shown on the Drawings and as specified herein. The work shall include, but not necessarily be limited to; excavation for structures, manholes, pipes and paving; all backfilling and fill; grading; disposal of waste and surplus materials; and all related work such as sheeting, bracing and pumping.

B. 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 State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

C. Loam, if any, excavated under this Section may be salvaged by the Contractor for his/her own convenience for use as specified under Section 02930.

D. The Contractor shall apply for and obtain a Construction General Permit from EPA pursuant to the National Pollutant Discharge Elimination System (NPDES) program. Information on the permit can be found at https://www.epa.gov/npdes/2022-construction-general-permit-cgp . The permit requires preparing and submitting a Notice of Intent (NOI) and Notice of Termination (NOT) via the NPDES eReporting Tool (NeT) and preparation of a Storm Water Pollution Prevention Plan (SWPPP). The NPDES NOI and SWPPP shall include construction dewatering as well as construction stormwater. See the website at https://www.epa.gov/npdes/2022-construction-general-permit-cgp for full text of the NPDES Construction General Permit and requirements.

1.02 RELATED WORK

A. Site preparation is included in Section 02100.

B. Erosion and sedimentation control is included in Section 02270.

C. Concrete walkways are included in Section 02515.

D. Pavement repair and resurfacing are included in Section 02576.

E. Loaming and seeding is included in Section 02930.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, the information as elsewhere specified in this Section.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C33 - Specification for Concrete Aggregates.

2. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu ft (2,700kN-m/cu m)

3. ASTM D1682 - Standard Test Methods for Breaking Load and Elongation of Textile Fabrics.

4. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes.

5. ASTM D4751 - Standard Test Methods for Determining the Apparent Opening Size of a Geotextile.

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 PROTECTION

A. Sheeting and Bracing

1. Furnish, put in place and maintain such sheeting and bracing as may be required: by Federal, State and local safety requirements; to support the sides of excavations; to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction; and to protect adjacent structures from undermining or other damage. If the Engineer is of the opinion that at any points sufficient or proper supports have not been provided, he/she may order additional supports put in, and compliance with such order shall not relieve or release 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. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill.

2. Construct the sheeting outside the neat lines of the foundation pads unless indicated otherwise, to the extent deemed desirable for the method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressures to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected to provide the necessary clearances and dimensions.

3. Engage a professional engineer, registered in the Commonwealth 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.

4. 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.

a. When installing rigid pipe (R.C., V.C., A.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.

b. When installing flexible pipe (PVC, D.I., 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.

5. The cost for use of sheeting will be included in the lump sum bid items, and shall include full compensation for driving, bracing and later removal of sheeting.

6. All sheeting and bracing shall be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed.

7. 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.

8. The right of the Engineer to order sheeting and bracing left in place shall not be construed as creating any obligation on his/her part to issue such orders and his/her failure to exercise his/her right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

B. Pumping and Drainage

1. At all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures 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 levels. Submit to the Engineer for review the design of the dewatering systems prior to commencing work.

2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation. Well or sump installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.

3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps and pumped from the excavation to maintain a bottom free from standing water.

4. Take all additional precautions to prevent uplift of any structure during construction.

5. Drainage shall be disposed of in an approved area only so that flow or seepage back into the excavated area will be prevented.

6. Flotation shall be prevented by maintaining a positive and continuous operation of the dewatering system. Be fully responsible and liable for all damages which may result from failure of this system.

7. Remove the dewatering equipment after the system is no longer required.

8. Take all necessary precautions to preclude the accidental discharge of fuel, oil, etc, in order to prevent adverse effects on groundwater quality.

2.01 MATERIALS

A. Common Fill shall consist of mineral soil substantially free from organic materials, loam, wood, trash and other objectionable materials which may be compressible or which cannot be properly compacted. Common fill shall not contain stones larger than 10 in in largest diameter and shall have a maximum of 75 percent passing the No. 40 sieve and a maximum of 20 percent passing the No. 200 Sieve. Common fill shall not contain granite blocks, broken concrete, masonry rubble or other similar materials. It shall have physical properties such that it can be readily spread and compacted during filling. Snow, ice and frozen soil will not be permitted.

B. Select Common Fill shall be as specified above for Common Fill except that the material shall contain no stones larger than 2 in in largest dimension.

C. Structural fill 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 graded within the following limits:

Sieve	Percent Passing
3-in	100
No. 4	20 - 50
No. 40	5 - 35
No. 200	0 - 10

D. Crushed Stone

1. Crushed stone shall be natural stone, free of clay, shale and organic matter, conforming to Section M2.01.4 of the MassDOT Standard Specifications for Highways and Bridges (hereinafter SSHB), latest edition and all addenda and supplements thereto.

E. Screened Gravel

1. Screened gravel shall be used for bedding as detailed and at other locations indicated on the Drawings.

2. Screened gravel shall consist of hard, durable, rounded or sub-angular particles of proper size and gradation and shall be free from sand, loam, clay, excess fines and deleterious materials. The gravel shall be graded within the following limits:

Sieve Size	Percent Finer by Weight
5/8-in	100
1/2-in	40 to 100
3/8-in	15 to 45
No. 10	0 to 5

3. Crushed stone meeting Section M2.01.4 or M2.01.5 of the MassDOT SSHB may be substituted for screened gravel.

F. Bank-run gravel base course for bituminous roads and sidewalks shall conform to Section M1.03.0 Type C of the MassDOT SSHB. Unless otherwise indicated, a minimum of 12 inches shall be provided below roadways and sidewalks.

G. Riprap at the box culvert outlet in the sediment forebay shall conform to Section M2.02.2 dumped riprap of the MassDOT SSHB.

H. River rock at the rock check dam used for erosion protection shall be rounded, hard, durable, resistant to weathering and may be naturally occurring. Boulders, sandstone, or similar soft stone or relatively thin slabs will not be acceptable. Stone shall be free of overburden, spoil, shale, and organic material. Rock used as river rock shall be a minimum 6-in, maximum 18-in diameter with an average diameter of 12 in for all supplied material. River rock shall be placed and graded off in a manner so that the larger rock fragments are uniformly distributed and the smaller rock fragments serve to fill the spaces between the larger rock fragments in a manner that will result in a compact mass of stone to the thickness shown in plans. Selective hand placing will be required to the extent necessary to secure the results specified above.

I. Articulated concrete block mat system shall be a precast, commercially manufactured system made specifically for use in exterior erosion protection applications. Articulated concrete block mat shall be comprised of open cell, interlocking, precast concrete units with cable ducts for longitudinal binding and two vertical openings per unit providing a minimum of 20% void space. Parallel strands of cable shall be inserted through each block to longitudinally bind each block in succession through the system per manufacturer's instructions. Each row of units shall be laterally offset by one-half of a block width from the adjacent row. Each block shall incorporate interlocking surfaces that minimize lateral displacement of the blocks.

1. Articulated concrete blocks shall be min. 4.75-in thick, 15.5-in wide, and 17.4-in long.

2. Articulated concrete blocks shall have a min. compressive strength of 4000 psi and a min. weight of 55 lbs per unit.

J. Sand

1. Sand shall conform to ASTM C33 for fine aggregate.

K. Erosion Control Blanket

1. Erosion control blanket shall be as specified in Section 02270.

PART 3 EXECUTION

3.01 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, drilling and blasting, wedging, sledging or barring and boulders which in the opinion of the Engineer require blasting for removal. 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 in any kind of excavation exceeding 1 cu yd in volume which can be excavated without resorting to blasting.

C. All blasting operations shall be conducted in full compliance with all the laws of the State, all local ordinances and with all possible care so as to avoid injury to persons and 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 all water pipes, gas pipes, or other structures and to private property. In addition, to observing all municipal and other ordinances relating to the storage and handling of explosives, 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 too deep or too heavy charges of explosives used or for any other reasons due to blasting, 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. Payment for rock and boulder shall be in accordance with Article 102 - General Conditions of the Contract for Construction.

3.02 TEST PITS

A. The Contractor may be required to excavate test pits 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.

3.03 EXCAVATION BELOW GRADE

A. If the bottom of any excavation is taken out below the limits shown on the Drawings, specified, or directed by the Engineer, it shall be refilled at the Contractor's expense with concrete, 8-in layers of compacted screened gravel or other material satisfactory to the Engineer. The type of material to be used shall be at the Engineer's option.

B. If care is not taken for water properly, through failure to postpone final excavation immediately above the subgrade until shortly before placing of the new work thereon, or other failure or neglect to conduct the excavation work properly so that the surface of the subgrade is in proper

condition for construction, remove the unsuitable material and replace it with concrete, compacted screened gravel, or other approved material at Contractor's own expense so that the condition of the subgrade meets with the approval of the Engineer before any work is placed thereon.

C. If, in the opinion of the Engineer, the material, in its undisturbed natural condition, at or below the normal grade of the excavation as indicated on the Drawings is unsuitable for foundations, it shall be removed to such depth and width as he/she may direct and be replaced with suitable material as directed by the Engineer for which compensation will be made in accordance with Article 102 - General Conditions of the Contract for Construction.

3.04 STRUCTURE EXCAVATION

A. Excavation shall be made to the grades shown on the Drawings and to such widths as will give suitable room for construction of the structures, for bracing and supporting, pumping and draining. The bottom of the excavations shall be rendered firm and dry and in all respects acceptable to the Engineer.

B. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. Exposed subgrades shall be proofrolled with at least two coverages of the specified equipment. The Engineer shall waive this requirement if, in his/her opinion, the subgrade will be rendered unsuitable by such compaction. Subgrade soils which become soft, loose, "quick," or otherwise unsatisfactory for support of structures as a result of inadequate excavation, dewatering, proofrolling, or other construction methods shall be removed and replaced by structural fill as required by the Engineer at the Contractor's expense.

C. Dewatering shall be such as to prevent boiling or detrimental underseepage at the base of the excavation as specified herein.

D. Excavation equipment shall be satisfactory for carrying out the work in accordance with the requirements specified. In no case shall the earth be ploughed, scraped, or dug with machinery so near to the finished subgrade as to result in excavation of, or disturbance of material below grade, the last of the excavated material being removed with pick and shovel just before placing of concrete or working mat thereon.

E. When excavation for foundations has reached prescribed depths, the Engineer shall be notified and will inspect conditions. If materials and conditions are not satisfactory to the Engineer, the Engineer will issue instructions as to the procedures and if additional costs are involved, adjustments of the Contract Price will be made in accordance with the provisions of Article 102 – General Conditions of the Contract for Construction.

F. During final excavation to subgrade level, take whatever precautions are required to prevent disturbance and remolding. Material which has become softened and mixed with water shall be removed. Hand excavation of the final 3 to 6 in will be required as necessary to obtain a satisfactory undisturbed bottom. The Engineer will be the sole judge as to whether the work has been accomplished satisfactorily.

3.05 TRENCH EXCAVATION AND BACKFILLING

A. Excavation for all trenches required for the installation of pipes and ducts shall be made to the depths indicated on the Drawings and in such a manner and to such widths as will give suitable room for laying the pipe or installing the ducts within the trenches, for bracing and supporting and for pumping and drainage facilities. Render the bottom of the excavations firm and dry and in all respects acceptable to the Engineer. Pavement, when encountered, shall be cut with pneumatic chisels along straight lines before excavating.

B. Rock shall be removed to a minimum 8-in clearance around the bottom and sides of all the pipe being laid.

C. Where pipes are to be laid in gravel bedding, the trench may be excavated by machinery to, or just below the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

D. As soon as practicable after the pipe has been laid and jointed, backfilling shall begin and thereafter be prosecuted expeditiously. If required, as shown on the Drawings, screened gravel shall be placed around the pipe to mid-diameter. As the screened gravel is placed, it shall be compacted by suitable tools.

E. After the screened gravel bedding has been placed to the mid-diameter of the pipe, screened gravel or selected common fill as shown shall be placed to a depth of 1 ft over the top of the pipe. Material shall be thoroughly compacted by hand-tamping or by a hand-operated vibration compactor as placed with at least one man tamping for each man shoveling material into the trench.

F. The remainder of the trench shall be filled with common fill in layers not to exceed 2 ft and thoroughly compacted by rolling, ramming, or puddling, as the Engineer may direct, sufficiently to prevent subsequent settling. The backfill shall be mounded 6 in above the existing grade or as directed. In some areas it may be necessary to remove excess material during the cleanup process, so that the ground may be restored to its original level and condition.

3.06 BACKFILLING - COMMON FILL, SELECT COMMON FILL AND STRUCTURAL FILL

A. Select common fill may be used as fill against exterior walls of structures as indicated on the Drawings. Material conforming to the requirements of select common fill shall be placed in layers having a maximum thickness of 1 ft measured before compaction.

B. Common fill shall be compacted to at least 92 percent of maximum density as determined by ASTM D1557, Method D. No bucket whacking shall be allowed.

C. Materials placed in fill areas shall be deposited to the lines and grades shown on the Drawings making due allowance for settlement of the material and for the placing of loam thereon.

D. 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.

E. No compacting shall be done when the material is too wet either from rain or from excess application of water. At such times, work shall be suspended until the previously placed and new materials have dried sufficiently to permit proper compaction.

F. Structural fill shall not be placed on a frozen surface or one covered by snow or ice, nor shall snow, ice or frozen earth be incorporated in the compacted fill.

3.07 DISPOSAL OF SURPLUS MATERIAL

A. No excavated materials shall be removed from the site of the work or disposed of, except as specified by the Engineer. Materials shall be neatly piled so as to inconvenience as little as possible the public and adjoining property owners until used or otherwise disposed of as specified below.

B. Suitable excavated material shall be used for fill or backfill on the different parts of the work as required.

C. Surplus fill shall become the property of the Contractor and shall be removed and disposed off site.

3.08 DISPOSAL AND REPLACING OF ROCK

A. Remove and dispose of all pieces of ledge and boulders which are not suitable for use in other parts of the work. Rock disposed of by hauling away to spoil areas is to be replaced by approved surplus excavation obtained elsewhere on the work, insofar as it is available. Any deficiency in the backfill material shall be made up with acceptable material approved by the Engineer.

B. Fragments of ledge and boulders may NOT be used in backfilling trenches.

3.09 ARTICULATED CONCRETE BLOCK MAT SYSTEM

A. Stake locations and layout of articulated concrete block mat system and turn-down trenches along perimeter of installation for review by the Engineer prior to installation. Concrete blocks shall fit tightly against each other, in an offset interlocking pattern, adjacent sides of each block abutting uniformly in continuous, staggered, linear rows, with the long axis of blocks positioned perpendicular to the direction of flow. Concrete blocks shall be installed on top of crushed stone base with filter fabric underlayment as indicated.

B. Inspect base preparation for grade, slope, compaction, and elevation prior to installing concrete block mat system. All deformities, roots, grade stakes, and stones shall be removed from prepared subgrade for geotextile filter fabric underlayment. Install geotextile filter fabric underlayment as shown on plans and specified. Install crushed stone base over geotextile underlayment and compact to min 90% proctor density. Install concrete block mat as staked in the field and approved by engineer. Join sections of block with parallel steel cables as directed by manufacturer. To make the articulated block mat system sit flush, blocks shall be “Seated” with a roller or other means as approved by Engineer.

C. Final assembly installation, including turn-down trenches, shall be inspected and approved by Engineer.

3.09 GRADING

A. Grading in preparation for placing of loam, planting areas, paved walks and drives 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 and shall be performed in such a manner that the requirements for formation of embankments can be followed. All material encountered, of whatever nature, within the limits indicated, shall be removed and disposed of as directed. During the process of grading, the subgrade shall be maintained in such condition that it will be well-drained at all times. 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. The right is reserved to make minor adjustments or revisions in lines or grades if found necessary as the work progresses, in order to obtain satisfactory construction.

C. Stones or rock fragments larger than 4 inches in their greatest dimensions will not be permitted in the top 6 inches of the finished subgrade.

END OF SECTION

SECTION 02270

EROSION AND SEDIMENTATION 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 and as specified herein. The work shall include, but not necessarily be limited to; installation of temporary access ways and staging areas, silt fences, stone filter boxes, stone filter berms, sediment removal and disposal, device maintenance, removal of temporary devices, temporary mulching, excelsior matting installation and final cleanup.

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

B. Loaming and seeding is included in Section 02930.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, within 10 days after award of Contract, technical product literature for all commercial products, including straw mulch tackifier, to be used for erosion and sedimentation control.

1.04 QUALITY ASSURANCE

A. Be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to off-site areas or into the stream system 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. Sedimentation and erosion control measures shall conform to the requirements outlined in the Conservation Commission Order of Conditions appended and shall conform to Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, latest edition.

C. Contractor shall provide an extra set of erosion and sedimentation controls on site for emergency.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed stone for sediment filtration devices shall conform to MassDOT Standard Specifications for Highways and Bridges Section M2.01.3, and crushed stone for access ways and staging areas shall conform to M2.01.1.

B. Sediment Fence

1. Sediment fence shall be a prefabricated commercial product made of a woven, polypropylene, ultraviolet resistant material such as:

a) "Mirafi FW402" by TenCate Geosynthetics

b) "Carthage 15%" by Carthage Mills

c) "HSP2" by ACF environmental, Inc.

d) Or equal.

C. 1/4-in woven wire mesh for filter boxes shall be galvanized steel or hardware cloth.

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. Latex acrylic copolymer or organic tackifier shall be a commercial product specifically manufactured for use as straw mulch tackifier.

F. Erosion control blanket shall be a double net, agricultural straw-coconut fiber matrix blend blanket, stitched with degradable thread between a UV stabilized top net and a polypropylene bottom net, with functional longevity of up to 24 months. Furnish wire staples as recommended by the manufacturer of blanket. Blanket shall be:

1. Model SC 150 Extended Term Blanket as manufactured by North American Green, Evansville, IN or,

2. Model Xcel CS-3 Regular Extended Term Protection Mat as manufactured by Western Excelsior Corp., Mancos, CO or,

3. Model Landlok CS2 ECB as manufactured by S.I. Geosolutions, Chattanooga, TN or equal.

G. Silt curtain with sorbent boom shall be as shown on the Drawings.

H. Compost filter sock shall be a prefabricated commercial product with outside casing made up of organic hessian

1. Effective Height: 12 inches plus or minus 1 inch.
2. Effective Circumference: 338 inches.

I. Product: Provide products by Massachusetts Environmental Products or equal.

2.02 SILTATION CONTROL DEVICE FOR CATCH BASINS AND INLETS

A. Where catch basins and surface drainage inlet structure existing on site, a siltation control device shall be used to trap sediment and prevent the drainage system from clogging. Siltation

control device(s) shall be installed between the frame and grate. The Contractor shall clean and maintain the siltation control device(s) on a regular basis and as directed by the Owner or Engineer.

B. The siltation control device will be a woven sack that is sewn with a double needle machine using high strength thread.

C. Siltation control device shall be SILTSACK as manufactured by ACF Environmental, Inc. or approved equal.

D. The siltation control device will be manufactured to fit the opening of the catch basin or surface drainage inlet structure. The siltation control device will have the following features; two dump straps attached to the bottom of the sack to facilitate the dumping of the trapped sediment. The top of the siltation control device shall have lifting loops as an integral part of the sack to be used to lift the partially filled sack out to empty. The siltation control device shall have a restraining strap approximately halfway up the sack to keep the sides away from the catch basin or surface drainage inlet structure walls. This yellow strap is a visual means of determining when the sack needs to be emptied. Once the strap is covered with sediment, the siltation control device should be emptied, cleaned and placed back in the catch basin or surface drainage inlet structure.

E. The geotextile fabric shall be woven fabric with the following properties:

1. Hi Flow

F. Catch Basin Filters

1. In lawn areas, furnish catch basin filter box as shown on the Drawings. Construct 2-in by 4-in wood frame with 1/4-in wire mesh that shall be galvanized steel hardware cloth.

2. In paved areas, furnish catch basin filter bags as shown on the Drawings. Filter bag shall be Dandy Bag as manufactured by Dandy Products, Grove City, OH Tel. No. 800 591-2284, or equal.

PART 3 EXECUTION

3.01 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 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 posts carrying to bottom of trench with about 4 in of fabric laid across bottom of trench. Stretch fabric fairly taut along fence length and maintain securely both ways.

5. Backfill trench with excavated material and tamp.

6. Install pre-fabricated silt fence according to manufacturer's instructions.

B. Construct filter boxes as detailed on the Drawings, from 1/4-in woven wire mesh or hardware cloth and wood. Fill with crushed stone and place over all drop inlets and manholes to storm drain system as each inlet is completed. This should be done prior to setting casting, if there is a delay between installation of inlet structures or drain manholes and setting of castings. An alternate method is to ring each inlet with a sediment fence.

C. Staging areas and access ways shall be surfaced with a minimum depth of 4 in of crushed stone.

D. Compost filter sock shall be installed as shown on the drawings.

3.02 MAINTENANCE AND INSPECTIONS

A. Inspections

1. Make a visual inspection of all erosion and sedimentation control devices once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to off-site areas, promptly install additional devices as needed. Sediment 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 of the fabric.

b. Replace damaged fabric, or patch with a 2-ft minimum overlap.

c. Make other repairs as necessary so that the fence is filtering all runoff directed to the fence.

2. Filter Boxes

a. Replace crushed stone when it becomes saturated with silt.

3. Stone Filter Berm

a. Muck out trapped silt from dewatering operations when it has built up to within 6 in of the top of the berm.

b. Replace crushed stone filter when saturated with silt.

4. Add crushed stone to access ways and staging area as necessary to maintain a firm surface free of ruts and mudholes.

3.03 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.

B. Straw mulch shall be applied at rate of 100 lbs/1000 sq ft and tackified with latex acrylic copolymer at a rate and diluted in a ratio per manufacturer's instructions.

