SECTION 01100

SUMMARY OF WORK
Sequence of Tasks

PART 1 - GENERAL

1.01 SCOPE OF WORK

The work for this project consists of AST installation behind the existing storage garage at the City's Moy Ranch facility as well as limited repaving at the recently removed UST. Specifically, work outlined below follows the steps necessary to provide the City with a fully operating facility that meets the operational requirements of the Department. Work also includes all electrical work associated with completing the above items. This document is a Performance Specification and as such does not specify the means and methods to be used by the Contractor to achieve those goals. For example, there are no design specifications related to how the tank is to be constructed or how associated apparatus such as pumps, stairs, paint or support structures are to be installed. These tank designs and components are the responsibility of the tank manufacturer and supplier, and the responsibility of the Contractor to follow applicable instructions. The Contractor is responsible for providing design drawing stamped by a professional engineer in the state of Massachusetts for a complete installation. At the completion of work, the Contractor shall certify that the work was performed according with regulatory requirements and MassDOT standards, and tank supplier plans and technical specifications as outlined herein, reference subsection 1.02 Submittals. The Contractor shall also supply final stamped As-Built drawings that outline any modifications from stamped construction plans provided prior to beginning work. The work shall follow the steps as outlined below:

1. Provide a set of stamped Fuel System Design Plans that outline complete installation including all key parts and materials required for a complete installation.

2. Mobilize of equipment, materials, and personnel to the site.

3. Preserve and maintain all existing utilities and utility connections within the project area and immediately adjacent.

4. Grading of areas behind the Storage Garage as outlined on plans to allow for installation of necessary concrete pads and repaving work. A 12-inch subbase installed in accordance with the MassDOT Standard Specifications is required under all newly paved areas and concrete pads.

5. Excavation and backfilling for conduit with necessary pavement patching. The Contractor shall be held responsible for the satisfactory execution of pipeline and conduit construction in accordance with applicable Building codes. The Contractor shall make all connections through conduit to be installed as shown on Drawings. The Contractor is responsible for wiring, including wall penetrations, sealing, necessary handholes,

junction boxes, etc. Pavement will be patched along the conduit line and will match existing grading.

6. Furnishing and installing a 10’ by 35’ reinforced concrete base pad and independent tank foundation elements designed for tank type to be installed, including associated earthwork. An expansion joint at the connection of the concrete base pad and concrete pad for the fuel island area will also be required. The Contractor is responsible for all inspections and testing required in accordance with the MassDOT Standard Specifications. 4-inch steel pipe bollards will be installed during installation of the concrete pad as shown on plans. The bollards will be 4 feet apart and approximately 1 foot from the tank.

7. Furnishing and installing a 30’ by 24’ concrete pad for the fuel island area, including associated earthwork. The Contractor is responsible for all inspections and testing required in accordance with the MassDOT Standard Specifications. The fuel island shall be designed as a spill containment pad with positive limiting barriers (PLBs) per the Commonwealth of Massachusetts Department of Fire Services Guidelines for Self-Service Motor Fuel Facility Applications. The PLBs around the edge of the dispensing area shall have the capacity to contain 5 gallons. An expansion joint as shown on the plans will also be required.

8. Repave the remaining graded area and the recently backfilled area where the UST was located with a 4-inch thick pavement. Regrading of the AST area will be completed to a distance of 15 feet from the perimeter of the newly installed concrete pads and will tie into the existing contours of adjacent pavement. The Contractor is responsible for all inspections and testing required in accordance with the MassDOT Standard Specifications.

9. Install new above ground, double walled 4,000-gallon combined compartment storage tank. Basis of design is a cylindrical Fireguard UL2085 5’10” diameter, 24’7” long 4,000 gallon tank from Highland Tank; equivalent double wall steel tanks including Modern Welding Company, Ace Tanks, etc. which can meet the required dimensional setbacks, size, material and specifications within are acceptable substitutes for this product.

10. Furnishing and installing a complete fuel system, including fuel distribution and vent piping with painting of piping as specified. The fuel distribution system will include two fill stations with Great Plain Industries G-PRO pumps and SmartFill systems for advanced fuel management. Equivalent pumps that meet the requirements of these specifications are acceptable substitutes. The two pumps to be installed must support a SmartFill system. It is the responsibility of the Contractor to deliver a fully operational system to the City, including high level alarm, fire suppression, and emergency disconnect in accordance with any applicable regulations.