3.04 EROSION CONTROL BLANKETS

A. Erosion control blankets shall be installed in all seeded sloped areas 3:1 or steeper and in areas disturbed outside of the specified seeding installation dates, and as directed by the Engineer in accordance with manufacturer's instructions. 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 drainage flow and stapled 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 inches in a trench. 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, turn down upper end of downstream roll into a silt trench to a depth of 4 inches. Overlap lower end of upstream roll 4 in past edge of downstream roll and staple.

1. To provide 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.

3.05 SILT CURTAIN

A. Install and anchor silt curtain per manufacturer's recommendations, as shown on the Drawings, and as directed by the Engineer.

3.06 REMOVAL AND FINAL CLEANUP

A. Once the site has been fully stabilized against erosion, remove sediment control devices 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 indicated on the Drawings.

END OF SECTION

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SECTION 02515

CONCRETE WALKWAYS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install concrete walkways as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

1.03 SUBMITTALS

1.04 REFERENCE STANDARDS

A. MassDOT Standard Specifications for Highways and Bridges, latest edition, including all addenda.

B. City of Worcester Department of Public Works & Parks Standard Construction Specifications and Details, latest revision.

C. American Society for Testing and Materials (ASTM)

1. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

D. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M213 - Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

E. 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. Concrete shall be as specified in Section 03300, but in no case less than 4,000 psi at 28 days.

B. Welded wire fabric shall conform to ASTM A185 and shall be of size and gauge shown on the Drawings.

C. Expansion joint filler shall be non-bituminous type, 1/2-in thick meeting AASHTO M153.

D. Backer Rod shall be 3/4" diameter closed cell foam.

E. Joint Sealant shall be self-leveling polyurethane Type S, Grade P, Class 25 complying with ASTM C-920. Color selected by owner from manufacturers full range.

F. Materials for crushed stone subbase course shall be as specified in Section 02200.

PART 3 EXECUTION

3.01 INSTALLATION

A. The subgrade for walkways shall be shaped parallel to the proposed surface of the walkways and thoroughly compacted. All depressions occurring shall be filled and again compacted until the surface is smooth and hard.

B. After the subgrade has been prepared, the crushed stone subbase course shall be placed. After being thoroughly compacted, the subbase course shall be at least 8 in in thickness and parallel to the proposed surface of the walkway.

C. Forms

1. Side and transverse forms shall be smooth, free from warp, of sufficient strength to resist springing out of shape, of a depth to conform to the thickness of the walkway and of a type satisfactory to the Engineer.

2. All mortar or dirt shall be completely removed from forms that have been previously used. The forms shall be well staked and thoroughly braced and set to the established lines with their upper edge conforming to the grade of the finished walk which shall have sufficient pitch to provide for surface drainage, but not to exceed 1/4-in/ft.

3. All forms shall be oiled before placing concrete.

D. Wire Fabric Reinforcement

1. All wire fabric shall be stored off the ground and shall be protected from moisture and be kept free from dirt, oil, or injurious coatings. No rolls of wire fabric shall be allowed; only mats and sheets will be permitted.

2. 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 as approved, spaced no more than 24 in on-center. Support as approved in middle of slab.

3. Before being placed in position, wire fabric shall be thoroughly cleaned of loose mill and rust scale, dirt and other coatings, including ice, that reduce or destroy bond. Where there is delay in depositing concrete after reinforcement is in place, fabric shall be reinspected and cleaned when necessary.

4. In no case shall wire fabric be covered with concrete until the amount and position of the fabric have been checked by the Engineer and his/her permission given to proceed with the concreting.

E. Placing and Finishing Concrete

1. Placing, finishing and curing concrete shall be performed in accordance with Section 901 of the MassDOT Standard Specifications for Highways and Bridges, latest edition.

2. Concrete walkways shall be placed in alternate slabs not exceeding 30 ft in length, except as otherwise ordered. The slabs shall be separated by transverse, preformed expansion joint filler.

3. Preformed expansion joint filler shall be placed adjacent to structures as directed.

4. Expansion joint installation:

    a) Place joint filler between paving components and building or other appurtenances to 1-1/4 inches below finish grade
    b) Place closed cell foam backer between paving components to ½ inch below finish grade for final sealant installation.
    c) Install self-leveling polyurethane joint sealant between paving components flush with finish grade.

5. Concrete shall be placed in such quantity that, after being thoroughly consolidated in place, it shall be 6 in in depth. Finishing operations shall be delayed until all bled water and water sheen has left the surface and concrete has started to stiffen. After water sheen has disappeared, edging operations shall be completed. After edging and jointing operations, the surface shall be floated with an aluminum or magnesium float. Immediately following floating, the surface shall be steel troweled. If necessary, tooled joints and edges shall be rerun before and after troweling to maintain uniformity. Finish with broom at right angles to alignment of walk, then round all edges with 1/4-in radius after brooming.

6. Within 48 hours after the forms have been removed and form ties cut back from the face of the concrete, all fins, projections and irregularities shall be carefully removed and all voids and cavities shall be carefully and completely filled with a stiff mortar of the same composition and air-entrainment as the mortar in the original concrete mix. The same brand and color of cement, and the same kind and color of aggregate as was used in the original concrete mix shall be used in this mortar. The mortar for filling shall have been mixed and let set for 30 minutes and then remixed before placing in the work. The surface film of all such pointed surfaces shall be carefully removed before setting of the mortar occurs.

7. Inferior concrete, as determined by the Engineer, will be removed at the Contractor's expense.

8. When completed, the walkways shall be kept moist and protected from traffic and weather for at least 5 days.

END OF SECTION

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SECTION 02576

PAVEMENT REPAIR AND RESURFACING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, material, equipment and incidentals required and replace all pavement disturbed by the Contractor's operations.

B. Streets, driveways and parking area pavements 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 replacement and in a manner satisfactory to the Owner.

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

1.03 REFERENCE STANDARDS

A. MassDOT Standard Specifications for Highways and Bridges, including all addenda.

B. City of Worcester Department of Public Works & Parks Standard Construction Specifications and Details, latest revision.

C. American Association of State Highways and Transportation Officials (AASHTO)

1. AASHTO M144 - Standard Specification for Calcium Chloride.

D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 MAINTENANCE

A. All pavement placed shall be maintained for a period of 1 year. During this period all areas which have settled or are unsatisfactory for traffic shall be refilled and replaced.

PART 2 PRODUCTS

2.01 MATERIALS

A. Calcium chloride shall conform to AASHTO M144, Type I or Type II.

B. Initial pavement shall be Binder Course, conforming to the referenced standard, Section M3.11, Class I, Type I-1 bituminous concrete.

C. Final pavement shall consist of Top Course, conforming to the referenced standard, Section M3.11, Class I, bituminous concrete.

PART 3 EXECUTION

3.01 GENERAL

A. Materials for pavement shall be mixed, delivered, placed and compacted in accordance with the referenced MassDOT standard, Section 460 and as specified herein.

B. Whenever the subbase becomes dry enough to cause dust problems, spread calcium chloride uniformly over the gravel surface in sufficient quantity to eliminate the dust.

C. 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.

D. 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 not suitable to the Engineer.

E. 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.

3.02 INSTALLATION

A. Initial pavement shall be placed wherever existing pavement has been removed or disturbed as soon as practical, but in no case more than 1 week after backfilling is completed or disturbance has occurred.

1. In damaged pavement areas, the bank run gravel subbase shall be excavated to a depth of 2 in below the top of subbase, refilled with new bank run gravel and compacted.

2. The minimum 2-in initial pavement shall be placed and compacted by steel-wheeled rollers of sufficient weight to thoroughly compact the bituminous concrete without damaging the existing pavement. The final 1-1/2-in top course shall be rolled smooth and even with the existing pavement.

3. Hose clean all road surfaces adjacent to the damaged area to be paved. No paving is to be placed until subsurface is dry.

4. Initial pavement shall be maintained in a condition suitable for traffic until replaced or overlaid by final pavement. Defects shall be repaired within 3 days of notification of such defects.

B. Final pavement shall not be placed in less than 90 days after completion of the backfilling unless otherwise directed in writing by the Engineer.

C. Final pavement shall be constructed as follows:

1. Remove initial pavement and subbase to minimum of 4 in below existing pavement. Shape and compact subbase to 92 percent of maximum dry density as determined by ASTM D1557, Method D.

2. Cut back edges one foot on each side, trim loose edges of existing pavement. Broom and tack coat all edges with emulsified or cutback asphalt.

3. Place Binder Course and compact to minimum 2 ½-in thickness by steel-wheeled roller.

4. Broom and tack coat edges of existing pavement and top of Binder Course with emulsified or cutback asphalt.

5. Place Top Course and compact to 1-1/2-in thickness, finish smooth, dense and flush with surface of existing pavement.

3.03 PAVEMENT MARKINGS

A. Reline all streets with pavement markings equal in type and location where existing prior to paving.

END OF SECTION

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SECTION 02605

PRECAST CONCRETE MANHOLES, HEADWALL AND PARTICLE SEPARATORS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to design and install precast concrete manholes, headwall, structures and particle separators, frames and covers, manhole steps, brickwork, dampproofing and appurtenances all as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Excavation and backfill is included is Section 02200.

B. Granular fill materials are included in Section 02200.

C. Cast-in-place concrete and reinforcing steel is included in Section 03301.

1.03 SUBMITTALS

A. Submit to the Engineer shop drawings as provided in Section 01300, showing details of construction, reinforcing, joints, pipe connection to manhole, manhole rungs, manhole frames and covers.

1. Base sections, riser sections, and conical top sections with notarized certificate indicating compliance with ASTM C478.

2. Pipe connection to manhole.

3. Manhole steps, including method of installation and notarized certificate indicating compliance with pull-out resistance test specified in this Section.

4. Manhole frame and cover with notarized certificate indicating compliance with ASTM A48, Class 30.

5. Method of repair for minor damage to precast concrete sections.

B. Structural computations as specified herein.

C. Submit P.E. Certification form as appended to Section 01300 to indicate compliance with the requirements of this Section.

1.04 REFERENCE STANDARDS

A. MassDOT Standard Specifications for Highways and Bridges, latest edition, including new addenda.

B. City of Worcester Department of Public Works & Parks Standard Construction Specifications and Details, latest revision.

C. 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.

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 D4101 - Standard Specification for Propylene Plastic Injection and Extrusion Materials.

D. American Concrete Institute (ACI)

1. ACI 318 - Building Code Requirements for Reinforced Concrete

2. ACI 350R - Environmental Engineering Concrete Structures

E. American Association of State Highway and Transportation Officials (AASHTO)

1. Standard Specifications for Highway Bridges

F. Occupational Safety and Health Administration (OSHA)

G. 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. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer, or other representative of the Owner. Such

inspection may be made at the place of manufacture, or on the work after delivery, or at both places, and the materials shall be subject to rejection at any time on account of failure to meet any of the Specification requirements; even though samples may have been accepted as satisfactory at the place of manufacture. Material rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All materials which have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced, entirely at the Contractor's expense.

B. At the time of inspection, the materials will be carefully examined for compliance with the ASTM designation specified below and these Specifications, and with the approved manufacturer's drawings. All manholes, headwalls, and structures shall be inspected for general appearance, dimension, "scratch-strength", blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

C. Imperfections in manholes and headwalls may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at 7 days and 5,000 psi at 28 days, when tested in 3-in by 6-in cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

PART 2 PRODUCTS

2.01 MANHOLES

A. All manhole materials shall conform to the City of Worcester Standards referenced above.

B. Precast concrete barrel sections and transition top sections, shall conform to Specifications for Precast Reinforced Concrete manhole 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 and 7 in for 72-in diameter reinforced barrel 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. 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.

5. The date of manufacture and the name and trademark of the manufacturer shall be clearly marked on the inside of each precast section.

C. The minimum compressive strength of the concrete for 4-foot, 5-foot and 6-foot diameter manholes for all sections shall be 5,000 psi.

The circumferential steel reinforcement for riser pipe, cone sections and base walls for the various sized manholes shall be as required by ASTM C478.

D. Minimum reinforcing in the bottoms of bases shall be of the same design as that required for the various sized manholes. Reinforcing shall extend into the tongue and groove of each manhole section.

E. Each section of the precast manhole shall have two holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with hydraulic cement after installation.

F. Prevent flotation, with groundwater level at finished ground surface, by dead weight of structure and of soil directly above structure. Do not consider skin friction, soil friction, or weight of equipment in structure. Minimum factor of safety shall be 1.15 for buoyancy.

2.02 PRECAST CONCRETE HEADWALL

A. Structural design calculations and fabrication drawings shall be prepared and stamped by a professional engineer registered in the Commonwealth of Massachusetts.

B. The headwall shall be precast concrete components manufactured by Oldcastle Infrastructure, CSI Concrete Systems, Inc., or equal.

C. The headwall and wingwalls shall be supported on precast concrete footings. The footings shall have keys, notches, connections, or other positive means of shear transfer between the footings and the headwall components. The footings shall bear a minimum of four feet below the adjacent ground surface for frost protection.

D. Lifting devices shall be provided for handling and installation.

E. Testing of the concrete used in the headwall and footings shall be in accordance with the concrete testing provisions specified for box sections in ASTM C789.

F. Design Criteria
   1. All exterior walls shall be designed for an equivalent fluid pressure in accordance with the AASHTO provisions for retaining walls. The top of the pressure diagram shall be assumed to originate at finished ground level. Additional lateral pressure from approaching truck wheels shall be considered in accordance with AASHTO.

2.03 PARTICLE SEPARATORS

A. The particle separators shall be Vortechs Stormwater Treatment System, Model 4000 for Park Avenue, Model 7000 for the 18-inch Boynton Street drain and Model 11000 for the Boynton Street 24-inch drain, manufactured by Contech Engineered Solutions, or equal.

B. Performance data and references shall be made available to the Engineer upon request to determine that the system meets the design criteria and performance requirements stated in these specifications.

C. Design Criteria

   1. Performance objective: To remove 80 percent of the average annual load of total suspended solids (TSS) from stormwater.

2. Design flows:

Particle Separator		Peak Flow
1	Park Avenue	5 cfs
2	Boynton Street	10 cfs
3	Boynton Street	16 cfs

D. The particle separators shall be capable of containing spills of floatable substances such as oil and gasoline.

E. The particle separators shall not be compromised by temporary backwater conditions or by flow rates up to and including the design flow rates listed above (i.e., trapped pollutants should not be re-suspended and scoured from the system during backwater conditions or at flow rates up to and including those listed above).

F. The manhole risers and frames and covers and flush-mount frames and covers for the particle separators shall be provided by the manufacturer.

G. The particle separators shall be easy to maintain. There shall be no obstructions in the sediment and floatable contaminant storage chambers which hinder maintenance.

H. Particle separators shall have a minimum of three (3) access points for inspection and maintenance.

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.

B. Bricks shall comply with the latest specifications of ASTM C32 for Sewer Brick, Grade SA.

C. Mortar used in the brick work shall be composed of Portland cement and sand, in which the volume of sand shall not exceed three (3) times the sum of the volume of cement and lime. The proportions of cement and lime shall be 1-1/4. Cement shall be Type II.

D. Sand shall conform to ASTM C144, be washed, cleaned and screened. 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 FRAME AND COVER

A. Manhole frames and covers shall conform to the City of Worcester Department of Public Works & Parks Standard Construction Specifications and Details, as shown on the Drawings. Manhole frames and covers 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 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-inch letters as appropriate. Manhole frames and covers shall be supplied by East Jordan Iron Works, Inc. – LeBaron Foundry, or approved equal, and shall be Model EJIW 1056Z frame and EJIW 1056A cover or LeBaron LC239/L23C-1, or equal.

2.06 JOINTING PRECAST MANHOLES

A. Tongue and groove joints of precast 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.

2.07 MANHOLE STEPS

A. Manhole steps shall be aluminum drop-front type as manufactured by Alcoa Aluminum Company,or approved equal.

2.08 PIPE CONNECTIONS

A. Pipe connections may be accomplished using a tapered hole filled with non-shrink waterproof grout, Hallemite, Waterplug, Embeco or equal, after the pipe is inserted is acceptable, provided the grout is placed carefully to completely fill around the pipe. If this method is used, place concrete encasement to assure a total 12-in of concrete including manhole thickness around the pipe stub.

2.09 DAMPPROOFING

A. The dampproofing shall be Hydrocide 648 by Sonneborn Building Products, Dehydratine 4 by A.C. Horn Inc., RIW Marine Liquid by Toch Brothers, or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Manholes, Headwall and Particle Separators

1. Construct to the dimensions shown on the Drawings in accordance with the City of Worcester Department of Public Works & Parks Standard Construction Specifications and Details, and as specified in these Specifications. All work shall be protected against flooding and flotation.

2. The bases of manholes and headwall shall be placed on a bed of 12-in minimum screened gravel as shown on the Drawings. The manhole bases shall be set at a grade to assure that a minimum of 12-in thickness of brickwork will bring the manhole frame and cover to final grade except as shown on the Drawings. Cast-in-place concrete 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 4000 psi.

3. Precast concrete barrel sections 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% 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, the inside joints shall be caulked with lead wool to the satisfaction of the 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 Step Installation

1. All steps shall be cast into walls of the precast sections so as to form a continuous ladder with a distance of 12 inches between steps.

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 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 12-in thick, shall be utilized to 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 structures shall be given two coats of bituminous dampproofing at the rate of 30-60 sq ft per gallon as directed by the Engineer and in accordance with manufacturer's instructions.

3.02 LEAKAGE TESTS

A. Leakage Tests for Drain Manholes and Particle Separators

1. The Engineer will visually inspect manholes and particle separators for possible leaks before backfilling is allowed. All joints shall be sealed to the satisfaction of the Engineer.

3.03 CLEANING

A. All new manholes and particle separators shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION

SECTION 02608

PRECAST REINFORCED CONCRETE BOX CULVERT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all plant, labor, materials and equipment required and perform all operations in connection with construction of the precast reinforced concrete box culvert complete in place, within the limits and to the lines and grades shown on the Drawings.

1.02 RELATED WORK

A. Earth excavation and backfill is included in Section 02200.

B. Concrete, concrete reinforcement and joints are included in Section 03301.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, prior to fabrication of the box culvert sections, shop drawings, a schedule of section lengths for the project. All precast sections furnished under this Contract shall be fabricated in full accordance with the approved shop drawings.

B. Prior to fabrication of the precast box culvert, submit drawings and design calculations stamped by a professional structural engineer registered in the Commonwealth of Massachusetts to the Engineer for review.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C33 - Standard Specification for Concrete Aggregates.

2. ASTM C150 - Standard Specification for Portland Cement.

3. ASTM C1433 - Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers.

B. 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. Precast Box Culverts

1. The precast reinforced box culvert shall be made up of sections of monolithically cast concrete. The box sections shall have internal dimensions as shown on the Drawings and

shall have a male and female end with sufficient overlap to allow a 1-in diameter neoprene gasket or a joint sealant to be cemented to the joint surface. Successive sections shall be bolted together on the inside surface with a minimum of three 7/8-in diameter equally spaced and recessed bolts. Bolt holes shall be grouted over after assembly so as to maintain a smooth inside wall surface and in no way restrict the flow in the completed installation. The precast concrete sections shall, as a minimum, conform to ASTM C1433 and shall be designed for a minimum of HS20 live loading and earth loading as shown on the Drawings. Lateral pressure shall be taken as 0.50 times the vertical soil pressure in addition to hydrostatic pressure resulting from maximum external water table assumed at finished ground surface.

2. Portland cement conforming to ASTM C150, Type II or III shall be used, except as otherwise approved in writing by the Engineer. The use of a non-bleeding, water-reducing, dispersing agent and air-entraining admixture shall be used. The use of any other admixture will not be permitted.

3. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33, except for gradation, with a maximum loss of 8.0 percent when subjected to 5 cycles of the soundness test using magnesium sulfate.

4. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33, except for gradation, with a maximum loss of 8.0 percent when subjected to 5 cycles of the soundness test using magnesium sulfate.

5. The 28-day compressive strength of the concrete, as indicated by cores cut from the culvert shall not be less than 5000 psi. The concrete mass shall be dense and uniform. Minimum reinforcement in the box culvert shall be as required by ASTM C1433.

6. The quality of all materials and the finished culvert shall be subject to inspection and approval by the Engineer, or other representative of the Owner. Such inspection may be made at the place of manufacturer, or on the work after delivery or at both places and the culvert shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though sample culverts may have been accepted as satisfactory at the place of manufacturer. Culvert rejected after delivery shall be marked for identification and shall be removed from the job at once. The Contractor shall require the manufacturer's cooperation in these inspections.

7. The Engineer shall have the right to cut cores form such pieces of the finished culvert as he desires for such inspection and test as he may wish to apply. Cores shall be obtained, capped and sealed in conformity with ASTM C1433. Core drilling and filling shall be carried out by the culvert manufacturer at his expense.

8. The Engineer shall inspect all box sections for quality and compliance with ASTM C1433 and with the approved manufacturer's drawings. The manufacturer shall inspect all culvert joints for uniformity and culvert ends for squareness. The manufacturer shall furnish to the Engineer a notarized affidavit stating all culverts meet the requirements of ASTM C1433, this Section and the joint design with respect to square ends and uniform joint surfaces.

9. Pits, blisters, rough spots, breakage and other imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Non-

shrink cement mortar used for repairs shall have a minimum compressive strength of 4000 psi at the end of 7 days and 6000 psi at the end of 28 days, when tested in 3-in cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

10. Unsatisfactory or damaged culvert will be either permanently rejected or returned for minor repairs. Only that culvert actually conforming to the specifications and accepted will be listed for approval, shipment and payment. Approved culvert will be so stamped or stenciled on the inside before it is shipped. All culverts which have been damaged after delivery will be rejected and if such culvert has already been laid in the trench, it shall be acceptably repaired, if permitted, or removed and replaced, entirely at the Contractor's expense. Culvert may be rejected for any of the reasons indicated in ASTM C1433.