11. Furnishing and installing Morrison Model 818 clock gauges, tank level, and interstitial space monitoring probes. Equivalent clock gauges that meet the requirements of these specifications are acceptable substitutes. Tank level and interstitial space monitoring

probes must be compatible with the existing Veeder Root TLS 350, and it is the responsibility of the Contractor to deliver a fully operational system to the City.

12. Furnishing and installing new galvanized stairway to provide access to fuel storage tank fill location. The stairway shall be custom fabricated to the tank and comply with OSHA regulations and conform with the tank supplier requirements. The stairway plan will be submitted to the City and Engineer prior to installation for review and comment.

13. Reprogramming of the existing Veeder Root TLS 350 to accept data from new probes and provide alarms as directed by the City, and it is the responsibility of the Contractor to deliver a fully operational system to the City.

14. Furnishing and installing new visual and audible alarm with exterior acknowledge and interior rest and an emergency stop to disconnect power to the tanks.

15. Furnishing and installing new twin LED light pole and base foundation with photosensor operation. Design is based on the PK0822 LED Light Pole Kit with Two LED Area Lights and a 20 ft. pole will be required. An equivalent twin light pole can be used.

16. Furnishing and installing all necessary electrical equipment, conduit, fittings, and wiring.

17. Electrical grounding of all system components, per the tank manufacturer/supplier and regulatory requirements.

18. Submission of As Built drawings and submission of operation and maintenance manuals and warranties as specified.

19. All other required labor, material, and equipment required to provide a complete working system.

1.02 SUBMITALS

A. Stamped Fuel System Design Plans with proposed parts and materials for a complete installation.

B. Contractor shall submit all project specific MassDOT field and laboratory test results along with the attached (Exhibit A) Certification form.

C. Operation and Maintenance Manual

D. Paving Materials Certificates

E. Concrete Statement of Materials, Drawings, Certifications, Materials List, and Reports

F. As-Built Drawings, Fuel Facility Product Data, Stairway Plan, Shop Drawings, Wiring Diagrams, Seismic Qualification Certificates, Brazing

Certificates, Welding Certificates, Field Quality Control Reports, Sample Warranty

PART 2 - PRODUCTS

(NOT USED)

PART 3 – EXECUTION

A. Approval from the Holden Conservation Commission has already been obtained and The Determination of Applicability is attached.

B. All work referenced herein shall be performed in accordance with Local, State, and Federal regulations. The Contractor is responsible for furnishing all labor, materials, and equipment necessary to perform the work as described above and shown on the contract drawings.

All work described herein shall govern and be conducted in accordance with all applicable Local, State, and Federal regulations and guidance documents, including, but not limited to:

- MassDOT Standard Specifications
- Applicable Local Building Code
- National Fire Protection Agency (NFPA) Codes and Standards
  - NFPA 30 Flammable and Combustible Liquids Code
  - NFPA 30A Code for Motor Fuel Dispensing Facilities and Repair Garages
- National Electrical Code (NEC)
- Massachusetts Fire Prevention Regulations 527 CMR 1.00 and 80.00
- CommTank Secondary Containment Requirements for Massachusetts ASTs (April 2017)
- OSHA and local safety regulations
- PEI RP200 Recommended Practices for Installation of Aboveground Storage Systems for Motor Vehicle Fueling
- 40 CFR Protection of the Environment Section 112 Oil Pollution Prevention, Mandates, and SPCC Plan.

C. The Contractor is responsible for identifying and locating all underground and above ground utilities and service lines prior to any below or above ground site alterations. The Contractor is responsible for notifying concerned utilities, at least 72 hours prior to excavation in the proximity of telephone, gas and electric utilities, by calling Dig Safe and all other utilities by calling the appropriate agency.

D. Contractor shall notify the City 72 hours prior to any work on City owned streets and/or utilities for mark-out of the existing system.

E. The Contractor is to perform the work of this contract in accordance with applicable State and Federal laws and regulations. In the event the City is required to pay any fines, administrative penalties or damages to anyone, including governmental agencies, due to the Contractor's failure to perform in accordance with this contract and/or regulations, the Contractor will indemnify and hold harmless the City and reimburse the City for all such payments plus reasonable legal fees and expenses incurred.

F. The Work shall consist or furnishing all labor, equipment, materials, tools, apparatus and all other incidental Work required to complete the AST installation, as specified as shown on the Drawings.