11. The precast box culvert shall be placed on a bed of 12 in of screened gravel as described in Section 02200. The gravel shall be spread upon the prepared subgrade and compacted to the required thickness by rollers, crawler tractors or mechanical tampers subject to the approval of the Engineer. Compaction shall continue until the surface is even and true to the proposed lines and grades.

12. Joints for concrete box culvert shall conform to ASTM C1433. The ends of the box sections shall be so formed that when the sections are laid together they will make a continuous line of box sections with a smooth interior free of appreciable irregularities in the flow line.

13. Joint sealant shall be Kent-Seal No. 2 by Hamilton Kent Co., Kent OH or equal. Joint sealant shall conform to Fed. Spec. SS-S-00210.

PART 3 EXECUTION

3.01 INSTALLATION OF PRECAST CONCRETE BOX CULVERT

A. Screened gravel as specified, shall be placed and compacted to give complete vertical and lateral support for the lower section of the culvert as indicated on the Drawings. Before the culvert is lowered into the trench, the ends of the box sections must be cleaned and free from dirt. The box culvert shall be installed in full accordance with the manufacturer's instructions. The box culvert shall be properly aligned in the trench to avoid any possibility of contact with the side of the trench and to permit feeding the gasket. As soon as the tongue is centered in the groove of the box culvert, the section shall be connected, drawn and held together using the three 7/8-in diameter bolts supplied by the manufacturer. Under no circumstances shall crowbars alone be used nor shall any motor driven equipment be used for the purpose of drawing culvert sections together. The culvert manufacturer shall furnish information for the installation of the culvert.

B. Holes in the concrete box culvert sections required for handling or other purposes shall be plugged with a non-shrink grout or in combination with concrete plugs, and finished flush on the inside. The interior joints of all box culverts shall be filled with non-shrink grout after backfilling and testing are completed. Grout shall consist of one part by volume of cement, 1-1/2 parts by volume of sand, conforming to ASTM C33 and ¼ part by volume of EMBECO or equal. The mixture shall have a dry, crumbly consistency and shall be pounded into place and troweled to make a smooth joint.

C. Dampproofing

1. Outer surfaces of precast box culvert shall be given two coats of bituminous dampproofing at the rate of 30 to 60 sq ft per gallon as directed by the Engineer and in accordance with manufacturer's instructions.

3.02 LEAKAGE TESTS

A. Leakage Tests for Box Culverts

1. The Engineer will visually inspect box culverts for possible leaks before backfilling is allowed. All joints shall be sealed to the satisfaction of the Engineer.

3.03 CLEANING

A. At the conclusion of the work, thoroughly clean all new box culverts to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period.

END OF SECTION

SECTION 02612

REINFORCED CONCRETE DRAIN PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary and install and test reinforced concrete pipe for drains complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Excavation and backfilling are included in Section 02200.

B. Granular materials are included in Section 02200.

1.03 SUBMITTALS

A. Within 30 days of the Effective Date of the Agreement submit the name of the pipe and fitting supplier and a list of materials to be furnished.

B. Submit, in accordance with Section 01300, shop drawings showing layout and details of reinforcement, joint, method of manufacture and installation of pipe, specials and fittings, and a schedule of pipe lengths by diameter for the entire job.

1.04 REFERENCE STANDARDS

A. MassDOT Standard Specifications for Highways and Bridges, latest edition, including all addenda.

B. American Society for Testing and Materials (ASTM)

1. ASTM C33 - Standard Specification for Concrete Aggregates.

2. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

3. ASTM C150 - Standard Specification for Portland Cement.

4. ASTM C361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.

5. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

6. ASTM E329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

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. Reinforced concrete pipe manufactured for this Contract may be inspected at the plant for compliance with this Section by an independent testing laboratory provided by the Owner. The manufacturer's cooperation in these inspections shall be required. The cost of this 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.

B. Inspection of the pipe will 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 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 REINFORCED CONCRETE PIPE

A. Except as otherwise specified herein, pipe shall conform to ASTM C76, Class III, Wall B or C, and Section M5.02.1 of the MassDOT Standard Specifications for Highways and Bridges. The pipe interior shall be smooth and even, free from roughness, projections, indentations, offsets, or irregularities of any kind. The concrete mass shall be dense and uniform.

B. Cement shall be non-air-entraining portland cement conforming to ASTM C150, Type II. The use of any admixture shall be subject to the specific approval of the Engineer.

C. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33, except for gradation, with a maximum loss of 8 percent when subjected to 5 cycles of the soundness test using magnesium sulfate. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33, except for gradation, with a maximum loss of 8 percent when subjected to 5 cycles of the soundness test using magnesium sulfate.

D. The 28-day compressive strength of the concrete, as indicated by cores cut from the pipe shall be equal to or greater than the design strength of the concrete. The concrete mass shall be dense and uniform. Reinforcement shall be circular for all concrete pipe. Quadrant steel shall not be used. Reinforcement shall be installed in both the bell and the spigot. At least one circumferential reinforcement wire shall be in both the bell and spigot area and reinforcement in the bell and spigot shall be adequate to prevent damage to concrete during shipping, handling and after installation. When cores indicate that reinforcing steel has less than 85 percent bond the pipe shall be subjected to a 3-edge bearing test to 13 psi to verify strength and water tightness.

E. Pipe may be rejected for any of the following reasons:

1. Exposure of any steel reinforcement in any surface of the pipe.

2. Transverse reinforcing steel found to be in excess of 1/4-in out of specified position after the pipe is molded.

3. Any shattering or flaking of concrete at a crack.

4. Voids, with the exception of a few minor bugholes, on the interior and exterior surfaces of the pipe exceeding 1/4-in in depth unless properly and soundly pointed with mortar or other approved material.

5. Unauthorized application of any wash coat of cement or grout. Any pipe dressing procedures shall be subject to approval of the Engineer.

6. A hollow spot (identified by tapping the internal surface of the pipe) which is greater than 30-in in length or wider than 3 times the specified wall thickness. Repair of such defective areas not exceeding these limitations may be made as specified in Paragraph 2.01R.

7. Defects that indicate imperfect molding of concrete; or any surface defect indicating honeycomb or open texture (rock pockets) greater in size than area equal to a square with a side dimension of 2-1/2 times the wall thickness or deeper than two times the maximum graded aggregate size; or local deficiency of cement resulting in loosely bonded concrete, the area of which exceeds in size the limits of area described in Paragraph 2.01E9 above when the defective concrete is removed. Repair of such defects not exceeding these limits may be made as specified in Paragraph 2.01R.

8. Any of the following:

    a. A crack having a width of 0.005 to 0.01 in throughout a continuous length of 36-in or more.

    b. A crack having a width of 0.0 to 0.03 in or more throughout a continuous length of 1 ft or more.

    c. Any crack greater than 0.005 in extending through the wall of the pipe and having a length in excess of the wall thickness.

    d. Any crack showing two visible lines of separation for a continuous length of 2 ft or more, or an interrupted length of 3 ft or more anywhere in evidence, both inside and outside.

    e. Cracks anywhere greater than 0.03 in in width.

F. The pipe shall be clearly marked as required by ASTM C76 in a manner acceptable to the Engineer. The markings may be at either end of the pipe for the convenience of the manufacturer, but for any one size shall always be at the same end of each pipe length. Pipe shall not be shipped until the compressive strength of the concrete has attained 4,000 psi.

G. Pipe shall have a minimum laying length of approximately 8 ft, except for closure and other special pieces as approved by the Engineer. Have available at the site of the work sufficient pipe of various lengths to affect closure at manholes or structures that cannot be located to accommodate standard lengths. Short lengths of pipe made for closure etc., may be used in the pipeline at the end of construction if properly spaced. The length of the incoming and outgoing concrete pipe at each structure shall not exceed 4 ft, except where the joint is cast flush with the exterior wall of the structure, where steel wall fittings are provided or where otherwise noted on the Drawings. Maximum laying length shall not exceed 16 ft, but the installation of 16-ft lengths will depend upon the ability to handle such lengths of pipe in sheeted trenches, comply

with trench width requirements, maintain the integrity of the sheeting and avoid disturbance to adjacent ground. If in the opinion of the Engineer the use of 16-ft lengths is impracticable, shorter lengths shall be used.

H. Each length of pipe shall be checked against the length noted on the shop drawings. Pipe more than 1-1/2 in longer than that shown on the shop drawings shall not be used on this project. Variations in length of the same pipe shall not exceed ASTM C76 requirements.

I. During manufacturing, measuring devices shall be used to assure joint assembly is within the tolerance of ASTM C76 and this Section.

J. The Engineer shall have the right to take samples of the concrete after it has been mixed or as it is being placed in the forms or molds and to make such inspection and tests thereof as he/she may wish.

K. At the start of the work, a set of test cylinders shall be taken each day on which pipe is manufactured for the project or more often if required. This may ultimately be reduced to one set of three specimens for every 50 cu yds of concrete placed, if the uniformity of results warrants and if approved by the Engineer. At the start of the work, a relationship shall be established between ultimate strength of test cylinders stored in a standard manner as compared to cylinders steam cured with the pipe and as compared to cores taken from the corresponding finished pipe. At least five sets of tests shall be made.

L. The Engineer shall have the right to cut cores from such pieces of the finished pipe as he/she selects for inspection and such tests as he/she may wish to apply. Holes left by the removal of cores shall be filled in an approved manner by and at the expense of the manufacturer. Core drilling shall be carried out by the pipe manufacturer at his/her expense. The number of cores shall not exceed the requirements of ASTM C76.

M. Test cores may be taken for every 500 linear feet of pipe manufactured, but not less than once each day on which pipe is manufactured for the project. Cores may be reduced to one set of two per week (or possibly fewer, but not less than one set for every 1,500 linear feet), if a satisfactory relationship is established between cores and cylinders made and cured in the standard manner. This relationship shall not vary by more than 10 percent more or less from the average ratio. Cores may be drilled in any manner which will provide a smooth core face. All pipe cylinders and cores shall be 4 in in diameter. Cores shall be carefully saw-trimmed and capped in a vertical position with a sulfur cap of minimum thickness, at least one day before being tested.

N. Core testing shall conform to Standard ASTM Methods.

O. At the time of inspection, the pipe will be carefully examined for compliance with the appropriate ASTM standard, as specified herein and shop drawings. All pipes shall be inspected for general appearance, dimension, "scratch-strength," blisters, cracks, roughness, soundness, etc. All pipes will be checked for soundness by being tapped and scratched at least once on every 50 sq in of pipe surface. The surface shall be dense and close-textured. Cores also shall serve as a basis for rejection of pipe, particularly if lamination or poor bond of reinforcement is apparent.

P. The manufacturer shall use measuring devices to assure joint assembly is within tolerances of ASTM C76 and as specified herein. If, during construction, the pipes cannot be satisfactorily joined, the manufacturer shall pre-join the pipe at the plant.

Q. Unsatisfactory or damaged pipe will be either permanently rejected or returned for minor repairs. Only that pipe actually conforming to the specifications and accepted will be listed for approval, shipment and payment. Approved pipe will be so stamped or stenciled on the inside before it is shipped. All pipe which has been damaged after delivery will be rejected and if such pipe already has been laid in the trench, it shall be acceptably repaired, if permitted, or removed and replaced, entirely at the Contractor's expense.

R. Pits, blisters, rough spots, breakage and other imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Non-shrink cement mortar used for repairs shall have a minimum compressive strength of 6,000 psi at the end of 7 days and 7,000 psi at the end of 28 days, when tested in 3-in cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

2.02 JOINTS FOR CONCRETE PIPE

A. Joints shall be concrete and rubber tongue and groove or bell and spigot type joint conforming to ASTM C361 with provisions for using a round rubber O-Ring gasket in a recess in the spigot end of the pipe. The bevel on the bell of the pipe shall be between 1-1/2 degrees and 2-1/2 degrees. The diameters of the joint surfaces which compress the gasket shall not vary from the true diameters by more than 1/16-in.

B. The round rubber O-Ring gaskets shall conform to ASTM C443 except as otherwise specified herein. Two gaskets shall be submitted to the Engineer for tests at least 30 days before joining any the pipe.

C. The ends of the pipe shall be made true to form and dimension and the bell shall be made by casting against steel forms. The manufacturer shall inspect all pipe joint surfaces for out-of-roundness and pipe ends for squareness. The manufacturer shall furnish to the Engineer a notarized affidavit stating all pipe meets the requirements of ASTM C76, as specified herein and the joint design.

PART 3 EXECUTION

3.01 LAYING CONCRETE PIPE

A. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe or fittings and the joint surfaces. 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.

B. As soon as the excavation is completed to the normal grade of the bottom of the trench, place screened gravel in the trench and the pipe shall be firmly bedded in this gravel to conform accurately to the lines and grades indicated on the Drawings. Screened gravel shall conform to the requirements of Section 02200. Blocking under the pipe will not be permitted.

C. Screened gravel shall be placed and compacted to give complete vertical and lateral support for the lower section of the pipe as indicated on the Drawings. A depression shall be left in the

supporting gravel at the joint to prevent contamination of the rubber gasket immediately before being forced home. Before the pipe is lowered into the trench, the spigot and bell shall be cleaned and free from dirt. Gasket and bell shall be lubricated by a vegetable lubricant which is not soluble in water, furnished by the pipe manufacturer and harmless to the rubber gasket. The pipe shall be properly aligned in the trench to avoid any possibility of contact with the side of the trench and fouling the gasket. As soon as the spigot is centered in the bell of the previously laid pipe, it shall be forced home with jacks or come-alongs. After the gasket is compressed and before the pipe is brought fully home, each gasket shall be carefully checked for proper position around the full circumference of the joint. Steel inserts shall be used to prevent the pipe from going home until the feeler gauge is used to check the final position of the gasket. The jacks or come-alongs shall be anchored sufficiently back along the pipeline (a minimum of five lengths) so that the pulling force will not dislodge the pieces of pipe already in place. Only a jack or come-along shall be employed to force the pipe home smoothly and evenly and hold the pipe while backfilling is in progress. Under no circumstances shall crowbars be used nor shall any of the motor-driven equipment be used.

D. As soon as the pipe is in place and before the come-along is released, backfill shall be placed as indicated on the Drawings and compacted for at least one-half the length of pipe. Not until this backfill is placed shall the come-along be released. If any motion at joints can be detected, a greater amount of backfill shall be placed before pressure is released. When pipe laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by a watertight plug or other approved means.

E. Carefully regulate the equipment and construction operations such that the loading of the pipe does not exceed the loads for which the pipe is designed and manufactured. Any pipe damaged during construction operations shall promptly and satisfactorily be repaired or replaced at the Contractor's expense.

3.02 CLEANING

A. The pipe shall be thoroughly cleaned to remove all dirt, debris, wood and stones after installation.

END OF SECTION

SECTION 02627

PIPE COUPLINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment and incidentals required to connect new gravity pipe to existing pipe complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Earthwork is specified in Section 02200.

B. Reinforced concrete drain pipe is specified in Section 02612.

C. Concrete and reinforcing steel are specified in Section 03301.

1.03 SUBMITTALS

A. Submit to the Engineer, as provided in Section 01300, the name of the manufacturers and model number of all materials to be furnished.

PART 2 PRODUCTS

2.01 MATERIALS

A. Flexible sleeve type couplings to connect different pipe types shall be of corrosion resistant rubber or PVC with Series 300 stainless steel clamp bands. Flexible sleeve type couplings shall be as manufactured by Fernco, Mission Rubber Company, Inc., Calder, or equal. All stainless steel bands shall be coated with bitumastic.

B. Flexible donut type couplings to connect different pipe types shall be of corrosion resistant rubber or PVC. Flexible donut type couplings shall be as manufactured by Fernco or equal.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPE COUPLINGS

A. Existing pipe shall be excavated with care so no damage to the pipe or existing fittings is caused. Hand digging around the existing pipe may be required to provide a clear opening for repairing or removing and reinstalling new pipe as specified herein.

B. All couplings shall be examined before installation and none shall be installed which are found to be defective.

C. Installation of all couplings shall be in accordance with manufacturer's instructions and as specified herein.

D. Any damage to existing pipe or fittings other than pipe or fittings specifically intended to be removed, replaced or abandoned as part of this Contract shall be repaired by the Contractor as directed by the Engineer. If the Contractor damages existing pipe or fittings through error or for his own convenience, he will be directed by the Engineer to repair all damages, in which case the repair work shall be performed at his own expense.

E. Flexible sleeve type couplings and donut type couplings shall be installed for connecting new PVC, RC or DI pipe and fittings to existing pipe or service connections made of any pipe material.

F. Flexible sleeve type couplings shall be installed over smooth spigot or cut ends of pipe. If cutting pipe is required, the cutting shall be done by machine or tool specifically intended for the purpose of cutting the type of pipe being worked on. All cutting of pipe shall be at right angles to the axis of the pipe and shall be performed so as to leave a smooth cut.

END OF SECTION

SECTION 02668

CONNECTIONS TO AND WORK ON THE EXISTING SYSTEM

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment required and maintain flow in existing drains, handle existing drain flow, construct and maintain all temporary connections and bypasses and construct the permanent connections to the new system as shown on the Drawings and as directed by the Engineer.

B. Should damage of any kind occur to the existing drain, at the Contractor's own expense, make repairs to the satisfaction of the Engineer.

C. Notify the Engineer immediately of any discrepancies in elevations of existing drains and manholes between those shown on the Drawings and those established during construction in order that the Engineer can make the necessary modifications.

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

B. Concrete manholes are specified in Section 02605.

C. Precast reinforced concrete box culvert is specified in Section 02608.

D. Concrete is specified in Section 03301.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 the proposed procedure for maintaining flows in the existing drain systems.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 HANDLING STORMWATER FLOWS

A. Furnish all labor, equipment and materials necessary to maintain existing flows, including temporary bypasses and all pumping of drainage that may be required to prevent backing up of drains and immediately cart away and remove all offensive matter at Contractor's own expense.

B. Permission will not be given to overflow, bypass, pump or by any other means convey drainage to any brook, or other watercourse without permission of the Engineer.

END OF SECTION

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SECTION 02830

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This work includes the installation of PVC-coated chain link fencing and swing gates in accordance with these specifications and in conformity with the details, lines and grades shown on the plans or established.

PART 2 PRODUCTS

2.01 MATERIALS

A. CHAIN LINK FENCE (BLACK PVC)

1. 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**.**

2. Posts for all fences shall be anchored directly into new concrete footings as shown on the Drawings.

3. 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:

a. Fence Posts and Rails

1) 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.

2) 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.

3) Boulevard socket-type clamps or other approved means shall be provided for attaching the top rail to each gate, corner, pull, and end post.

4) Bottom rails shall be provided between all posts with means for attaching rail to each post. Fence bottom rail and fabric shall be set 6 in above finish grade to allow for movement of wildlife. 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.

5) 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

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

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

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

** Fence bottom rail and fabric shall be set 6-in above finish grade to allow for movement of wildlife.

B. FENCE FABRIC:

1. 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.

2. Polyvinylchloride (PVC) Finish: Comply with ASTM F934, with core wire diameter (gauge) measured prior to application of PVC coating.

3. 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 shall exhibit equal or greater strength than the cohesive strength of the vinyl. All cut ends shall be coated with vinyl at the factory.

4. Fabric shall have top and bottom selvage knuckled.

5. 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.

6. Fence Fabric for all fences shall be as follows:

a. 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.

b. 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.

C. FENCE ACCESSORIES

1. 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.

2. 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.

3. Fittings shall be steel conforming to ASTM A370 and galvanized in conformance with ASTM A123.

4. 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.

5. 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.

6. 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.

D. SWING GATES

1. Gate Configuration: Double leaf.

2. Gate Frame Height: 48 inches.

3. Gate Opening Width: 12’-0” inches.

4. Galvanized-Steel Frames and Bracing: Fabricate members from square tubes 2 by 2 inches formed from 0.108-inch nominal-thickness, metallic-coated steel sheet or formed from 0.105-inch nominal-thickness steel sheet and hot-dip galvanized after fabrication.

5. Additional Rails: Provide as indicated, complying with requirements for fence rails.

6. Infill: vinyl (PVC) coating color black fence fabric matching adjacent fence.

7. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.]

8. Padlock to be keyed to specifications provided by Owner.

9. Hinges: BHMA A156.1, Grade 1, suitable for exterior use.

10. Function: 39 - Full surface, triple weight, antifriction bearing.

11. Material: Wrought steel, forged steel, cast steel, or malleable iron; galvanized.

12. Finish exposed welds to comply with NOMMA Guideline 1, Finish #3 - partially dressed weld with splatter removed.

13. Metallic-Coated-Steel Finish: High-performance coating.

E. CONCRETE AND GROUT FOR FENCE POSTS

1. 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.

2. Grout for Fence Posts

3. Grout shall be "Sikadure 32 HiMod" as manufactured by Sika Corporation, Lyndhurst, NJ or approved equal. Grout shall be in accordance with the following:

   a. Compressive Properties (ASTM D695) at 28 days.
   b. Tensile Properties (ASTM D638) at 14 days.
   c. Flexural Properties (ASTM D790) at 14 days.
   d. Shear Strength (ASTM D732) at 14 days: 5,000 PSI min.
   e. Total Water Absorption (ASTM D570) at 7 days: 1.0% max. (2-hour boil).
   f. Bond Strength (ASTM C882) Hardened Concrete to Hardened Concrete.
   g. 2 day (dry cure): 2700 PSI min.
   h. 14 day (moist cure) 2200 PSI min.
   i. Deflection Temperature (ASTM D648) at 14 days: 102 deg F min. (fiber stress loading = 264 PSI).
   j. 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 ¼-inch max. Tensile Stress: 90,000 PSI min. (rebar fracture).