G. The Work shall include, but not necessarily be limited to, the following:

1. PREPARATION OF PLANS

   Prior to initiating work, the Contractor shall prepare the following submittals for review and approval by the Engineer.

   a. PE Stamped Fuel System Design Plans.

2. REMOVAL OF ACTIVE AND INACTIVE BURIED UTILITIES

   a. If inactive buried utilities are encountered, the Contractor shall excavate, remove, and dispose of inactive utility lines and restore site to grade.
   b. If active buried utilities are encountered, the Contractor shall excavate, remove, relocate, and retest all active utilities lines identified and buried in the vicinity of the new above ground storage tank and restore site to grade.
   c. Payment for this additional work, if necessary, will be at the approval of the Engineer and shall be paid from the appropriate bid allowance item in the Bid Form.

3. BACKFILL

   a. Contractor shall maximize the reuse of excavated materials onsite as backfill to minimize the generation of surplus excavated materials requiring offsite recycling or disposal.
   b. Excavated materials reused onsite shall be reused in the general area where it was excavated.
   c. Import additional backfill material as needed to restore the excavation area to original grade. The Contractor shall provide laboratory analytical testing result for the imported backfill material including gradation testing. The City reserves the right to reject any backfill material not deemed suitable for site restoration.

4. SITE RESTORATION

    a. All surfaces shall be restored to the grade specified in the drawings and the site shall be regraded to provide drainage away from the nearby City buildings.
    b. The quality of materials and the performance of work used in the site restoration shall produce a surface or features at least equal to the existing site conditions before the work began.

5. CONTAMINATED SOIL AND GROUNDWATER

    a. If any contaminated soil and/or groundwater is encountered during construction, the City and the Engineer shall be notified. The Contractor is not responsible for handling the contaminated material.

6. PROVISION OF NEW ABOVE-GROUND STORAGE TANKS

    a. Installation of new above ground double wall storage tank, in accordance with the manufacture's specification.
    b. Provide local fill, vent, and feed line piping for new tank.
    c. Provide level sensors for new tank and reprogram the existing Veeder Root system.
    d. Provide a concrete support structure suitable for the tank propose by the Contractor.
    e. All other work as specified in the Contract Documents needed for a complete and fully-functioning system, compatible with the existing system.

H. Work and materials which are necessary in the construction, but which are not specifically referred to in the Specifications or shown on the Drawings, but required to complete the work, shall be furnished by the Contractor in accordance with the manufactures requirements.

I. The project shall include furnishing all labor, services, equipment, materials, devices, facilities, and appurtenances for the management of soil and site restoration as required to complete the Work. The Work shall include, but not necessarily be limited to, the following:

1. Coordination of all construction activities with the appropriate local and State Authorities, utilities and subcontractors.
2. Submission of a construction schedule, list of subcontractors, and proposed source locations for off-site materials, including, but not limited to backfill material.
3. Submission of all required shop drawings, in a timely manner, to the Engineer, for review.
4. Perform all field engineering associated with the project Work including,

but not limited to: construction layout and elevations and mark-up record (as- built) drawings at the completion of the project.
5. Mobilization to the Site and Demobilization from the Site.
6. Providing site security and other construction site control measures, as needed.
7. Protection of existing on-site structures and coordination with on-going City and DPW operations.
8. On-site and laboratory testing.
9. Re-grading and site restoration of the Site.
10. Obtaining necessary permits and licenses, maintaining all items required by applicable permits, and payment of fees.
11. Maintenance and repair of all Work for a period of one (1) year following issuance of the Certificate of Substantial Completion.

J. CONTRACTOR'S USE OF PREMISES

1. Contractor is provided a limited onsite stagging area as shown on the Drawings, but shall limit the use of the premises for the Work within the Limits of Work as shown on the drawings.
2. Coordinate use of premises with the Engineer and the City.
3. Contractor shall assume full responsibility for security of all Contractor and subcontractors' materials and equipment stored on the site.
4. If directed by the City, the Contractor shall move any stored items which interfere with operations of the City or other contractors.
5. Contractor is responsible, at its own expense, for providing any additional storage areas or Work areas as necessary and required to perform the Work.

K. PROPERTY OWNER OCCUPANCY

1. Property Owners will occupy premises during performance of the Work for the conduct of his/her normal operations. Coordinate all construction operations with Owner to minimize conflict and to facilitate Property Owner usage.

L. UTILITIES

1. It shall be the Contractor's responsibility to locate all existing utilities and to protect same from damage or harm. All utilities interfered with or damaged shall be properly restored by the Contractor, to the satisfaction of the Owner and Engineer and at Contractor's expense.

PART 4 – PAYMENT

(NOT USED)

END OF SECTION

SECTION 01505

MOBILIZATION

PART 1 - GENERAL

1.01 DESCRIPTION

Work Includes: The transportation and storage of all equipment, labor and materials to and from the construction site necessary to the Work and the Contractors field office.

1.02 RELATED WORK

Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and these Specifications.

PART 2 - MATERIALS

(NOT USED)

PART 3 - EXECUTION

3.01 STAGING AREA

A. The City has outlined a staging area to be used by the Contractor as shown in the Plans.

1. The staging area shall not obstruct or interfere with pedestrian or vehicular movement, and shall not occupy any space within the public right-of-way, except with specific permission from the City.

2. For temporary construction access and staging, the Contractor shall enter via Dirt Road, as shown on the Drawings.

3. The storage / staging areas shall be kept neat at all times.

4. The storage / staging areas shall be surrounded by erosion controls as shown on the Contract Drawings.

5. The City shall not be a party to negotiations related to acquisition of additional areas for storage or cleanup of the same.

3.02 - EQUIPMENT

Contractor shall transport all equipment to the site, assemble the equipment, disassemble equipment and remove as needed to proceed with the work. During construction, all equipment and materials shall be maintained as needed during the work.

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

Bid Item No.	Description	Unit of Measurement
1	Mobilization and Demobilization	Lump Sum

Mobilization and Demobilization shall be measured on a Lump Sum basis and shall include all materials, labor, equipment and appurtenant work associated with completing the work in place and accepted by the City and Engineer.

4.02 BASIS OF PAYMENT

Mobilization and Demobilization shall be paid for by the unit Lump Sum.

END OF SECTION

SECTION 01567

ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION

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

B. The requirements set forth in this section of the specifications apply to cross country areas, stream crossings and areas adjacent to wetlands and ponds, unless otherwise specifically stated.

C. The Contractor shall minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract.

D. The Contractor shall comply with all applicable environmental Federal, state, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations.

E. The Contractor shall ensure compliance with this section by subcontractors.

1.02 DEFINITIONS

A. Environmental Pollution and Damage: Environmental pollution and damage is 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 humankind; or degrade the environment aesthetically, culturally and/or historically.

B. Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

C. Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams

would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction.

D. Wetlands means those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with applicable regulations. Resource areas exist within the limits of the proposed work; Wetland Buffer Zones are delineated on the plans.

1.03 NOTIFICATION

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

1.04 AREAS OF CONSTRUCTION ACTIVITY

A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

B. Isolated areas within the general work area which are not to be disturbed shall be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

1.05 GENERAL REQUIREMENTS

A. Any material that becomes contaminated through negligence by the Contractor, as determined by the Engineer, and cannot be decontaminated and, as a result, requires removal, transport, and legal disposal offsite as remediation waste, will be managed properly by the Contractor at the Contractor's sole expense.

1.06 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

A. Any deviations, requested by the Contractor, from the drawings, plans, and specifications which may have an environmental impact will be subject to approval by the Engineer and may require an extensive review, processing, and approval time. The Engineer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Engineer determines that the proposed alternate method will have an adverse environmental impact.

PART 2 – PRODUCTS

A. Erosion control barriers for slope protection and for use as sedimentation traps in borrow areas and as barriers in drainage swales shall conform to the details shown on the Contract Drawings.

B. Filter fabric shall be made of 15 mil reinforced polypropylene (3.5 ounce per square yard). It shall have a water flow rate of 20 gallons per minute per square foot. The apparent opening size shall be 36-50 (U.S. Standard Sieve). Fabric shall be stable against ultraviolet radiation. Fabric width shall be 3 feet with netting and tension cord on 1-1/2 inch by 1-1/2 inch by 48-inch posts. Filter fabric shall be "Envirofence" Style No. 10550 as manufactured by Mirafi Inc. Charlotte N.C. or approved equal.

C. Woven netting or "jute mesh" shall be "Ludlow Soil Saver", as manufactured by the Ludlow Corp., or similar product as manufactured by Advanced Netting Co., or "Jute-Net" as manufactured by Bemis, Inc.