PART 3 EXECUTION

3.01 EXAMINATION

A. Consider using sleeves to leave voids in new concrete substrates.

B. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.

C. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

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

3.02 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, underground structures and benchmarks..

3.03 FENCE INSTALLATION

A. Install fences according to manufacturer’s written instructions.

B. Post-Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches plus 3 inches for each foot or fraction of a foot that fence height exceeds 4 feet.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
   1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

   2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

   3. Posts Set in Concrete: Extend post to within 6 inches of specified excavation depth, but not closer than 3 inches to bottom of concrete.

   4. Space posts uniformly at 8 feet on-center.

3.04 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.05 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION

SECTION 02850

SITE IMPROVEMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide all labor, equipment 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. Interpretive signs

1.02 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 mock-up graphics, sample colors, and surfacing finishes 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.

1.03 CLEANUP

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.

1.04 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 INTERPRETIVE SIGNS

A. Similar to existing interpretive signs on the Institute Park boardwalk, interpretive signs shall be double-post pedestal, surface mounted, as manufactured by Fossil Industries, 44 Jefryn Boulevard, Deer Park, NY 11729, Phone: 631.254.9200, or approved equal.

1. Signs shall be of solid, composite panels to be fire retardant, impervious to moisture, UV radiation, scratching, impact, and graffiti. UV inhibitor shall have a 10-year min. warranty for outdoor applications.

2. Laminate shall be manufactured with a smooth sub-surface image printed with 12-color high definition printing technology, and bonded with a ¾" total panel thickness.

a. Laminate shall be a Custom High-Pressure Decorative Laminate consisting of decorative surface papers, impregnated with melamine resins, bonded under heat and pressure to kraft papers impregnated with phenolic resins.

3. Finish shall be semi-gloss with a reflectivity of 30 +- 5 units.

B. Each panel shall be mounted on a black powder-coated aluminum pedestal, surface-mounted with a 45-degree viewing angle and a height of 44.5" +_ at the mounting point. Pedestal shall be Fossil Industries DP 1212 or approved equal.

1. Upper mounting plate shall be 12" x 12" x 3/16" aluminum plate.

2. Post shall be 3"x3" aluminum.

3. Bottom plate shall be 6" x 6" with 5/8" surface-mounting holes.

C. Owner shall provide graphics to the Contractor. Contractor shall coordinate the timing for final development of graphics and installation with the manufacturer.

D. Furnish a minimum of two sign panels for the one sign location. One sign panel shall be installed at project completion, and one shall be returned to Owner for storage.

PART 3 EXECUTION

3.01 INTERPRETIVE SIGNS

A. Install interpretive signs at the location shown on the Drawings. Install interpretive signs with upright vertical posts in accordance with manufacturer's recommendations.

B. Prior to installation, stake sign locations in the field for review and approval by the Owner.

END OF SECTION

SECTION 02900

PLANTING

PART 1 GENERAL

1.01 SCOPE

A. The work of this section consists of furnishing and planting all trees and related items as indicated on the Plant List and Drawings and/or as specified herein and includes, but is not limited to, the following:

1. Loam Borrow
2. Planting Soil Mix
3. Plant Material
4. Mulch
5. Fertilizer
6. Staking, Guying and Anchoring Material
7. Water
8. Planting Season
9. Planting Locations
10. Excavation and Preparation of Tree Pits
11. Pruning
12. Preliminary Acceptance
13. Establishment Period
14. Guarantee

B. The work to be done under this section shall require the Contractor to provide all labor, material, equipment, and transportation necessary for the furnishing and planting of trees as specified herein.

1.02 RELATED WORK

A. Loaming and hydroseeding are included in Section 02930.

1.03 STANDARDS AND DEFINITIONS

A. The following standards and definitions shall apply to the work of this Section.

1. ASNS: “American Standard for Nursery Stock,” ANSI 260.1, latest edition. published by the American Association of Nurserymen, (AAN).

2. SPN: “Standardized Plant Names”. latest edition, by the American Joint Committee on Horticultural Nomenclature.

3. AOAC: “Association of Official Agricultural Chemists”.

4. MassHighway Standard Specifications for Highways and Bridges, Latest Edition and all addenda and supplements thereto.

5. Pruning Standards: ANSI A300 Practices for Trees, Shrubs & Other Woody Plant Maintenance: Secretariat, National Arborist Association, PO Box 1094 Amherst NH 03031

6. "Owner" shall mean the Owner's designated representative- "Landscape Architect", "Engineer", or "Superintendent" as referenced herein, rendering approvals for the Owner.

7. "Contractor" as referenced herein, shall mean the contractor furnishing and planting the trees and performing all other related work of this contract.

1.04 SAMPLES AND SUBMITTALS

A. At least thirty (30) days prior to intended use, the Contractor shall provide the following samples and submittals for approval. Do not order materials until Owner's approval of submittal has been obtained. Delivered materials shall closely match the approved samples. Should the source of supply be changed within the course of the contract, the Contractor shall submit new samples or submittals for approval per the original submission.

1. Plant Material: Contractor shall provide written certification as to source of plant material and species/cultivars to be supplied.

2. Loam Borrow: The Contractor shall provide samples as necessary for the testing laboratory's use, from each proposed source.

3. Fertilizer: Submit one (1) sample packet of fertilizer and six certificates showing composition and analysis for fertilizer, also submit invoices of total purchased material for this contract.

4. Planting Mulch: Submit a one- (1) cubic foot sample.

5. Tree Staking Accessories – Submit manufacturer's literature and sample.

6. Suppliers receipted invoices for moisture retention material and fertilizer packets. Invoice shall state that material was furnished for this project.

1.05 EXAMINATION OF CONDITIONS

A. All areas to be planted shall be inspected by the Contractor before starting work and any defects shall be reported to the Owner prior to beginning this work. The commencement of work by the Contractor shall indicate acceptance of the areas to be planted and assumption of full responsibility for the work of this Section.

B. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including, but not limited to the potential need for storing and maintaining trees temporarily and/or re-handling plants prior to final installation.

1.06 PERSONNEL QUALIFICATIONS

A. The planting shall be done by horticulturally skilled workers, trained and experienced in accepted nursery practices. The work shall be done under the supervision of a qualified planting supervisor demonstrating a background in landscape operations.

PART 2 PRODUCTS

2.01 LOAM

A. Loam shall be a "fine sandy loam" or a "sandy loam" determined by mechanical analysis and based on the "USDA classifications system", modified by the addition of crushed stone to reduce compaction, as directed by the Owner. It shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than two inches (2"), lumps, plants and their roots, debris and other extraneous matter. It shall not contain toxic substances harmful to plant growth. Loam shall contain not less than 6% or more than 12% organic matter as determined by the loss on ignition of oven-dried samples.

B. All loam shall be provided by the Contractor as loam borrow from off-site sources.

C. All loam proposed for use shall be tested prior to use, and improved as necessary to satisfy specification requirements, in accordance to the testing laboratory's recommendations.

2.02 PLANTING SOIL MIX

A. Planting soil mix for general planting of trees shall have a true pH value of 6.5 to 7.05.

2.03 MYCORRHIZAL FUNGI INOCULANT

A. Mycorrhizal Fungi Inoculant shall be Mycor Tree Saver Transplant, as manufactured by Plant Health Care, Inc., Pittsburgh, Pa., Rhizanova Tree Transplant, as manufactured by Becker Underwood, Inc., or approved equal.

B. Packets must contain a minimum of:

1. One thousand (1000) live spores of Vesicular-Arbuscular fungi, including: *Entrephosphora columbiana*, *Glomus clarum*, *Glomus etunicatum*, and *Glomus sp.;*

2. Seventeen million five hundred thousand (17,500,000) live spores of Ectomycorrhizal fungi (*Pisolithus tinctorius)*;

3. Biostimulant ingredients including *Yucca schidigera* extract; soluble sea kelp extract derived from *Ascophylum nodosum*; humic acids; and acrylamide copolymer gel as a water absorbent medium.

C. Mycorrhizal Fungi Inoculant must be applied by means of a three ounce (3 oz.) premeasured dry formulation packet. Mycorrhizal fungi inoculant must be added to the top six to eight inches (6-8") of backfill soil in each planting pit and thoroughly mixed to distribute the inoculant. The material must be applied according to the following chart:

Size of rootball or container	Ounces per plant
PART 2 - 1 gallon	1
PART 3 - 2 gal.	2
PART 4 - #3 can.	3
PART 5 - 5 gal.	3
PART 6 - 7 gal.	3
PART 7 - 10 gal.	3
PART 8 - 15 gal.	3
PART 9 - 20" B&B	6
PART 10 - 24" B&B	9
PART 11 - 30" B&B	9
PART 12 - 36" B&B	12
PART 13 - 12" B&B	12

2.04 PLANT MATERIALS

A. Selection of Nursery Stock

1. At least fourteen (14) days prior to the date on which the tree selections are to be made and at least 28 days prior to the expected planting date, the Contractor shall request, in writing, that the Owner designate a representative from its technical staff to select and tag trees to be furnished.

2. The letter of request shall also have attached a certification from the supplier attesting to the fact that the stock to be selected from is, in fact, the particular trees required under this Section. No substitutions will be permitted.

3. The Contractor shall arrange for and bear the cost of transportation, meals in transit, and overnight accommodations, if necessary, for the Owner's representative during the period of time required to select and tag the required number of stock.

4. All trees shall be tagged at the source prior to digging. The Owner will inspect and tag all trees with the Contractor.

5. The Owner shall provide the necessary tags or seals for identifying the trees at the source. The tags are of durable construction and are numbered sequentially with raised lettering.

B. General Qualifications

1. Trees shall be good examples of their species or variety, with uniform, well developed branch structure, balanced head, and single leader.

2. Trees shall be in accordance with the American Standard for Nursery Stock of the American Association of Nurserymen.

3. Trees shall be freshly dug. No plants from cold storage or previously heeled in stock will be accepted.

4. All trees shall be nursery grown. No collected trees will be accepted.

5. Only trees grown within Hardiness Zones 1 through 5, as established by the Arnold Arboretum, Jamaica Plain, Massachusetts, or USDA zones 2-6 will be accepted. The Contractor shall certify in writing that the stock has actually been grown under Zone 5 or hardier conditions. Trees will not be accepted without such certification.

6. Trees shall be sound, healthy, and vigorous of growth, free of disease, insect pests, eggs or larvae. All parts shall be moist and show active green cambium when cut.

C. Tree Roots

1. The root system of each tree shall be well-provided with dense, fibrous roots.

2. Root systems shall be solid natural balls of earth firmly wrapped with untreated eight- (8-) ounce organic burlap, securely held in place by stout cord or wire. Processed or manufactured root balls or inorganic (plastic) burlap will not be accepted. No trees will be accepted if the ball of earth surrounding its roots has been badly cracked or broken.

3. The diameter and depth of the root ball must be sufficient to encompass the fibrous and feeding root system necessary for healthy development of the tree.

D. Tree Trunk

1. The trunk of each tree shall be a single uncut leader and straight trunk growing from a single unmutilated crown of roots. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety. No trees, which have had their leaders cut, scared, scraped, bruised, or wounded, will be accepted.

2. 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 growth on all edges. Trees shall not be pruned prior to delivery.

3. Caliper size shall be as shown on the Drawings.

E. Tree Height

1. When indicated, the overall height of the trees (measured from the crown of the roots to the tip of the top branch) shall be not less than the minimum size designated.

2. Height from the ground to the lowest branch shall be eighty (80) inches. The required height to the lowest branch may be accomplished by pruning after installation if, in the Owner's opinion, this does not detract from the shape or form of the tree, or cause unsightly scars.

F. Handling

1. Trees shall be dug, handled and transported so as to prevent damage of any sort including but not limited to breakage of branches, scraped or bruised trunk, or broken root ball.

2. Trees shall be protected from desiccation during digging, storage, and transportation by watering, covering, and application of anti-desiccants, as necessary to ensure their continued health and viability.

3. When trees cannot be transported and planted immediately upon being dug they shall be stored and protected from desiccation and extremes in temperature by being heeled in, watered, and/or sprayed with an anti-desiccant.

G. Inspection Upon Delivery

1. Inspection and approval of plants at the source shall not impair the right of subsequent inspection and rejection upon delivery to the site, if the Owner finds that the trees have declined noticeable due to handling abuse, lack of maintenance, or other causes. Costs of replacements for trees found deficient at time of delivery shall be borne by the Contractor.

2.05 MULCH

A. Mulch shall be shredded soft wood pine bark processed to yield fibrous, pliable slices not exceeding one half (1/2) inch in width and/or 3 inches in length. It shall be ninety-eight (98) percent organic matter with a pH range of 3.5 to 4.5. Moisture content of packaged material is not to exceed thirty-five (35) percent. Mulch shall not contain an excess of wood fiber or an admixture of their materials as determined by the Owner.

2.06 FERTILIZER

A. Fertilizer for amending loam to meet test laboratory requirements for the particular type of planting to be done shall be a non-phytotoxic biostimulant formulated to promote rapid root growth and regeneration. It shall be derived from organic composts and humus extracts and is compatible with fertilizers, herbicides, pesticides, fungicides and absorbent gels. Material shall be Roots2, a product of LISA Products Corporation, (800) 342-6173 or approved equal.

B. In addition to the soil amendment required above, fertilizer shall be provided for each tree through the use of slow-release fertilizer packets, packaged in plastic sacks with micropore holes, which provide for a controlled release of nutrients gradually over a minimum eight-year period. Tablets are acceptable.

C. Each packet shall consist of four ounces of water-soluble fertilizer with a minimum guaranteed analysis of available elements as follows:

Nitrogen	16%
Phosphoric Acid	8%
Potash	16%

2.07 STAKING, GUYING AND ANCHORING MATERIALS

A. The top 10” off all stakes shall be taped with Red duct tape for identification purposes.

B. Guys shall be new Arbor tie.

C. Stakes shall be 2 x 3 x 8’ made of spruce. And be placed into the ground 3’

D. Any stake that damages a root ball will not be paid for, until the stake is replaced.

E. Staking systems that are not taped, or are improperly anchored, will be considered incomplete and will not be paid for.

2.08 WATER

A. Water shall be free from impurities injurious to plant growth.

B. The Contractor shall be responsible to furnish its own supply of water to the site.

PART 3 EXECUTION

3.01 PLANTING SEASON

A. The Contractor shall locate plant material sources and ensure that plants are shipped in a timely fashion for installation during the following periods:

Fall:	Deciduous Trees -	September 15 through December 1
Spring	Deciduous Trees -	March 15 through June 15

B. Dig trees only while dormant: i.e., prior to bud break in the spring or after the onset of dormancy in the fall.

C. All trees shall be planted within the same season that they are dug. No heeling in of trees over the winter or planting out of season will be permitted.

3.02 PLANTING LOCATIONS

A. If it is necessary to adjust any of the locations because of unforeseen concealed conditions, notify the Owner and proceed as directed by the Owner.

3.03 PLANT PIT PREPARATION

A. Upon approval of plant locations and pavement removal (where applicable), excavate existing soils and remove all stumps and any other deleterious materials, as shown on the drawings and as specified herein. Haul and legally dispose of excavated material off site.

B. All tree pits shall measure a minimum of twenty four (24) square feet in open surface area and shall leave not less than forty two (42) inch wide paved sidewalk width as a passable way. (I.e., 4’x6’, 3’x8’, 2 ½’x10’, etc.)

C. Plant pits shall have sloped sides and flat bottoms, lightly scarified to aid in penetration by tree roots and shall be excavated to the full width and length of the surface opening.

D. On all sides of the pit there shall be at least one (1) foot clearance between the root ball and side of tree pit. Any modifications to the sidewalk cuts necessary to meet the required root ball clearance shall be made as directed by the Owner in accordance with the respective unit price item.

3.04 PLANT INSTALLATION

A. If the subsoil appears to be injurious to plant health, the Contractor shall, at the Owner's direction, fill the planting pit with enough planting mix to provide a twelve- (12-) inch depth when firmly tamped in place, prior to setting trees in place. If the subsoil does not appear to be deleterious, the tree root ball shall be set directly on level, undisturbed subgrade.

B. Set trees to line and grade as shown in the drawings, with the root flare two (2) inches higher than the sidewalk surface or finish grade, centered in the planting pit, and plumbed straight.

C. Cut and remove rope and wires and remove or layback the top 2/3 of burlap off the root ball, if the ball is wrapped in burlap and rope tied. Do not pull burlap and wires out from under the root ball. Remove all non-biodegradable root ball materials if present.

D. Backfill the planting pit with planting soil in layers not to exceed six (6) inches to half the pit depth. Water soil to settle. After watering, continue backfilling the mix until planting mix level is at the level, which the plant was previously grown. Water again and adjust soil level to compensate for any settlement, which may occur.

E. Form a six- (6-) inch deep saucer around trees installed in lawns or other soft surfaces and three- (3-) inch saucer around trees installed in sidewalks or other paved areas.

F. Reset trees to proper grade, align and plumb, retighten stakes and wires, and restore planting saucer and mulch as necessary to complete installation.

3.05 FERTILIZING

A. Install fertilizer packets at depth of six (6) to eight (8) inches equally spaced around the plant, as it is being backfilled. Packets shall be installed per the manufacturer's instructions. Packets shall not be cut, ripped, or damaged. The application rates for fertilizer packets shall be one packet for each inch of tree trunk caliper. As documentation of compliance with this requirement the Contractor shall provide the Owner with receipted invoice showing the project name and quantity of packets supplied.

3.06 MULCHING

A. Place mulch material over entire saucer area, extending beyond the lip, for individual trees and over the entire area of planting beds and pits in sidewalks to a depth of three inches (3") after settlement.

B. Place mulch immediately after planting. No mulch material shall be applied prior to the initial watering of plant materials upon installation.

C. Furnish and place, as directed by owner, any additional mulch required as part of tree planting pay item.

3.07 STAKING AND GUYING

A. Line up stakes parallel to the curb line. Do not install stakes through the root ball.

B. Upon completion of the guarantee period, remove stakes and guys and dispose of the materials off site.

3.08 PRUNING

A. Prune each tree in accordance with the workmanship requirements of "Pruning Standards" to preserve the natural character of the plant.

B. Tree pruning shall be undertaken to the full height of the affected trees.

C. Remove all dead wood or suckers and all broken or badly bruised branches. Never cut a leader or "turkey tail". Trim lateral branches.

D. Contractor to encourage apical dominance by removing one co-dominant leader as required.

E. Pruning shall be undertaken to encourage good scaffold branching.

F. All pruning shall be done in the presence of the Owner's representative.

3.09 PRELIMINARY ACCEPTANCE

A. After the completion of planting and all other related operations the Contractor shall make written request to the Owner for a formal inspection of the work. If plant materials and workmanship are acceptable upon inspection, written notice will be given to the Contractor stating that the work has received Preliminary Acceptance and that the establishment period has commenced from the date of the notice.

3.10 ESTABLISHMENT PERIOD

A. Fall tree plantings shall be cared for through September 30 of the following calendar year.

B. Tree care shall begin immediately after each plant is plated to ensure the viability of the tree throughout the establishment period.

C. Plants shall be straightened, restaked and reguyed, watered, mulched, weeded, pruned, sprayed and treated for insect pests and diseases, fertilized cultivated and otherwise cared for, and shall be protected until final acceptance of the project at the end of the establishment period.

D. The Contractor shall meet with the Owner monthly during the establishment period to inspect the plantings and shall take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional specialists such as arborists and horticulturists to inspect plant materials, identify problems, recommend and carry out remedial procedures.

E. Defective work shall be corrected as soon as possible after becoming apparent, weather and season permitting. Plants that die during the establishment period shall be removed at once. Replacement of dead trees will be done immediately if during the specified installation season. If the dead tree has bee removed out of planting season, the contractor shall wait until the beginning of the subsequent planting season, at which time the replacement tree will be planted. If the tree to be replaced is a fall hazard species the contractor shall wait until the beginning of the spring planting season, at which time the replacement tree will be planted.

F. When dead or unhealthy plants are removed and replaced, any damaged or broken fertilizer packets shall be replaced with new packets, at the same rate of application as specified herein for new installations.

3.11 GUARANTEE PERIOD

A. Following completion of the establishment period the trees shall be guaranteed for a period of two (2) years. At the end of the guarantee period, a Final Inspection with the Contractor and Owner will be held to determine whether any plant material replacements are required.

B. During the guarantee period the Contractor shall provide tree care as required to produce an acceptable planing at the Final Inspection. To be found acceptable at that time each tree shall have been established in place for at least two (2) years, shall show at least 75% healthy growth and shall have the natural character of its species as determined by the Owner.

C. Trees found unacceptable or dead shall be removed promptly from the site and replaced during the specified planting season. Replacements shall be of the same species and size and shall conform in all respects to the specifications for furnishing and installing new plants. Replacements shall be maintained and guaranteed as specified for the original plantings. If, at the end of the guarantee period for the replacement planting, the replacement is not in acceptable condition, the Owner may elect to accept a credit in lieu of a second replacement.

D. Cost of replacements shall be borne by the Contractor, except when such replacement is required due to vandalism or neglect by others.

E. At the end of the Guarantee period the Contractor shall remove and dispose of all stakes and guys, as a condition of final acceptance and release of retainage.

END OF SECTION

SECTION 02930

LOAMING AND HYDROSEEDING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to provide erosion control and place loam, finish grade, apply lime and fertilizer, hydraulically apply seed and mulch and maintain all seeded areas as shown on the Drawings and as specified herein, including all areas disturbed.

1.02 RELATED WORK

A. Site preparation is included in Section 02100.

B. Earthwork is included in Section 02200.

C. Erosion and sedimentation control is included in Section 02270.

D. Planting is included in Section 02900.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, samples of all materials for inspection and acceptance including: loam testing, seed mixture product label and application rate, schedule for application of seeding, certified statement as to the number of pounds of hydroseed materials to be used per 100 gallons of water, and number of square feet of seeding that can be covered with the quantity of solution in the Contractor's hydroseeder.

1.04 PRODUCT HANDLING

A. Deliver products in original containers with all original legible labels. Remove all seeding materials which do not comply with the provisions of these Specifications. Protect all seeding materials before, during, and after installation, and protect installed work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Loam shall be fertile, friable, natural soil typical of topsoil of the locality, and shall be obtained from a well drained site that is free of flooding. It shall be without admixture of subsoil or slag and free of stones, lumps, plants or their roots, sticks, clay, weeds, sod, peat and other extraneous matter and shall not be delivered to the site or used while in a frozen or muddy condition. Loam shall be free of any admixture of subsoil, stones larger than 3/4-in. and clods of hard earth.

B. The loam texture shall be a mixture of sand, silt and clay particles as to exhibit sandy and clayey properties in and about equal proportions, and clay content shall be between 10 and 25%, based on sample test mechanical analysis of particle size distribution.

C. Loam shall contain not less than 6 percent, nor more than 12 percent, organic matter as determined by loss of ignition of moisture-free samples dried at 100 degrees Celsius.

D. Loam as delivered to the site or stockpiled shall have pH between 6.0 and 7.0

E. Loam Testing Program

1. At least 30 days prior to anticipated start of loaming operations, Contractor shall submit a one pint sample of loam to a public extension service or a certified independent testing laboratory to test for texture, organic content, pH and nutrient characteristics. Testing shall be performed 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 for analysis by test methods S1A, S2, particle size analysis, and lead content. Soil samples shall be tested for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Aluminum, Soluble Salts and show the acidity of the soil.

2. Tests shall be combined hydrometer and wet sieving in compliance with ASTM D422-Standard Test Method for Particle Size Analysis, after destruction of organic matter by ignition.

3. Test results shall include written recommendations by the laboratory to make the sample conform to specifications, and to make the sample promote growth for the vegetation specified, including nutrient recommendations. Written test results and written recommendations shall be sent directly to the Engineer and Contractor for review and approval.

4. After review of test results and recommendations, the loam shall be identified as acceptable, acceptable with certain fertilizer and limestone applications or unacceptable. If the loam is found acceptable, the fertilizer and lime requirements will be as specified or as recommended by the Engineer. If the loam is found unacceptable, identify another source of loam and incur all expenses associated with testing additional samples.

5. All loam incorporated into the site work shall match the sample provided to the Engineer for testing. Loam stockpiled under other Sections of this Division may be used subject to the testing and approval outlined above. Contractor shall be responsible for screening stripped stockpiled topsoil and providing additional loam as required at his/her own expense.

F. Fertilizer shall be commercial mixed free-flowing granules or pelleted fertilizer, 10-20-10 (N-P2O5-K2O) grade for lawn and naturalized areas. Fertilizer shall be delivered to the site in original unopened containers each showing the manufacturer's guaranteed analysis conforming to applicable state fertilizer laws. At least 40 percent of the nitrogen in the fertilizer used shall be in slowly available (organic) form.

G. Lime shall be ground limestone of an approved agricultural dolemite limestone containing not less than 85 percent of total calcium or manganese carbonates and be ground to such fineness

that at least 50 percent shall pass a 100-mesh sieve and at least 95 percent shall pass a 20-mesh sieve.

H. Seed shall be labeled in accordance with USDA Rules and Regulations under the Federal Seed Act and applicable State seed laws. Seed shall be furnished in sealed bags or containers bearing the date of the last germination, which date shall be within a period of 6 months prior to commencement of planting operations. Seed shall be from same or previous year's crop; each variety of seed shall have a purity of not less than 85 percent, a percentage of germination not less than 90 percent, shall have a weed content of not more than 1.0 percent and contain no noxious weeds. The seed mixtures shall consist of seed proportioned by weight as follows:

1. Native Grass and Wildflower Mix
   New England Conservation/Wildlife Mix as manufactured by New England Wetland Plants., Amherst, MA 413 548-8000 or equal.

2. Lawn Area Seed Mix

'Rebels' Tall Fescue	70 percent
'Baron' Kentucky Bluegrass	10 percent
'Palmer II' Perennial Ryegrass	20 percent

3. Wetland area seed mix
   New England Wetmix, as manufactured by New England Wetland Plants., Amherst, MA 413 548-8000 or equal.

I. The seed shall be furnished and delivered pre-mixed in the proportions specified above. A manufacturer's certificate of compliance to the specified mixes shall be submitted by the manufacturers 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 certificates have been submitted.

J. Seed shall be delivered in sealed containers bearing the dealer's guaranteed analysis.

K. Mulch shall be specially processed 100 percent Virgin wood fiber mulch containing no growth or germination-inhibiting factors. Wood fiber mulch shall be "Second Nature Regenerated wood fiber as by Central Fiber Corporation, Wellsville, KS or equal. 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 wood fiber shall be marked by the manufacturer to show the air dry weight content and not contain in excess of 10 percent moisture.

L. Water used in this work shall be furnished at the nearby hydrant by the Owner. Water from Owner will be suitable for irrigation and free from ingredients harmful to plant life. Hose and other watering equipment required for the work shall be furnished by the Contractor.

M. Erosion control blanket, straw mulch, tackifier, and washed stone are specified in Section 02270.

PART 3 EXECUTION

3.01 APPLICATION

A. Unless otherwise shown on the Drawings, loam shall be placed to a minimum compacted depth of 6 in on all parts of the site not covered with structures, pavement, or existing woodland.

B. For all areas to be seeded:

1. Lime shall be applied at the rate of 150 lbs/1,000 sq ft or as determined by the soil test to bring topsoil pH to a range of 6.0 to 7.0.

2. Fertilizer (10-20-10) shall be applied at the rate of 30 lbs/1,000 sq ft or as determined by the soil test.

3. Lawn Area Seed Mix shall be applied at the rate of 7 lbs/1,000 sq ft. Native Grass and Wildflower Mix and Wetland Area Seed mix shall be applied at a rate of 25 lbs./acre.

4. Fiber mulch shall be applied at the rate of 45 lbs/1,000 sq ft.

5. In areas where erosion control blanket is not applied, apply straw mulch a rate of 100 lbs/1000 sq ft with tackifier.

6. Tackifier shall be installed per manufacturer's instructions and reapplied as necessary so that the straw mulch is stabilized until reasonable turf growth is established as determined by the Engineer with a minimum rate of 1 gal/1000 sq ft per application.

C. If possible, limestone shall be applied 2 to 3 months before the application of fertilizer. Limestone may not be mixed with fertilizer for application and shall be applied a minimum of 2 weeks prior to fertilizer application.

D. After the loam is placed and before it is raked to true lines and rolled, limestone shall be spread evenly over the loam surface and thoroughly incorporated by heavy raking to at least one half the depth of topsoil.

E. The application of fertilizer may be performed hydraulically in one operation with hydroseeding and fiber mulching. Clean all structures and paved areas of unwanted deposits of the hydroseeded mixture.

F. Straw mulch and tackifier shall be applied immediately following seeding operations (same day) unless otherwise approved by the Engineer.

3.02 INSTALLATION

A. Previously established grades, as shown on Drawings shall be maintained in a true and even condition.

B. Subgrade shall be prepared by tilling prior to placement of loam to obtain a more satisfactory bond between the two layers. Tillage operations shall be across the slope. Tillage shall not take place on slopes steeper than 2 horizontal to 1 vertical or where tillage equipment cannot be operated. Tillage shall be accomplished by disking or harrowing to a depth of 9-in parallel to

contours. Tillage shall not be performed when the subgrade is frozen, excessively wet, extremely dry or in other conditions which would not permit tillage. The subgrade shall be raked and all rubbish, sticks, roots and stones larger than 2-in shall be removed. Subgrade surfaces shall be raked or otherwise loosened immediately prior to being covered with loam.

C. Loam shall be placed over approved areas to a depth sufficiently greater than required so that after natural settlement and light rolling, the complete work will conform to the lines, grades and elevations indicated. No loam shall be spread in water or while frozen or muddy.

D. After loam has been spread, it shall be carefully prepared by scarifying or harrowing and hand raking. All stiff clods, lumps, roots, litter and other foreign material shall be removed from the loamed area and disposed of. The areas shall also be free of smaller stones, in excessive quantities, as determine by the Engineer. The whole surface shall then be rolled with a hand roller weighing not more than 100 lbs/ft of width. During the rolling, all depressions caused by settlement of rolling shall be filled with additional loam and the surface shall be regraded and rolled until a smooth and even finished grade is created.

E. Seeding, mulching 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 Engineer. Hydroseed and straw mulch only on a calm day.

F. Wetland Area Seed Mixes shall be applied in the areas and to the elevations as shown on the Drawings. Prior to flooding of the basin area, allow 6-8 weeks of germination during the growing season for an initial establishment and root growth period.

G. Schedules for seeding and fertilizing must be submitted to the Engineer for approval prior to the work. Seeding as specified herein shall be accomplished between the period of April 1 to June 1 or August 15 to October 1. Seeding during the period from October 2 to March 31 shall only be undertaken upon approval of the Engineer. Seeding during the period from June 1 to August 14 shall only be performed if irrigation is provided.

H. Seeding shall be done within ten days following soil preparation. 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, furnish the 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 hydroseeder. Upon completion of seeding operations, furnish the Engineer with a certified statement on the actual quantity of solution applied.

I. In order to prevent unnecessary erosion of newly loamed and graded slopes and unnecessary siltation of drainage ways, carry out seeding and mulching as soon as he has satisfactorily completed a unit or portion of the project. For the purpose of this project a unit is defined as 10,000 sq ft. When protection of newly loamed and graded areas is necessary at a time which is outside of the normal seeding season, protect those areas by what ever means necessary as approved by the Engineer and shall be responsible for prevention of siltation in the areas beyond the limit of work.

J. Erosion control blankets shall be installed on all slopes steeper than 3(H):1(V), drainage swales, and ditches as shown on the Drawings and as directed by the Engineer in accordance manufacturer's instructions. The area to be covered shall be properly prepared, fertilized and

seeded 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, butted snugly at the ends and side and stapled. Blankets shall be placed a minimum of three rows (of 4-ft) wide (total 12-ft width) within the drainage swale/ditch and stapled together in accordance with manufacturer's instructions. The staples shall be made of wire, .091-in in diameter or greater, "U" shaped with legs 6-in in length and a 1-in crown. The staples shall be driven vertically into the ground, spaced approximately two linear yards apart, on each side and one row in the center alternately spaced between each size. Adjoining shall not be overlapped and shall utilize a common row of staples to attach.

K. When newly graded subgrade areas cannot be loamed and seeded because of season or weather conditions and will remain exposed for more than 30 days, protect those areas against erosion and washouts by whatever means necessary such as straw applied with a tar tack, wood chips or by other measures as approved by the Engineer. Prior to application of loam, any such materials applied for erosion control shall be thoroughly incorporated into the subgrade by discing. Fertilizer shall be applied prior to spreading of topsoil.

L. In addition to erosion control blankets, apply straw mulch and tackifier and provide against washouts by an approved method. Any washout which occurs shall be regarded, reseeded and remulched at the Contractor's expense until a good turf is established.

3.03 MAINTENANCE AND PROVISIONAL ACCEPTANCE

A. Keep all seeded areas watered and mowed and in good condition, reseeding all seeded areas if and when necessary until a good, healthy, uniform growth is established over the entire area seeded and shall maintain all seeded areas in an approved condition until provisional acceptance.

B. The Engineer will inspect all work for provisional acceptance at the end of the 10 week maintenance period, upon the written request received at least 10 days before the anticipated date of inspection. The maintenance period must occur during the growing season between March 31 and October 1 and shall include a minimum of three mowings.

C. A satisfactory turf will be defined as:

1. No bare spots larger than 3 sq ft.

2. No more than 10 percent of total area with bare spots larger than 1 sq ft.

3. Not more than 15 percent of total area with bare spots larger than 6-in square.

D. After the inspection has occurred but prior to provisional acceptance, a soil test shall be performed to determine if additional soil fertilization should occur. If necessary additional fertilizer not to exceed 30 lbs/1000 sq ft of 20-10-10 shall be applied as directed by the Engineer.

E. Furnish full and complete written instructions for maintenance of the seeded areas to the Owner at the time of provisional acceptance.

F. The inspection by the Engineer will determine whether maintenance shall continue. Continue maintenance until all areas of the site meet the minimum requirements specified above.

G. After all necessary corrective work and cleanup has been completed, and maintenance instructions have been received by the Owner, the Engineer will certify in writing the provisional acceptance of the turf areas. Maintenance of all turf areas shall cease on receipt of provisional acceptance.

3.04 GUARANTEE PERIOD AND FINAL ACCEPTANCE

A. All seeded areas shall be guaranteed for not less than 1 full year from the time of provisional acceptance.

B. At the end of the guarantee period, inspection will be made by the Engineer upon written request submitted at least 10 days before the anticipated date. Seeded areas not demonstrating satisfactory stands as outlined above, as determined by the Engineer, shall be renovated, reseeded, replanted and maintained meeting all requirements as specified herein.

C. After all necessary corrective work has been completed, the Engineer shall certify in writing the final acceptance of the seeded and herbaceous root stock areas.

END OF SECTION

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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 SUBMITTALS

A. Submit, in accordance with Section 01300, shop drawings and product data. Submittals shall include 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. Certifications

1. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain for Concrete Reinforcement.

2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

3. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

4. ASTM C33 - Standard Specification for Concrete Aggregates.

5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

6. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete

7. ASTM C150 - Standard Specification for Portland Cement

8. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

9. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

10. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

11. 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.

1.04 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.

1.05 DELIVERY, STORAGE AND HANDLING

A. Reinforcing steel shall be shipped and stored with bars of the same size and shape 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 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 allowable types of cement for each concrete class are 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 67. 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 301. 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

Class	Design Strength (1)	Cement. ASTM C150	Cement Content (2)	W/C (3)	WR (4)	Slump Range Inches
D	4500	Type II	560	0.44 max.	Yes	3-5

All concrete classes 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 Water Cement ratio
(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 reinforcements 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. Place concrete for walls using tremie tubes in 12 to 24-in lifts, keeping the surface horizontal. 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 water cured. 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 five field control cylinder specimens will be taken 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. Two cylinders shall be broken at 7 days and two cylinders shall be broken and their strengths averaged at 28 days. The fifth cylinder shall be saved for a 56 day break, if needed. 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 Owner.

C. Slump tests will be made in the field by the Engineer 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 the 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. As soon as forms have been stripped, form ties, if employed, shall be removed, and the recess filled to insure complete watertightness. Any defects in the surface of the walls shall be chipped out and repaired in a workmanlike manner. 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 for filling form tie recesses shall be mixed to a slightly damp consistency (just short of "balling"), pressed into the recess until dense, and troweled smooth. 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 tie cones 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 broom finish. Failure to meet the condition shall be cause for removal, grinding, or other correction as directed by the Engineer

3.08 SCHEDULE

A. The following (Table 2) are the general applications for the various concrete design strengths to be used:

TABLE 2

Class	Design Strength (psi)	Description
D	4,500	Sidewalks, walls, slabs on grade and all other structural concrete

END OF SECTION

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SECTION 03600

GROUT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install grout complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Cast-in-place concrete and reinforcing steel is included in Section 033001.

B. Modifications to existing concrete are included in Section 03740.

C. Miscellaneous metals are included in Section 05500.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of surface preparation, mixing and installation for:

1. Commercially manufactured non-shrink cementitious grout. Include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to the specified ASTM standards, and Material Safety Data Sheet.

B. Qualifications

1. Submit documentation that grout manufacturers have a minimum of 10 years' experience in the production and use of the grouts proposed.

1.04 REFERENCE STANDARDS

A. ASTM International

1. ASTM C33 - Standard Specification for Concrete Aggregates

2. ASTM C150 - Standard Specification for Portland Cement

3. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes

4. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures

5. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

6. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

7. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.

8. ASTM E329 - Standard specification for agencies engaged in the testing and/or inspection of materials used in construction

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 QUALITY ASSURANCE

A. Qualifications

1. Grout manufacturers shall have a minimum of 10 years' experience in the production and use of the type of grout proposed.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions.

B. Store materials in full compliance with the manufacturer's recommendations. Limit total storage time from date of manufacture to date of installation to six months or the manufacturer's recommended storage time, whichever is less.

C. Remove immediately from the site material which becomes damp, contains lumps, or is hardened and replace with acceptable material at no additional cost to the Owner.

D. Deliver non-shrink cementitious grout as a pre-portioned blend in prepackaged mixes requiring only the addition of water.

1.07 DEFINITIONS

A. Non-shrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state and bonds to a clean base plate.

PART 2 PRODUCTS

2.01 GENERAL

A. The use of a manufacturer's name and product or catalog number is for the purpose of establishing the standard of quality desired.

B. Like materials shall be the products of one manufacturer or supplier to provide standardization of appearance.

2.02 MATERIALS

A. Non-shrink Cementitious Grout

1. Non-shrink cementitious grouts: Conform to ASTM C1107. Grouts shall be portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents and require only the addition of water. Non-shrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.

    a. General purpose non-shrink cementitious grout: Conform to the standards stated above. SikaGrout 212 by Sika Corp.; NS Grout by The Euclid Chemical Co.; Five Star Grout by Five Star Products, Inc., or equal.
    b. Flowable (Precision) non-shrink cementitious grout: Conform to the standards stated above. Masterflow 928 by BASF Building Systems; Hi-Flow Grout by The Euclid Chemical Co.; SikaGrout 212 by Sika Corp.; Five Star Grout by Five Star Products, Inc., or equal.

B. Water

1. Potable water free of oil, acid, alkali, salts, chlorides (except those attributable to drinking water), organic matter, or other deleterious substances.

PART 3 EXECUTION

3.01 PREPARATION

A. Place grout where indicated or specified over existing concrete and cured concrete which has attained its specified design strength unless otherwise approved by the Engineer.

B. Concrete surfaces to receive grout shall be clean and sound; free of ice, frost, dirt, dust, grease, oil, form release agent, laitance and paints and free of all loose material or foreign matter which may affect the bond or performance of the grout.

C. Roughen concrete surfaces by chipping, sandblasting, or other dry mechanical means to bond the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance and firmly embedded into the parent concrete.

1. Air compressors used to clean surfaces in contact with grout shall be the oilless type or equipped with an oil trap in the airline to prevent oil from being blown onto the surface.

D. Remove all loose rust, oil or other deleterious substances which may affect the bond or performance of the grout from metal embedments or bottom of baseplates prior to the installation of the grout.

E. Wash concrete surfaces clean and then keep moist for at least 24 hours prior to the placement of non-shrink cementitious. Saturation may be achieved by covering the concrete with saturated burlap bags, use of a soaker hose, or other method acceptable to the Engineer. Upon completion of the 24-hour period, remove visible water from the surface prior to grouting.

F. Provide forms for grout. Line or coat forms with release agents recommended by the grout manufacturer. Provide forms anchored in place and shored to resist the forces imposed by the grout and its placement.

1. Forms for all grout shall be designed to allow the formation of a hydraulic head and shall have chamfer strips built into forms.

G. Level and align the structural members in accordance with the structural requirements, as applicable.

H. Support structural members during alignment and installation of grout by shims, wedges, blocks or other approved means. The shims, wedges and blocking devices shall be prevented from bonding to the grout by bond breaking coatings and removed after grouting unless otherwise approved by the Engineer. Grout voids created by the removal of shims, wedges and blocks.

3.02 INSTALLATION - GENERAL

A. Mix, apply and cure products in strict compliance with the manufacturer's recommendations and these specifications.

B. Provide staffing and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.

C. Maintain temperatures of the structural members, supporting concrete, and grout between 40 and 90 degrees F during grouting and for at least 24 hours after placement, until grout compressive strength reaches 1000 psi or as recommended by the grout manufacturer, whichever is longer. Do not allow differential heating or cooling of baseplates and grout during the curing period.

D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with the grout are outside of the 40 to 90 degrees F range.

3.03 INSTALLATION - NON-SHRINK CEMENTITIOUS GROUTS

A. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel or admixtures without prior approval by the Engineer.

B. Do not mix by hand. Mix in a mortar mixer with moving blades. Pre-wet the mixer and empty excess water. Add pre-measured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.

C. Placements greater than 3-in in depth shall include the addition of clean, washed pea gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.

D. Provide forms as specified in Paragraph 3.01.F. Place grout into the designated areas and prevent segregation and entrapment of air. Do not vibrate grout to release air or to consolidate the material. Fill all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes and vent holes as necessary.

E. Place grout rapidly and continuously to avoid cold joints. Do not place grout in layers. Do not add additional water to the mix (retemper) after initial stiffening.

F. Just before the grout reaches its final set, cut back the grout to the substrate at a 45-degree angle from the lower edge of bearing plate unless otherwise ordered and approved by the Engineer. Finish this surface with a wood float or brush finish.

G. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement, until grout compressive strength reaches 1000 psi or as recommended by the manufacturer, whichever is longer. Saturate the grout surface by use of saturated burlap bags, soaker hoses or ponding. Provide sunshades. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

3.04 SCHEDULE

A. The following list indicates where the particular types of grout are to be used:

1. General purpose non-shrink cementitious grout: Use at all locations where non-shrink grout is indicated on the Drawings.

2. Flowable (precision) non-shrink cementitious grout: Flowable (precision), non-shrink, cementitious grout may be substituted for general purpose non-shrink cementitious grout.

END OF SECTION

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SECTION 03740

MODIFICATIONS TO EXISTING CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to cut, remove, or otherwise modify parts of existing concrete structures or appurtenances as shown on the Drawings and as specified herein as necessary to complete the work. Work under this Section shall also include bonding new concrete to existing concrete.

1.02 RELATED WORK

A. Cast-in-place concrete and reinforcing steel is included in Section 03301.

B. Grout is included in Section 03600.

C. Miscellaneous metals are included in Section 05500.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, the following:

1. Manufacturer's technical literature and installation/application instructions for all products.
    a. Manufacturer's current printed recommendations and product data sheets for all products provided under this Section including manufacturers printed performance criteria, product life, working time after mixing, surface preparation and application requirements and procedures, curing, volatile organic compound data, and safety requirements.
    b. Material Safety Data Sheets (MSDS) for any materials brought on-site including all resurfacing system materials, solvents, and abrasive blast media.
    c. Storage requirements including temperature, humidity, and ventilation.

2. Documentation of the qualifications as specified in Paragraphs 1.05.D, 1.05.E and 1.05.F.

B. Submit for adhesive anchoring system manufacturer’s ICC ESR report for anchorage to cracked concrete.

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM):

1. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

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 QUALITY ASSURANCE

A. No existing structure or concrete shall be shifted, cut, removed, or otherwise altered until authorization is given by the Engineer.

B. When removing materials or portions of existing structures and when making openings in existing structures, all precautions shall be taken and all necessary barriers, shoring and bracing and other protective devices shall be erected to prevent damage to the structures beyond the limits necessary for the new work, protect personnel, control dust and to prevent damage to the structures or contents by falling or flying debris.

C. Unless otherwise permitted, shown or specified, line drilling will be required in cutting existing concrete.

D. Contractor qualifications. Complete a program of instruction in the application of the approved manufacturer's material and provide certification from the manufacturer attesting to their training and status as an approved applicator.

E. Manufacturer's qualifications. Have a minimum of ten years' experience within the last ten years in the manufacture and use of the products specified and have an ongoing program of training, certifying and technically supporting the Contractor's personnel.

F. The Contractor's supervisor shall have attended a training program sponsored by the manufacturer supplying the materials approved for this project.

G. A representative of the product manufacturer shall be present for the first three days of installation to give instructions to the installation crew.

H. A representative of the product manufacturer shall make periodic site visits to ensure the product is being installed in accordance with published instructions.

I. Construction tolerances shall be as specified elsewhere in Division 3, except as modified herein and elsewhere in the Contract Documents.

J. The Contractor shall make available all locations and phases of the work for access by the Engineer or other personnel designated by the Engineer. The Contractor shall provide ventilation and safe access to the work.

K. The Contractor is solely responsible for the workmanship and quality of the modification work. Inspections by the manufacturer, the Engineer, or others do not limit the Contractor's responsibility for the quality of the work.

L. Apply the most stringent requirements of other stated specifications, codes, standards, and this Section when conflicts exist.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:

1. Deliver all materials in original, new and unopened packages and containers clearly labeled with the following information:

a. Manufacturer's name.
b. Name or title of material, and other product identification.
c. Manufacturer's stock number and batch number.
d. Date of manufacture.
e. Instructions.
f. Expiration or "use by" date.

B. Storage of Materials:

1. Store the products in accordance with the manufacturers' recommendations, and supplementary requirements below.

2. Store only approved materials on site.

3. Store in a suitable location approved by Engineer. Keep area clean and accessible.

4. Restrict storage to repair materials and related equipment.

5. Comply with health and fire regulations including the requirements of the Occupational Safety and Health Administration (OSHA).

C. Handling of Materials:

1. Handle the products in accordance with the manufacturers' recommendations, and supplementary requirements below.

2. Handle materials carefully to prevent inclusion of foreign materials.

3. Do not open containers or mix components until necessary preparatory work has been completed and application work will start immediately.

PART 2 PRODUCTS

2.01 MATERIALS

A. General:

1. Materials shall comply with these Specifications and any state or local regulations.

B. Epoxy Bonding Agent:

1. General:
   a. The epoxy bonding agent shall be a two-component, solvent-free, asbestos-free moisture insensitive epoxy resin material used to bind plastic concrete to hardened concrete and complying with the requirements of ASTM C881, Type V, Grade 2, Class C.

2. Approved Manufacturers;
   a. Sika Corporation, Lyndhurst, NJ – Sikadur 32, Hi-Mod.
   b. Euclid Chemical Company, Cleveland, OH – Dural 452 MV.
   c. Simpson Strong-Tie Company Inc., Pleasanton, CA – FX-762.

d. or approved equal.

C. Epoxy Paste Adhesive:

1. General:
   a. Epoxy paste adhesive shall be a two-component, solvent-free, moisture insensitive epoxy resin material used as an adhesive for mating surfaces where the glue line is 1/8-in or less and to bond fresh, plastic concrete to clean, sound hardened concrete. The material shall comply with the requirements of ASTM C881, Type IV, Grade 3, Class C.

2. Approved Manufacturers:
   a. Sika Corporation, Lyndhurst, NJ – Sikadur 31 Hi-Mod Gel.
   b. Euclid Chemical Company, Cleveland, OH – Dural 452 Gel.
   c. BASF Corporation, Shakopee, MN – MasterEmaco ADH 1420.
   d. or approved equal.

D. Adhesive Anchor System:

1. Provide an adhesive anchor system utilizing an injection adhesive manufactured for the installation of drilled-in reinforcing steel dowels where indicated on the Drawings.

2. Injection Adhesive:
   a. Injection adhesive shall be a two-component epoxy system including a hardener and a resin, furnished in pre-measured side-by-side cartridges which keep the two components separate. Side-by-side cartridges shall be designed to accept a static mixing nozzle which thoroughly blends the two components and allows injection directly into the drill hole.

3. Adhesive anchor system shall be Hilti HIT-RE 500 V3 Adhesive Anchor System; Simpson Strong-Tie SET-XP Adhesive Anchor System; ITW Red Head EPCON C6+ Adhesive Anchor System; or equal. Adhesive anchors are designed based on Hilti HIT-RE 500 V3, unless otherwise noted.

E. Repair Mortar (Polymer-Modified Portland Cement Mortar):

1. Horizontal Surfaces:
   a. Repair mortar is a two-component polymer-modified, portland cement based mortar used to repair horizontal surfaces with a migrating corrosion inhibitor and having a minimum compressive strength at 28 days of 7,000psi.
   b. Approved Manufacturers:
      1) Sika Corporation, Lyndhurst, NJ – SikaTop 122 Plus.
      2) Euclid Chemical Company, Cleveland, OH – DuralTop Flowable Mortar.
      3) BASF Corporation, Shakopee, MN – MasterEmaco T 310CI.
      4) or approved equal.

2. Vertical and Overhead Surfaces:
   a. Repair mortar is a two-component polymer-modified, portland cement based, fast setting, non-sag mortar used to repair vertical and overhead surfaces with a migrating corrosion inhibitor and having a minimum compressive strength at 28 days of 7,000 psi.

b. Approved Manufacturers:
   1) Sika Corporation, Lyndhurst, NJ – SikaTop 123 Plus.
   2) Euclid Chemical Company, Cleveland, OH – DuralTop Gel.
   3) US MIX Co., Denver, CO – US SPEC H2.
   4) or approved equal.

F. Expansion Joint Seal

1. Expansion joint seal is an impermeable closed-cell, low density, resilient, non-extrudable, ethylene vinyl acetate foam material with a hindered amine light stabilizer. Joint seal shall be held in place by a two component 100% solids epoxy adhesive. The design of the seal shall be capable of accommodating movement and variations in joint widths through compression and tension of its shape. Enhanced Surface Preparation (E.S.P.) shall be grooves 1/8" (3mm) wide by 1/8" (3mm) deep and spaced between 1/4" (6mm) to 1/2" (13mm) apart and run along the entire length of the bond surfaces of the seal to ensure an effective and quality surface for adhesion. Provide seal profile that satisfies project requirements including movement and water tightness. Install all components utilizing manufacturer's recommended adhesive for complete installation.

2. The low density closed cell cross linked seal shall be installed utilizing a 100% solids two component moisture insensitive modified epoxy adhesive which meets ASTM C-881 Type I & II Grade 2 Class B & C.

3. Typical properties of expansion joint seal
   a. Dynamic movement range
      1) -60%
      2) +30%
   b. Rated pressure head
      1) 70-ft
   c. Elongation (ASTM D3575)
      1) 185-275%
   d. Density (ASTM D3575 Suffix W)
      1) 2.7–3.4 lbs/ft³
   e. Water Absorption (ASTM 3575 Suffix L)
      1) 0.02 lbs/ft² avg.
   f. Weatherability (ASTM G154 3000 Hrs)
      1) No chalking, flaking, blistering, checking & cracking
   g. Tensile (ASTM D3575 Suffix T)
      1) 92-140 psi
   h. Tear Resistance (ASTM D624)
      1) 10-20 lbs/in
   i. Compression Deflection (ASTM D3575)
      1) 25% 9 psi avg.
   j. Thermal Stability (ASTM D3575 Suffix S)
      1) 5.9% Max
   k. Recovery (ASTM D545)
      1) 98.9%

4. Approved Manufacturer

a. CEVA 100 System Joint System with Phyzite 380 foam by Chase Construction Products, Westwood, MA or equal.

G. Premolded Joint Filler - Structures: ASTM D 1752, Type III, self-expanding cork.

1. Thickness: 1 inch, unless otherwise indicated.

H. Sealant:

1. Comply with ASTM C 920 for following conditions:

a. Sealant for Joints in Horizontal Surfaces: Silicone, Type S or M, Grade P or NS, Class 25.
b. Sealant for Joints in Sloping and Vertical Surfaces: Silicone, Type S or M, Grade NS, Class 25.

PART 3 EXECUTION

3.01 PRE-CONSTRUCTION INSPECTION OF EXISTING BOX CULVERT

A. Prior to proceeding with any structural modification work to the existing double barrel box culvert, the Contractor shall allow the Engineer to inspect the interior of the box culvert. The purpose of this inspection is to confirm the condition of the culvert prior to cutting the new openings in the walls. The Contractor shall chip out the concrete in the areas of the culvert indicated on the Drawings to exposed the existing culvert reinforcing bars prior to the inspection.

B. The Contractor shall notify the Engineer a minimum of two weeks prior to the readiness of the structure for inspection. The contractor shall allow 1 full day for inspection by the Engineer.

C. The Engineer shall notify the Contractor of the type and locations of repairs within four weeks after the completion of the inspection. If necessary, the Engineer will provide repair details and repair specifications.

D. The Contractor shall provide the Engineer with complete access to the culvert for inspection and shall provide all confined space requirements in accordance with OSHA, labor, materials, and equipment required by the Engineer to perform these inspections. This includes but is not limited to providing and moving access ladders to allow the Engineer safe entry and safe access to all elements, providing lighting within the culverts, providing ventilation (if needed), and any other requirements necessary for the Engineer to work safely for an extended period of time. As part of the contractor's confined space permit, the contractor shall confirm that rescue services are willing and able to assist in a confined space rescue, if needed. The Contractor shall also prepare the structures for inspection by cleaning all concrete surfaces. Remove all sediment, efflorescence, dirt, and foreign matter so the concrete surface is free of all laitance by power washing or other means acceptable to the Engineer, dispose all sediment in the tank, and dewater low spots using pumps so no standing water is present.

3.02 GENERAL

A. Cut, remove, or otherwise modify parts of the existing structures or appurtenances, as indicated on the Drawings, specified, or necessary to complete the work. Finishes, joints, reinforcements,

sealants, etc, are specified in their respective Sections. All work shall comply with the requirements of this Section and as shown on the Drawings.

B. The locations, details, and limits of the modifications are shown on the Drawings. All work shall comply with the requirements of this Section and as indicated on the Drawings.

C. Examine areas and conditions under which the modifications work is to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

D. All commercial products shall be stored, mixed, applied and cured in strict compliance with the manufacturer's instructions.

E. When drilling holes for dowels/bolts, stop drilling if reinforcing is encountered. As approved by the Engineer, relocate the hole to avoid reinforcing. Do not cut reinforcing without prior approval by the Engineer. Where possible, identify reinforcing locations prior to drilling using "rebar locators" so that drill hole locations may be adjusted to avoid reinforcing interference.

F. Drill holes for adhesive anchor system using rotary impact type hammer drills with carbide-tipped bits.

G. All saw-cut edges for modification areas shall be vertically and horizontally straight. Intersecting cuts shall be perpendicular to each other.

H. Saw cutting shall stop if rebar is encountered. Rebar shall not be cut without prior approval by the Engineer. Where possible, Contractor shall identify rebar locations within one foot of saw cut locations in any direction prior to saw cutting using "rebar locators."

I. Clean concrete surfaces of all efflorescence, deteriorated concrete, dirt, laitance, existing repair materials (liners, adhesives, epoxies, etc.), and foreign matter by sandblasting, airblasting, scarifying or other mechanical means to sound original concrete.

J. Care shall be taken to fully consolidate the modification material, completely filling all portions of the area to be filled.

K. The finished surfaces shall be brought into alignment with the adjacent existing surfaces to provide a uniform, even surface. The modified surfaces shall match adjacent existing surfaces in texture and shall receive any coatings or surface treatments that had been provided for the existing surface.

L. The Engineer may from time to time direct the Contractor to make additional modifications to existing concrete. These modifications shall be made as specified or by such other methods as may be appropriate.

M. Repair or replace concrete shown or specified to be left in place which is damaged as a result of the work by approved means at no additional cost to the Owner.

3.03 CONCRETE REMOVAL

A. Concrete designated to be removed to specific limits as shown on the Drawings or directed by the Engineer, shall be done by line drilling at limits of removal followed by chipping or jack- hammering as appropriate in areas where concrete is to be taken out. Remove concrete in such a manner that surrounding concrete and existing reinforcing to be left in place and existing in place equipment are not damaged. Sawcutting at limits of concrete to be removed shall only be done if indicated on the Drawings, specified herein, or after obtaining written approval from the Engineer.

B. Where existing reinforcing is exposed due to saw cutting/line drilling and no new material is to be placed on the cut surface, a coating or surface treatment of epoxy paste shall be applied to the entire cut surface to a thickness of 1/4-in.

C. In all cases where the joint between new concrete or grout and existing concrete will be exposed in the finished work, except as otherwise shown or specified, the edge of concrete removal shall be a 1-in deep saw cut on each exposed surface of the existing concrete or as indicated on the Drawings.

D. Concrete specified to be left in place which is damaged shall be repaired by approved means to the satisfaction of the Engineer.

3.04 CONNECTION SURFACE PREPARATION

A. Connection surfaces shall be prepared as specified below for concrete areas requiring patching, repairs or modifications as shown on the Drawings, specified, or as directed by the Engineer.

B. Remove all loose and deteriorated materials, efflorescence, existing repair materials (sealants, adhesives, epoxies, etc.) dirt, oil, grease, and all other bond inhibiting materials from the surface by dry mechanical means, i.e. - sandblasting, chipping, wire brushing, or other mechanical means as approved by the Engineer. Uniformly roughen the concrete surface to approximately 1/4-in amplitude with pointed chipping tools. Thoroughly clean surface of loose or weakened material by sandblasting or airblasting. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into parent concrete.

C. If reinforcing steel is exposed, it must be mechanically cleaned to remove all loose material, contaminants, rust, etc, as approved by the Engineer. If half of the diameter of the reinforcing steel is exposed, chip out behind the steel. The distance chipped behind the steel shall be a minimum of 1-in. Reinforcing to be incorporated in new concrete and/or repair mortar shall not be damaged during the removal operation.

D. Reinforcing from existing removed or deteriorated concrete which is shown to be incorporated in new concrete and/or repair mortar shall be cleaned by mechanical means to remove all loose material and products of corrosion before proceeding. It shall be cut, bent or lapped to new reinforcing as shown on the Drawings and provided with one-inch minimum cover all around.

E. The following are specific concrete surface preparation "methods" to be used where called for on the Drawings, specified or as directed by the Engineer.

1. Method A - Roughen and clean existing concrete surface at connection. Thoroughly saturate surfaces with water; prevent standing water during application. Scrub cement paste

(cement and water mixed to consistency of a thick paste) into substrate filling concrete pores and voids. Place new concrete against scrub coat of cement paste while cement paste is still plastic.

2. Method B - After the existing concrete surface has been roughened and cleaned, apply epoxy bonding agent at connection surface. The field preparation and application of the epoxy bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or grout mixture to limits shown on the Drawings within time constraints recommended by the manufacturer to ensure bond.

3. Method C – Adhesive anchoring system shall be used for installation of all reinforcing steel dowels into existing concrete where indicated on Drawings. The installation shall comply strictly with manufacturer's recommendations, including drill bit diameter, surface preparation, injection and installation of dowel. Use oil free compressed air to blast out loose particles and dust from the drilled holes. Dowels must be clean and free of dirt, oil, grease, ice or other material which would reduce bond. Deformed bars shall be drilled and embedded to the depth indicated on the Drawings. Concrete in all existing structures shall be considered to have a strength of 3000 psi.

3.05 EXPANSION JOINT SEAL

A. Remove all exiting joint material to expose a clean concrete substrate. Remove all dirt, oil, grease, and other bond inhibiting materials from the surface by dry mechanical means such as sand blasting. Thoroughly clean surface of loose or weakened material and dust by dry mechanical means such as air blast. Additional surface preparation shall follow the recommendations of the repair mortar manufacturer.

B. Install expansion joint seal in a neat and workmanlike manner. All surfaces to receive the expansion joint seal shall be free from dirt, water and any other loose foreign debris, which may be detrimental to effective joint sealing.

C. The low density closed cell material should be sized at least 25% larger than the joint opening. The seal profile shall be cut to the correct length for installation. Care should be taken to extend the profile to its full length, without exerting any tension or stretching of the seal. The bond at the splice location is achieved by heat welding. Heat welds and splices and other directional changes should be cut and made a minimum of fifteen (15) minutes prior to seal installation. Heat welds at corners and bends shall be performed in the shop. Heat welds performed in the field shall be straight butt joints only. Provide factory fabrications for all changes of direction, transitions, and intersections. Factory fabrications shall be made and inspected by the expansion joint seal manufacturer. Provide stub ends of sufficient length to leave only straight butt joints for splicing in the field.

D. Apply bonding agent to both the substrates and joint material. Install the joint seal under compression and in strict accordance with the manufacturers’ recommendations.

3.06 INSTALLATION - SEALANTS

A. Install sealants in clean dry recesses free of frost, oil, grease, form release agent, loose material, laitance, dirt, dust, and other deleterious materials that will impair bond.

B. Apply sealant conforming to manufacturer's recommendations including concrete cure, temperature, moisture, mixing, primer, primer cure time, joint and recess preparation, tooling, and curing.

C. Apply masking tape to each side of joint prior to sealant installation. Remove masking tape afterwards, along with any spillage to leave a sealant installation with neat straight edges.

3.07 GROUTING

A. Grouting shall be as specified in Section 03600.

3.08 INSPECTION

A. At completion of all modification work, the Contractor, Engineer, and installers of the materials used on the repairs shall inspect the work. Modifications not in conformance with the Drawings or Specifications shall be repaired in accordance with the manufacturer's instructions at no additional cost to the Owner. At the completion of these repairs, the Contractor, Engineer, and installers of the materials shall inspect the repaired problem areas.

END OF SECTION

SECTION 05500

MISCELLANEOUS METALS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install all miscellaneous metal complete as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submit, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation for:

1. Shop drawings, showing sizes of members, method of assembly, anchorage and connection to other members.

B. Design Data:

1. Submit manufacturer's specifications and data including recommended design values and physical characteristics for adhesive anchor system.

C. Test Reports:

1. Certified copy of mill test reports on each stainless steel proposed for use showing the physical properties and chemical analysis.

D. Certificates:

1. Submit current International Code Council (ICC) Evaluation Service Reports for adhesive anchor system, for installation into cracked concrete or masonry, as applicable, indicating conformance with current ICC ES Acceptance Criteria.

2. Submit certifications of installer training for adhesive anchor system.

3. Certify that welders have been qualified under AWS, within the previous 12 months, to perform the welds required under this Section.

1.03 REFERENCE STANDARDS

A. American Concrete Institute (ACI):

1. ACI 318 - Building Code Requirements for Structural Concrete.

2. ACI-CRSI Adhesive Anchor Installer Certification.

B. ASTM International (ASTM):

1. ASTM A240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Plate, Sheet, and Strip Pressure Vessels.

2. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

C. American Welding Society (AWS):

1. AWS D1.6 - Structural Welding Code - Stainless Steel.

D. Occupational Safety and Health Administration (OSHA).

E. International Code Council (ICC):

1. International Building Code (IBC).

2. Other related ICC building codes as appropriate.

F. International Code Council Evaluation Services (ICC ES):

1. AC308 - Post-Installed Adhesive Anchors in Concrete Elements.

G. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 QUALITY ASSURANCE

A. General:

1. The work of this Section shall be completely coordinated with the work of other Sections. Verify, at the site, both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.

2. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

3. Adhesive anchor system shall be installed by a contractor with at least five years of experience performing similar installations.

4. All welding shall be performed by qualified welders and shall conform to the applicable AWS welding code. Welding of stainless steel shall conform to AWS D1.6.

B. Adhesive Anchor System:

1. Installer Training: Conduct thorough training by the manufacturer or the manufacturer's representative. Training shall consist of a review of the complete installation process for drilled-in anchors, including but not limited to:

a. Tool selection.
b. Hole drilling.
c. Hole preparation & cleaning.
d. Adhesive injection & dispenser training / maintenance.

e. Stud or bolt preparation and installation.
f. Proof loading/torqueing.
g. Temperature and moisture limitations.
h. Setting time.
i. Working time limitations.

2. Installer Training for Adhesive Anchors installed horizontally or upwardly inclined to support sustained tension loads: Provide the following, in addition to the requirements of Paragraph 1.04.B.1. Installation of adhesive anchors horizontally or upwardly inclined to support sustained tension loads shall be performed only by personnel certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Anchor Installer Certification program, or equivalent.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation.

B. Store materials on skids and not on the ground and block up so that they will not become bent or otherwise damaged. Handle materials with cranes or derricks. Do not dump material off cars or trucks nor handle in any other way that will cause damage.

C. Repair items that have become damage or corroded to the satisfaction of the Engineer prior to incorporating them into the work.

1.06 PROJECT/SITE REQUIREMENTS

A. Field measurements shall be taken at the site, prior to fabrication of items, to verify or supplement indicated dimensions and to ensure proper fitting of all items.

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.

2.02 MATERIALS

A. Unless otherwise noted, materials for miscellaneous metals shall conform to the following standards:

1. Stainless Steel Plates, Sheet, and Washers:

a. Exterior, Submerged or Industrial Use: ASTM A240, Type 316 (Type 316L for welded components).

2. Stainless Steel Shapes and Bars:

a. Exterior, Submerged or Industrial Use: ASTM A276, Type 316 (Type 316L for welded components).

2.03 ANCHORS, BOLTS AND FASTENING DEVICES

A. Adhesive anchor system, for fastening to solid concrete substrate, shall be a system manufactured for the installation of post installed studs including anchoring hardware and chemical dispenser. Injection adhesive shall be a two-component epoxy system including a hardener and a resin, furnished in pre-measured side-by-side cartridges which keep the two components separate. Side-by-side cartridges shall be designed to accept a static mixing nozzle which thoroughly blends the two components and allows injection directly into the drilled hole. Provide Type 316 stainless steel stud assemblies as indicated on the Drawings consisting of an all-thread anchor rod with nut and washer. Adhesive anchor system shall meet ICC ES AC308. All holes shall be hammer drilled. Adhesive anchor system shall be Hilti HIT-RE 500 V3; Simpson Strong Tie SET-XP; ITW Ramset Red Head Epcon C6+; or equal. Unless otherwise noted, anchorage designs shown on the Drawings are based on Hilti HIT- RE 500 V3.

2.04 MISCELLANEOUS STAINLESS STEEL

A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Holes shall be drilled or punched. Edges shall be smooth and without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.

B. Connections and accessories shall be of sufficient strength to safely withstand the stresses and strains to which they will be subjected. Exposed joints shall be close fitting and jointed where least conspicuous. Threaded connections shall have the threads concealed where practical. Welded connections shall have continuous welds or intermittent welds as specified or shown. The face of welds shall be dressed flush and smooth. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.

C. Miscellaneous stainless steel items shall include: beams, angles, plates, and any other miscellaneous stainless steel called for on the Drawings and not otherwise specified.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all items except those to be embedded in concrete which shall be installed under Division 3. Items to be attached to concrete or masonry after such work is completed shall be installed in accordance with the details shown.

B. Specialty products shall be installed in accordance with the manufacturer's recommendations.

C. Install adhesive anchor system in strict compliance with the manufacturer's recommendations, including drill bit type and diameter, surface preparation, temperature, moisture conditions, injection, and installation of bolts. Drill holes using rotary impact type hammer drills with carbide-tipped bits. Use oil free compressed air to blast out loose particles and dust from the

drilled holes. Studs must be clean and free of dirt, oil, grease, ice or other material which would reduce bond.

D. All steel surfaces that come into contact with exposed concrete or masonry shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in accordance with the manufacturer's instructions prior to installation.

END OF SECTION

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SECTION 11280

STAINLESS STEEL SLIDE GATE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and install slide gates, operators, operating stems and appurtenances complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Precast concrete headwall is included under Section 02605.

B. Post-installed anchors are included in Section 05500.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, copies of shop drawings and product data to establish compliance with this Section. Submittals shall include the following:

1. Description of materials.

2. Certified shop and installation drawings showing all details of construction, dimensions, and anchor bolt locations, of gate, frame, operating stems, and operators.

3. Descriptive literature, bulletins and/or catalogs of the equipment.

4. Complete bill of materials.

5. Weight of each component.

6. Installation and anchoring requirements, fasteners, and other details.

7. Certification of design head.

B. Certifications

1. Manufacturer’s Certificate: Products meet or exceed specified requirements.

2. Manufacturer’s Instruction: Detailed instructions for installation requirements, including storage and handling procedures.

3. Results of shop tests and inspections.

4. Results of field tests and inspections.

5. Manufacturer's certification that equipment has been installed according to manufacturer's instructions.

C. Operation and Maintenance Manuals: Provide two copies of manufacturer's operation and maintenance manuals. Include required cuts, drawings, equipment lists, parts lists, descriptions, etc. to instruct operating and maintenance personnel unfamiliar with equipment supplied. Include trouble shooting data and full preventive maintenance schedules.

1.04 QUALITY ASSURANCE

A. Slide gates, operators, operating stems, and appurtenance to be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture equipment furnished. Design, construct, and install in accordance with best practices and methods.

B. Slide gates and actuators to be manufactured in accordance with AWWA C561.

PART 2 PRODUCTS

2.01 STAINLESS STEEL SLIDE GATES

A. Slide gate to be installed on face of precast concrete headwall:

1. Self-contained frame with yoke to support operators.
2. Face mounted.
3. Rising stem.
4. Disc rising to open.
5. Flush bottom closure.
6. Material: Type 316 stainless steel.
7. Headwall opening 144 inches wide x 48 inches tall.
8. Dimensions of gate disc: 144 inches wide x 36 inches tall.
9. Slide gate to be normally open, closed to block outlet through headwall.
10. Normal operating water depth at gate: 24 inches.
11. Depth of water during gate closure: 24 inches.
12. Maximum closure head: 36 inches (unseating).
13. Maximum disc opening: Not less than 48 inches (to provide clear 48-inch opening).
14. Maximum water depth at gate: 48 inches (flow overtopping if gate is closed).

15. All gate components designed to withstand not less than 100 pounds of rim pull on the crank operator.

B. Disc:

1. Plate reinforced with "U" or angle-shaped stainless steel members welded to the plate not more than 18-in apart. Reinforcing ribs to extend into guides to overlap seating surface of the guide.

2. Deflection: Not more than 1/360 of span under design head.

3. Flush Bottom Seal:

   a. Invert of unit frame to be a formed stainless steel channel welded to the lower ends of the guides to form a retainer for a resilient seal to engage the bottom edge of the disc.

   b. Seal shape to provide a seating surface with minimum width of 2 inches and extend into the secondary slot of the guide.

   c. Seal to be removable and replaceable.

C. Guides:

1. Formed stainless steel construction, designed for maximum rigidity.

2. Holes for anchorage to the mounting face spaced not more than 16 inches on center.

3. Attach hollow bulb "J" or "P" seals to guides with stainless steel strips and bronze attaching bolts.

4. Arrange seals to deflect 1/16-inch minimum when contacting disc.

5. Stainless steel guides to extend above disc maximum opening to provide support for the gate yoke and operators. Guide extensions to have sufficient strength to be self-supporting without further reinforcing above the mounting face of the headwall.

6. Guides to provide mounting for bolted connection of gate yoke.

7. Disc to be removable from guides by unbolting the yoke.

D. Yoke:

1. Stainless steel structural or fabricated shape bolted to gate frame.

2. Designed to support all operating loads of the gate operators.

E. Stems:

1. Rising stem with threads at operator.

2. Type 316 stainless steel with tensile strength of 60,000 psi.

3. Diameter:

   a. Sufficient at base of thread to lift the weight of the gate and offset the resistance of the gate to the maximum unbalanced head.

   b. Sufficient to transmit in compression at least two times the rated output of the crank operator with a 40-pound effort on the crank.

   c. Slenderness Ration (l/r): Less than 200.

4. Stems of more than one section joined by stainless steel couplings pinned and bolted to the stem sections.

5. Stems securely bolted to fabricated stainless steel mounting on disc.

6. Stem Threads: Machine-cut threads, Acme type, double lead. Cut threads are not acceptable.

7. Stem guides not permitted for full length of stem.

8. Stop Collar: Provide bronze or stainless steel stop collars on stem to prevent over-closing of the gate and stop gate opening at 48-inch disc elevation.

9. Stem Covers: Provide rising stem covers of Type 304 stainless steel of length to allow full 48-inch disc opening. Stem cover base of Type 304 stainless steel to mount to top of gate operator.

F. Operator:

1. Gate to be operated with tandem interconnected bevel gear operators to provide distributed lifting of the disc. Mount operators on the gate yoke, attached with stainless steel bolts. Provide Type 316 stainless steel interconnecting shafting and flexible couplings for operating of gate at one of the operators.

2. Operators to be crank-operated with removable crank. Crank arranged to function with two-speed gate drive. Provide permanent indications of direction of rotation to open. Provide one crank of cast iron or fabricated steel construction.

3. Crank connection to operator to match Owner's existing gate operators. Provide a stainless steel adaptor plate bolted to the driving gate operator matching adaptor plates utilized on Owner's existing gates to allow operation by Owner's portable power drive.

4. Operator construction:

   a. Bevel gear operator fully enclosed in cast or ductile iron housing.

   b. Grease-lubricated.

   c. Mechanical seals on all shaft connections.

d. Shafting fully supported with anti-friction ball or roller bearings throughout.

e. Precision machined high-strength bronze lift nuts. Stem nut designed to fail from excessive crank force before failure of stem or yoke.

f. Precision-cut steel gears.

g. Input shaft: Type 316 stainless steel

h. Two speed reduction to meet rim pull requirements for seating and lifting disc motion.

2.02 FINISHES

A. Stainless steel surfaces: mill finish, welds cleaned and passivated.

B. Cast/ductile iron and steel surfaces: manufacturer to clean, prime, and shop paint surfaces with finishes suitable for outdoor service to coating manufacturer's specifications.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install slide gates according to manufacturer's instructions.

B. Check that gates are installed plumb, true, and free of warp or twist.

C. Perform installation of gate under supervision of gate manufacturer's factory representative who has complete knowledge of proper installation. Inspect the final installation and supervise a test of the equipment.

D. Surface Installation of Guides:

1. Install guides with post-installed anchors as specified in Section 05500.

2. Position guides to align with opening of precast concrete headwall.

3. Install nuts on each side of guide and adjust to assure guides provide a single plane alignment for the disc.

4. Check operation of disc for free motion.

5. Once disc motion is confirmed, apply non-shrink grout as recommended by gate manufacturer to seal gate frame in place.

6. Fully tighten outside nuts.

E. Provide all lubricants required for initial operation.

F. Perform testing of slide gate in accordance with AWWA C561 where applicable.

1. Test full open/closure of gate disc for 3 cycles. Test using both hand crank and Owner's portable powered operator.

2. If conditions permit, test for leakage with gate closed, upstream baffles in place, and downstream impoundment pumped out to produce a 24-inch unseating head on the gate.

G. Submit manufacturer's certification of field inspection and test.

END OF SECTION

Appendix A

Soil Borings

Geologic - Earth Exploration, Inc.

7 Sherwood Drive
TEL (508) 384-4434
Norfolk, MA 02056
FAX (508) 384-4452

CLIENT: Camp, Dresser & McKee, Inc.
PROJECT: Drainage Basins
LOCATION: Worcester, MA

BORING #: B-1
PAGE 1 OF 1

File #: 05038
Date Started: 2/11/05
Date Completed: 2/11/05
Driller: R. Eastwood
Site Rep.:

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	
SIZE	3.25"	1-3/8	
HAMMER		140#	---
FALL		30"	---

Surface Elevation:
Station:
Groundwater level readings
Date 2/11/05 Depth 8.5+-
Date Depth

Depth ft	Sample No.	Sample Depth ft	Pen. in	Rec. in	Blows/6"	Strata Change ft	Sample Description
	S-1	0.0-2.0	24	16	12-17-21-29		S-1 Dry, medium dense, brown, fine to medium, SAND and GRAVEL, SILT, some coarse gravel, -FILL-
						4.0	
5	S-2	5.0-7.0	24	14	42-30-52-61		S-2 Dry, very dense, brown, very dense, fine to medium SAND and fine GRAVEL
10	S-3	10.0-12.0	24	19	11-11-10-9		S-3 Wet, medium dense, brown fine to medium SAND
15	S-4	15.0-17.0	24	19	10-9-11-14		S-4 Similar to S-3 above
						19.0	
20	S-5	20.0-22.0	24	14	35-47-46-58		S-5 Wet, medium dense, brown/gray, fine to medium SAND and fine GRAVEL, silty, -TILL-
25	S-6	24.0-25.0	12	8	49-73-100/0"	25.0	S-6 Wet, medium dense, olive, fine SAND and GRAVEL, silty, - TILL-
							Bottom of exploration at 25.0'
30							

Ground Surface to _____ used _____ then _____

Proportions Used		Cohesive Consistency Blows/ft				Cohesionless Density Blows/ft		Sample Type
Trace	0 to 10%	0-2	Very Soft	9-15	Stiff	0-10	Loose	UP = Fixed Piston
Little	10 to 20%	3-4	Soft	16-30	V-Stiff	10-30	M-Dense	UT = Shelby Tube
Some	20 to 35%	5-8	M-Stiff	31+	Hard	30-50	Dense	OE = Open End Rod
And	35 to 50%					50+	V-Dense	* = 300# hammer

Notes:
1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual.
2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.

Remarks:

NEW ADDRESS 05038CDM.GPJ GEOLOGIC.GDT 2/16/05

Geologic - Earth Exploration, Inc.

7 Sherwood Drive
TEL (508) 384-4434
Norfolk, MA 02056
FAX (508) 384-4452

CLIENT: Camp, Dresser & McKee, Inc.
PROJECT: Drainage Basins
LOCATION: Worcester, MA

BORING #: B-3
PAGE 1 OF 1

		CASING	SAMPLER	CORE BARREL
File #:	05038	TYPE: HSA	SS	
Date Started:	2/11/05	SIZE: 3.25"	1-3/8	
Date Completed:	2/11/05	HAMMER:	140#	---
Driller:	R. Eastwood	FALL:	30"	---
Site Rep.:				

Surface Elevation:
Station:
Groundwater level readings
Date 2/11/05 Depth 14.0+-
Date Depth

Depth ft	Sample No.	Sample Depth ft	Pen. in	Rec. in	Blows/6"	Strata Change ft	Sample Description
	S-1	0.0-2.0	24	3	26-34-8-10		S-1 Dry, medium dense, brown, fine SAND and GRAVEL, SILT, -FILL-, cobble stuck in tip of spoon
						3.5	
5	S-2	5.0-7.0	24	14	31-12-28-23		S-2 Dry, dense, brown, fine to medium SAND and GRAVEL, trace silt
						9.0	
10	S-3	10.0-12.0	24	13	64-53-100/6"		S-3 Dry, very dense, gray/brown, very dense, fine to medium SAND and GRAVEL, some silt, -till-
						14.5	
15	S-4	15.0-17.0	24	10	66-81-35-26		S-4 Wet, very dense, gray decomposed and weathered BEDROCK
							Refusal with augers at 19.3
						19.3	
20							Bottom of exploration at 19.3'
25							
30							

Ground Surface to _____ used _____ then _____

Proportions Used		Cohesive Consistency Blows/ft				Cohesionless Density Blows/ft		Sample Type
Trace	0 to 10%	0-2	Very Soft	9-15	Stiff	0-10	Loose	UP = Fixed Piston
Little	10 to 20%	3-4	Soft	16-30	V-Stiff	10-30	M-Dense	UT = Shelby Tube
Some	20 to 35%	5-8	M-Stiff	31+	Hard	30-50	Dense	OE = Open End Rod
And	35 to 50%					50+	V-Dense	* = 300# hammer

Notes:
1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual.
2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.

Remarks:

NEW ADDRESS 05038COM.GPJ GEOLOGIC.GDT 2/16/05

Geologic - Earth Exploration, Inc.

7 Sherwood Drive
TEL (508) 384-4434
Norfolk, MA 02056
FAX (508) 384-4452

CLIENT: Camp, Dresser & McKee, Inc.
PROJECT: Drainage Basins
LOCATION: Worcester, MA

BORING #: B-4
PAGE 1 OF 1

File #: 05038
Date Started: 2/11/05
Date Completed: 2/11/05
Driller: R. Eastwood
Site Rep.:

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	
SIZE	3.25"	1-3/8	
HAMMER		140#	---
FALL		30"	---

Surface Elevation:
Station:
Groundwater level readings
Date 2/11/05 Depth 4.5+-
Date Depth

Depth ft	Sample No.	Sample Depth ft	Pen. in	Rec. in	Blows/6"	Strata Change ft	Sample Description
	S-1	0.0-2.0	24	14	6-12-19-23		S-1 Dry, medium dense, brown, fine SAND and GRAVEL, SILTY, -FILL-
						3.0	
5	S-2	5.0-7.0	24	8	6-14-21-27		S-2 Wet, medium dense, 5-5.4 black SILT Gray, fine to medium SAND and trace coarse GRAVEL, and trace SILT
						8.5	
10	S-3	10.0-11.5	18	12	39-74-100		S-3 Wet, very dense, gray, very dense, medium to coarse SAND and GRAVEL
15	S-4	16.0-17.5	18	15	48-79-102		S-4 Wet, very dense, gray, very dense, fine to medium SAND and fine to coarse GRAVEL, some silt
						17.5	Bottom of exploration at 17.5'
20							
25							
30							

Ground Surface to _____ used _____ then _____

Proportions Used		Cohesive Consistency Blows/ft				Cohesionless Density Blows/ft		Sample Type
Trace	0 to 10%	0-2	Very Soft	9-15	Stiff	0-10	Loose	UP = Fixed Piston
Little	10 to 20%	3-4	Soft	16-30	V-Stiff	10-30	M-Dense	UT = Shelby Tube
Some	20 to 35%	5-8	M-Stiff	31+	Hard	30-50	Dense	OE = Open End Rod
And	35 to 50%					50+	V-Dense	* = 300# hammer

Notes:
1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual.
2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.

Remarks: *Hole # was moved approx. 60' S.East of original location at clients request.

NEW ADDRESS 05038CDM.GPJ GEOLOGIC.GDT 2/17/05

Appendix B

Permits

(Wetlands Order of Conditions)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
349-1353
MassDEP File #

eDEP Transaction #

Worcester
City/Town

A. General Information

Please note: this form has been modified with added space to accommodate the Registry of Deeds Requirements

1. From: City of Worcester
Conservation Commission

2. This issuance is for (check one): a. ☒ Order of Conditions b. ☐ Amended Order of Conditions

3. To: Applicant:

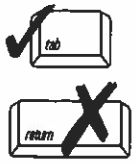
a. First Name | b. Last Name

City of Worcester Department of Public Works & Parks
c. Organization

50 Officer Manny Familia Way
d. Mailing Address

Worcester (e. City/Town) | MA (f. State) | 01605 (g. Zip Code)

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



4. Property Owner (if different from applicant):

a. First Name | b. Last Name

c. Organization

d. Mailing Address

e. City/Town | f. State | g. Zip Code

5. Project Location:

82 Salisbury Street
a. Street Address

Worcester
b. City/Town

01-01X
c. Assessors Map/Plat Number

-03-05
d. Parcel/Lot Number

Latitude and Longitude, if known: 42d 16m 46.42s (d. Latitude) | -71d 48m 20.72s (e. Longitude)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP: 349-1353
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Worcester
City/Town

A. General Information (cont.)

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):

Worcester
a. County

b. Certificate Number (if registered land)

n/a
c. Book

n/a
d. Page

7. Dates: 3/1/2023 a. Date Notice of Intent Filed; 4/10/2023 b. Date Public Hearing Closed; 4/11/2023 c. Date of Issuance

8. Final Approved Plans and Other Documents (attach additional plan or document references as needed):

Salisbury Pond Water Quality Improvements
a. Plan Title

CDM Smith
b. Prepared By

Virginia A. Road, P.E.
c. Signed and Stamped by

3/31/2023 (as amended by Attachment A)
d. Final Revision Date

1"=10' & 1"=20'
e. Scale

NOI Application Materials
Stormwater Report
f. Additional Plan or Document Title

March 2023
March 2023
g. Date

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act (the Act). Check all that apply:

a. ☒ Public Water Supply
b. ☐ Land Containing Shellfish
c. ☒ Prevention of Pollution
d. ☒ Private Water Supply
e. ☒ Fisheries
f. ☒ Protection of Wildlife Habitat
g. ☒ Groundwater Supply
h. ☒ Storm Damage Prevention
i. ☒ Flood Control

2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

Approved subject to:

a. ☒ the following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP: 349-1353
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Worcester
City/Town

B. Findings (cont.)

Denied because:

b. ☐ the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c. ☐ the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

3. ☐ **Buffer Zone Impacts:** Shortest distance between limit of project disturbance and the wetland resource area specified in 310 CMR 10.02(1)(a) ____ a. linear feet

Inland Resource Area Impacts: Check all that apply below. (For Approvals Only)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. ☒ Bank	20 a. linear feet	20 b. linear feet	20 c. linear feet	20 d. linear feet
5. ☐ Bordering Vegetated Wetland	____ a. square feet	____ b. square feet	____ c. square feet	____ d. square feet
6. ☒ Land Under Waterbodies and Waterways	880 a. square feet	880 b. square feet	880 c. square feet	880 d. square feet
	____ e. c/y dredged	____ f. c/y dredged		
7. ☒ Bordering Land Subject to Flooding	11,045 a. square feet	11,045 b. square feet	21,625 c. square feet	21,625 d. square feet
Cubic Feet Flood Storage	1,951 e. cubic feet	1,951 f. cubic feet	75,446 g. cubic feet	75,446 h. cubic feet
8. ☐ Isolated Land Subject to Flooding	____ a. square feet	____ b. square feet		
Cubic Feet Flood Storage	____ c. cubic feet	____ d. cubic feet	____ e. cubic feet	____ f. cubic feet
9. ☐ Riverfront Area	____ a. total sq. feet	____ b. total sq. feet		
Sq ft within 100 ft	____ c. square feet	____ d. square feet	____ e. square feet	____ f. square feet
Sq ft between 100-200 ft	____ g. square feet	____ h. square feet	____ i. square feet	____ j. square feet

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
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Worcester
City/Town

B. Findings (cont.)

Coastal Resource Area Impacts: Check all that apply below. (For Approvals Only)

	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. ☐ Land Under the Ocean	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
12. ☐ Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. ☐ Coastal Beaches	a. square feet	b. square feet	c. nourishment cu yd	d. nourishment cu yd
14. ☐ Coastal Dunes	a. square feet	b. square feet	c. nourishment cu yd	d. nourishment cu yd
15. ☐ Coastal Banks	a. linear feet	b. linear feet		
16. ☐ Rocky Intertidal Shores	a. square feet	b. square feet		
17. ☐ Salt Marshes	a. square feet	b. square feet	c. square feet	d. square feet
18. ☐ Land Under Salt Ponds	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
19. ☐ Land Containing Shellfish	a. square feet	b. square feet	c. square feet	d. square feet
20. ☐ Fish Runs	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	a. c/y dredged	b. c/y dredged		
21. ☐ Land Subject to Coastal Storm Flowage	a. square feet	b. square feet		
22. ☐ Riverfront Area	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	g. square feet	h. square feet	i. square feet	j. square feet

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP: 349-1353
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B. Findings (cont.)

* **#23.** If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c (BVW) or B.17.c (Salt Marsh) above, please enter the additional amount here.

23. ☐ Restoration/Enhancement *:

a. square feet of BVW | b. square feet of salt marsh

24. ☐ Stream Crossing(s):

a. number of new stream crossings | b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects.

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
   a. The work is a maintenance dredging project as provided for in the Act; or
   b. The time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
   c. If the work is for a Test Project, this Order of Conditions shall be valid for no more than one year.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order. An Order of Conditions for a Test Project may be extended for one additional year only upon written application by the applicant, subject to the provisions of 310 CMR 10.05(11)(f).
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Order will expire on _____ unless extended in writing by the Department.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
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C. General Conditions Under Massachusetts Wetlands Protection Act

8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.

9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.

10. A sign shall be displayed at the site not less then two square feet or more than three square feet in size bearing the words,

"Massachusetts Department of Environmental Protection" [or, "MassDEP"]

"File Number 349-1353 "

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before MassDEP.

12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.

13. The work shall conform to the plans and special conditions referenced in this order.

14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.

15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.

16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.

18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

19. The work associated with this Order (the "Project")
    (1) ☒ is subject to the Massachusetts Stormwater Standards
    (2) ☐ is NOT subject to the Massachusetts Stormwater Standards

    If the work is subject to the Stormwater Standards, then the project is subject to the following conditions:

    a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Construction General Permit as required by Stormwater Condition 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.

    b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that:

    i. all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures;

    ii. as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized;

    iii. any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10;

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

iv. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition;

v. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.

c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement) for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following:

i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and

ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.

d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Multi-Sector General Permit.

e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 18(f) through 18(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 18(f) through 18(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.

f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

g) The responsible party shall:
1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.

h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.

i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.

j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.

k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.

l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):

See Attachment A.

20. For Test Projects subject to 310 CMR 10.05(11), the applicant shall also implement the monitoring plan and the restoration plan submitted with the Notice of Intent. If the conservation commission or Department determines that the Test Project threatens the public health, safety or the environment, the applicant shall implement the removal plan submitted with the Notice of Intent or modify the project as directed by the conservation commission or the Department.

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D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? ☒ Yes ☐ No

2. The City of Worcester Conservation Commission hereby finds (check one that applies):

   a. ☐ that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw, specifically:
   City of Worcester Wetlands Protection Ordinance & Regulations (1. Municipal Ordinance or Bylaw)
   COW GRO Part 1. Ch. 6. (2. Citation)

   Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.

   b. ☒ that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:
   City of Worcester Wetlands Protection Ordinance & Regulations (1. Municipal Ordinance or Bylaw)
   COW GRO Part 1. Ch. 6. (2. Citation)

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.
   The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):
   See Attachment A.

ATTACHMENT A

Worcester Conservation Commission

Special Order of Conditions

City of Worcester Wetlands Protection Ordinance & City of Worcester Wetlands Protection Regulations

(City of Worcester Revised Ordinance Part I, Chapter 6)

And

Massachusetts General Laws, Chapter 131, §40 - Massachusetts Wetlands Protection Act

82 Salisbury Street – Institute Park / Salisbury Pond (CC-2023-009 & DEP#349-1353)

Project Description: To install two below ground particle separators, construct a sediment forebay, and conduct related site work.

Findings/Waivers: Finding that project is exempt from performance standard 4.2.4 as a component of a storm water, flood control, water conservation, erosion control or soil conservation project otherwise approved pursuant to 4.2.4(A)(2).

Table of Contents:

Notes:

- **Office of the Commission** is located at the Division of Planning and Regulatory Services (455 Main Street 4th floor, Worcester, MA), which can be contacted by e-mailing planning@worcesterma.gov or calling 508-799-1400 ext. 31440.
- **Asterisked (*) conditions** are standard conditions of approval for all projects.

I. Conditions to Meet Prior to and During Construction

21. Person Responsible for Compliance with the Order of Conditions* – A person shall be designated to be responsible to monitor compliance with the Order of Conditions. Their name and contact information (24/7) shall be provided to the Office of the Commission prior to start of any activity. This person shall conduct:
    a) periodic inspections to assure the adequacy and continued effectiveness of erosion and sediment controls;
    b) inspections of said controls following 0.5-inch or greater rain events, or after a heavy snow melt.
22. Contract* - This Order of Conditions and all approved plans shall be included as part of any contract and subcontract and shall be posted in a prominently displayed location in the supervisory office on site during all phases of construction.
23. Notification* - The applicant shall notify the Office of the Commission a minimum of 48 hours prior to the start of any activity.
24. Wetland Flagging – Prior to construction, wetland flags shall be installed along the wetland boundary and shall remain in place during and after construction until approved for removal through the issuance of Certificate of Compliance for the entire project.

II. Conditions to Meet Before the Start of Any Activity

25. Sequencing Plan – Prior to the start of any activity, the contractor shall provide a sequencing plan for the construction of the sediment forebay for the review and approval of the Commission. The plan shall include details for the penetration of the culvert, the redirection of flow during the work, the installation of articulated concrete block, riprap, etc., and plans for dewatering.
26. Stormwater Management System Maintenance – Prior to the start of any activity, the applicant must submit in writing the name, address and telephone number of the party responsible for ongoing maintenance of the stormwater management system components.
27. Stormwater Pollution Prevention Plan (SWPPP)* – That one (1) digital copy of the SWPPP submitted to the EPA in compliance with the NPDES permit requirements, if applicable, shall be provided to the Office of the Commission prior to commencement of work. The contact information for the SWPPP inspector as well as evidence of their status as a Qualified Person to conduct inspections under Part 4 of the Construction General Permit (i.e. a certificate of completion of the NPDES Construction Inspection Training Course) shall also be provided.
28. Tree Cutting* – Tree cutting is allowed following installation of erosion and sediment controls; otherwise, it may be allowed, prior to such installation, with the explicit permission of the Commission or its Agents.
29. Trees To Remain* – All trees to remain post construction shall be marked on site as shown on the approved plan so that the Commission or its representative can verify them before any clearing takes place.
30. Pre-Construction Conference* -
    a) The Conservation Commission or its Agents shall conduct a pre-construction conference prior to commencement of activities in each phase of the project. Phasing, if any, shall conform to the approved plans.
    b) The property owner / applicant and any person performing work that is subject to this Order are responsible for understanding and complying with the requirements of this Order, the Wetlands Protection Act, 310 CMR 10.00 and City of Worcester Wetlands Protection Ordinance and

Regulations. Said persons shall acknowledge such in writing prior to commencement of activities.

31. Inspections Prior to Site Preparation and Site Work* - Erosion and sediment controls shall be installed and verified, in compliance with final approved plans, by the Commission or its Agents prior to the commencement of any excavation, grubbing and/or stumping of vegetation, grading, construction, or other site preparation.

32. Construction Schedule* - Submit a Construction Schedule consistent with Work Sequencing plans provided to the Office of the Commission prior to the start of any activities.

III. Stormwater Management System

33. Catch Basins* –

    a) The paved roadways and parking lots shall be bermed and shall be installed with standard City of Worcester catch basins.

    b) Prior to start of activity on site that causes soil erosion and sedimentation, catch basin filter traps shall be installed in the existing and new catch basins.

    c) Catch basins shall be cleaned as warranted during construction to keep them clear of sediment, and minimum twice a year thereafter.

34. Stormwater Management System Maintenance* – The stormwater management system shall be maintained in accordance with the approved design plans and Operation and Maintenance Plan on file with the Office of the Commission. The system shall be maintained in good hydraulic condition (e.g. any accumulated silt/sediment shall be removed; the system shall be kept free of any litter, refuse, or other extraneous matter, etc.). **This condition shall extend in perpetuity beyond the issuance of the Certificate of Compliance.**

IV. Conditions to Meet During Construction

35. Limit of Work* – No removal, filling, dredging or altering of jurisdictional areas shall take place outside the approved work under this Order of Condition.

36. Work Sequencing* – Activities shall take place in accordance with all phasing and sequencing shown on the plan and/or provided in the application materials on file with the Office of the Commission and shall follow any lot opening restrictions otherwise provided herein.

37. Erosion Stabilization -

    a) *Erosion and Sediment Controls** - All erosion and sediment controls shall be monitored, maintained, and adjusted for the duration of the project to prevent adverse impacts to jurisdictional areas. Additional erosion and sediment controls may be utilized on site as needed.

    b) *Off Site Impacts** - There shall be no off-site erosion, flooding, ponding, or flood-related damage from runoff caused by the project activities.

    c) *Unanticipated Drainage or Erosion** - The applicant shall control any unanticipated drainage and/or erosion conditions that may cause damage to jurisdictional areas and/or abutting or downstream properties. Said control measures shall be implemented immediately upon need. The Office of the Conservation Commission shall be notified if such conditions arise and of the measures utilized.

    d) *Soil Stabilization due to Delay in Work** - If there is an interruption of more than 10, but less than 60 days between completion of grading and revegetation, the applicant shall sow all disturbed areas with annual rye grass to prevent erosion. If soils are to be exposed for longer than 60 days, a temporary cover of rye or other grass should be established following US Soil Conservation Services procedures, as recently amended, to prevent erosion and sedimentation.

Once final grading is complete, loaming and seeding of final cover should be completed promptly.

e) *Grading of Slopes**-

i. >40% Slope – Slopes shall not exceed those specified in the plans approved by the Conservation Commission. Any slope equal to or greater than 40% (1 vertical to 2 1/2 horizontal) shall be stabilized with erosion control matting.

ii. <40% Slope – Final grades of vegetated areas shall not exceed a slope of 1 vertical to 2 1/2 horizontal (40%) and shall be stabilized to prevent erosion, particularly during the construction period.

f) *Stockpile Maintenance** - Any stockpiling of loose materials shall be properly stabilized to prevent erosion into and sedimentation of jurisdictional areas. Preventative controls such as strawbales or erosion control matting shall be implemented to prevent such an occurrence.

g) *Stockpile Location* – In no case shall any soil or excavated material be stockpiled within 50 feet of any wetland, floodplain, or storm drain inlet.

h) *Site Stabilization Prior to Winter** - Prior to winter, exposed soils shall be stabilized (e.g. with demonstrated vegetative growth, impermeable barriers, erosion control blankets, etc.).

38. Invasive Insects* -

a) *Plantings* – No trees to be planted shall be species susceptible to the Asian Longhorned Beetle or Emerald Ash Borer.

b) *Wood Removal* – All tree, brush & wood removal shall adhere to the most recently amended requirements set forth by the Massachusetts Department of Conservation & Recreation for any project located in the Asian Longhorned Beetle Quarantine Zone.

39. Invasive Vegetation – The goal of this condition is to keep jurisdictional areas (bufferzone and resource areas) free of all invasive, likely invasive, and potentially invasive species as identified in *The Evaluation of Non-native Plant Species for Invasiveness in Massachusetts,* published by the MA Invasive Plant Advisory Group in April 1, 2005. This condition is intended to prevent the introduction and spread of non-native and invasive species which are known to result in resource area alterations and have impacts on wildlife habitat, etc.

a) *Material Introduction* – All imported materials, such as compost, topsoil, etc. shall be inspected for evidence of invasive vegetation prior to use within jurisdictional areas at the site in order to prevent introduction and/or the spread of invasive vegetation. No materials with evidence of invasive vegetation shall be used in jurisdictional areas.

b) *On-going Management* - A weeding program must be implemented within all jurisdictional areas that are disturbed as part of the project. The weeding program shall begin within one month of when final grades are reached and shall continue, at a minimum of, twice per growing season until a Certificate of Compliance is issued for the project.

40. Dust Control* - Provisions for dust control shall be provided during all construction and demolition activities. Such provisions shall be conducted in compliance with all City of Worcester Water Use Restrictions, if in effect, during such activities.

41. Dewatering* – If dewatering is required,

a) Notice of such activities shall be given to the Office of the Commission within 24 hours of commencement;

b) There shall be no discharge of untreated dewatered stormwater or groundwater to jurisdictional areas either by direct or indirect discharge to existing drainage systems;

c) Any discharge to surface waters or drainage structures must be visibly free of sediment;

d) To the maximum extent practicable, proposed dewatering activities should be located outside of the 100' buffer. If such activities must be located within the 100' buffer, they shall be monitored at all times when the pumps are running;

e) Dewatering activities shall be confined within an area of secondary containment at all times.

42. SWPPP Monitoring Construction Reports – Written construction reports or copy of SWPPP reports, shall be submitted to the Office of the Commission during all earthwork and drainage construction. Reports shall be submitted monthly or after each precipitation event (rain or snow melt) of 0.5 inches or greater, whichever is more frequent, and shall include:

a) an evaluation, during such events, of all existing erosion and sedimentation controls, as well as stormwater management system/s performance; and

b) solutions employed and/or recommendations to fix areas found to be deficient, if any.

43. Spill Prevention* -

a) No fuel, oil, or other pollutants shall be stored in any resource area or the buffer zone thereto, unless specified in this Order;

b) No refueling shall take place within resource areas or 100-ft to a resource area;

c) The applicant shall take all necessary precautions to prevent discharge or spillage of fuel, oil or other pollutants onto any part of the site;

d) A spill kit shall be present on site at all times.

44. Fertilizers – For any portion of the lot located in the buffer zone, the Commission will allow the use of fertilizers only during the construction phase in order to establish vegetation in order to stabilize slopes as quickly as possible.

V. Conditions to Meet at Completion of Project

45. Post-Construction Monitoring – After the completion of the construction of the sediment forebay, two (2) years of monitoring are required to ensure that there is no scour/channelization within the Bordering Vegetated Wetland adjacent to the spillway. Annual monitoring reports shall be provided to the Office of the Commission detailing any observed scour and any actions needed to remediate it.

46. Operation & Maintenance Dewatering – For the dewatering necessary to conduct Operation & Maintenance Activities for the sediment forebay:

f) Notice of such activities shall be given to the Office of the Commission within 24 hours of commencement;

g) There shall be no discharge of untreated dewatered stormwater or groundwater to jurisdictional areas either by direct or indirect discharge to existing drainage systems;

h) Any discharge to surface waters or drainage structures must be visibly free of sediment;

i) To the maximum extent practicable, proposed dewatering activities should be located outside of the 100' buffer. If such activities must be located within the 100' buffer, they shall be monitored at all times when the pumps are running;

j) Dewatering activities shall be confined within an area of secondary containment at all times.

47. Site Stabilization* - All disturbed areas shall be properly stabilized with well-established perennial vegetation or other approved methods before the project is considered complete.

48. Erosion and Sediment Controls* - Erosion and sediment controls shall not be removed from the site until all disturbed areas have been stabilized with final vegetative cover and approval has been

received from the Commission or its Agents to do so. The controls must then be removed within two weeks of receipt of that certification.

49. Compensatory Storage – The area of required compensatory storage shall be deeded as a perpetual restriction on the property to prevent any permanent or temporary structure, stockpiling of fill or other alterations to bordering land subject to flooding.

50. Certificate of Compliance* - Upon completion of the project, the applicant shall request in writing a Certificate of Compliance from the Commission. If the project has been completed in accordance with plans stamped by a registered professional engineer, architect, landscape architect, or land surveyor, certification must include a written statement by such professional certifying the same.

    a) A certified as-built plan-of-land shall be provided showing final grades, resource areas, and all constructed improvements;

51. Pesticides, Etc. – No pesticides, herbicides, or fertilizers, with the exception of lime, shall be used on lawn(s) within the buffer zone to bordering vegetated wetland or bank after completion of the project.

52. Snow Storage – At no time shall snow be stored or stockpiled within the sediment forebay.

53. Deed Condition – Conditions numbered 34, 46, 51, & 52 shall extend beyond the Certificate of Compliance, in perpetuity, and shall be referred to in all future deeds to this property.

VI. General Conditions

54. Change in Ownership* - If a change in ownership takes place while this Order is still in effect, it is the responsibility of the new owner to notify the Commission of the change and to provide the name of the person responsible for compliance with the Order.

55. Conservation Agent's Power to Act* - With respect to all conditions, except _____, the Conservation Commission designates the Conservation Agent, as its Agent with full powers to act on its behalf in administering and enforcing this Order, unless the Agent determines approval from the Commission is appropriate.

56. Right to Inspect* - A member of the Conservation Commission or its Agent may enter and inspect the property and the activity that are the subjects of this Order at all reasonable times, with or without probable cause or prior notice, and until a Certificate of Compliance is issued, for the purpose of evaluating compliance with this Order (and other applicable laws and regulations).

57. Changes to the Plan or Errors & Omissions* -

    (a) If any plan, calculation, or other data presented to the Office of the Commission is in error or have omissions, and are deemed significant by the Commissioners or their Agents, all work will stop at the discretion of the Commission, until the discrepancies have been rectified to the Commission's satisfaction.

    (b) The applicant must notify the Commission in writing of any changes in the plans or implementation of the proposed activity where mandated by any local, state, or federal agencies having jurisdiction over the proposed activity. If, in the opinion of the Commission, any changes in the plans or implementation of the proposed activity so require, then the Commission may modify, amend or rescind this Order in a way consistent with:

        - M.G.L. Chapter 131, Section 40,
        - 310 CMR 10.00, *Wetlands Protection*,
        - the City of Worcester's *Wetlands Protection Ordinance*, and
        - the Commission's *Wetlands Protection Regulations*

If any provisions of any conditions, or application thereof is held to be invalid, such invalidity shall not affect any other provisions of this Order. If the Commission deems that a proposed change is major or substantial, a new hearing may be required.

58. Liability* - The applicant shall indemnify and save harmless the Commonwealth, the City of Worcester, the Conservation Commission, and its Agents against all sites, claims or liabilities of every name and nature arising at any time out of or in consequence of the acts of the Commission or its Agents in the performance of the work covered by this Order and/or failure to comply with the terms and conditions or this Order whether by itself or its employees or subcontractors.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
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City/Town

E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

4/11/2023
1. Date of Issuance

Please indicate the number of members who will sign this form.
This Order must be signed by a majority of the Conservation Commission.

4 of 6
2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.
The names typed below represent the intent to sign the foregoing document in accordance with MGL Chapter 110G §9
Duly authorized by Ch.110G and recorded at Worcester Registry of Deeds in Book 62537 Page 329.

Signatures:

☐ by hand delivery on

Date

☒ by certified mail, return receipt requested, on 4/11/2023

Date

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.
Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.
The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in

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the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Conservation Commission

Please be advised that the Order of Conditions for the Project at:

Project Location | MassDEP File Number

Has been recorded at the Registry of Deeds of:

County | Book | Page

for: Property Owner

and has been noted in the chain of title of the affected property in:

Book | Page

In accordance with the Order of Conditions issued on:

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Massachusetts Department of Environmental Protection
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Document Number

Signature of Applicant

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

Request for Departmental Action Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number:

Provided by DEP

A. Request Information

1. Location of Project

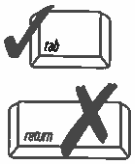
a. Street Address

b. City/Town, Zip

c. Check number

d. Fee amount

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



2. Person or party making request (if appropriate, name the citizen group's representative):

Name

Mailing Address

City/Town

State

Zip Code

Phone Number

Fax Number (if applicable)

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

Name

Mailing Address

City/Town

State

Zip Code

Phone Number

Fax Number (if applicable)

4. DEP File Number:

B. Instructions

1. When the Departmental action request is for (check one):

☐ Superseding Order of Conditions – Fee: $120.00 (single family house projects) or $245 (all other projects)

☐ Superseding Determination of Applicability – Fee: $120

☐ Superseding Order of Resource Area Delineation – Fee: $120

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

Request for Departmental Action Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number:

Provided by DEP

B. Instructions (cont.)

Send this form and check or money order, payable to the *Commonwealth of Massachusetts,* to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see http://www.mass.gov/eea/agencies/massdep/about/contacts/).

4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.