D. Geotextile material for sedimentation basin shall consist of a woven or non-woven fabric made from polypropylene. The fabric shall be non-rotting, acid- and alkali-resistant and inert to organic chemicals commonly encountered in soils.

E. Temporary/short term erosion control mats shall be S150 (North American Green) or equal and temporary/long term erosion control mats shall be C125 (North American Green) or equal.

PART 3 - EXECUTION

3.01 PROTECTION OF WATER RESOURCES

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids, excessive construction related sediments, or harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters.

C. Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, state and local governments.

D. The Contractor shall not enter, disturb, destroy or allow discharge of contaminants into any wetlands.

3.02 LAND RESOURCES

A. The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, the Contractor shall identify any land resources to be preserved within the work area.

B. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without special authority. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. The Contractor shall in any event be responsible for any damage resulting from such use.

C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may direct the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of.

3.03 LOCATION OF STORAGE AREAS

A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared, and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of twenty-five (25) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as silt fence in combination with straw wattles or coir logs or Filter Mitts, or other alternative as may be approved by the Commission or its agent shall be employed around the downstream perimeter of stockpiles to protect any downstream areas from siltation.

C. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

3.04 AIR RESOURCES

A. Equipment operation, activities, or processes performed by the Contractor shall be in accordance with all Federal and state air emission and performance laws and standards.

B. Dust particles; aerosols and gaseous by products from construction activities shall be controlled at all times, including weekends, holidays and hours when work is not in progress.

C. The Contractor shall maintain excavations, stockpiles, and other work areas within or outside the project boundaries free from particulates that would cause the Federal, state, or local air pollution standards to be exceeded or that would cause a hazard or nuisance. The Contractor shall have sufficient equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

D. Odors from construction activities shall be controlled at all times. The odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

3.05 EROSION AND SEDIMENT CONTROL

A. The Contractor shall be responsible for providing erosion and sediment control measures in accordance with Federal, state, and local laws and regulations. The erosion and sediment controls selected and maintained by the Contractor shall be such that the water quality standards are not violated as a result of the Contractor's construction activities.

B. The area of bare soil exposed at any one time shall be kept to a minimum.

C. The Contractor shall install temporary and permanent erosion control best management practices (BMPs) as indicated on the Drawings and as specified herein. BMPs may include, but not be limited to vegetation cover, stream bank stabilization, slope stabilization, silt fences, sediment traps, inlet and outfall protection, and diversion channels. The erosion/sedimentation/work limit control line shall consist of silt fence in combination with hay bales, or other alternative as may be approved by the local Conservation Commission or its agent.

D. Any temporary BMPs shall be removed after the area has been stabilized.

E. To trap sediment and to prevent sediment from clogging drainage systems, silt sacks as well as Filter Mitts, or other alternative as may be approved by the local Conservation Commission or its agent shall be used where directed by the Engineer. All deposited sediment shall be removed periodically.

F. Flow of surface water into excavated areas shall be prevented.

3.06 PROTECTION OF STORM DRAINS

A. Care shall be taken to prevent or reduce to a minimum any storm drain or sewer from pollution by debris, sediment, or other material, or from the manipulation of equipment and/or materials in or near such structures.

B. All preventative measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action drawing or plan approved by the Massachusetts Department of Environmental Protection. Contractor shall submit two copies (2) of approved contingency drawings or plans to the Engineer.

3.07 SPECIAL CONDITIONS

A. The local Conservation Commission or its agent shall be given 48 hours notice in advance of commencement of work on the project.

B. All paved surfaces shall be swept clean by the end of each work day.

C. If dewatering of segments of trench is necessary during construction, then water pumped from the trench shall be discharged to a dewatering filter bag. Dewatering filter bags shall be placed on a level, stable surface, consisting of pavement, grass or aggregate. Dewatering filter bags shall not be placed within a wetland or in open water. Discharge water shall not cause erosion. Discharge water shall be free of sediment or other pollutants. Dewatering filter bags shall be maintained or replaced when full to capacity. The pump discharge hose shall be installed into the dewatering filter bag spout and secured with a strap. One discharge hose shall be installed per bag. Filter bags shall be capable of collecting and filtering sediment from pumped water. In no case and under no circumstance shall any water or other material of any kind be discharged directly to wetlands.

D. No fill, excavate, construction debris or equipment shall be allowed to enter the wetlands; any such material entering the wetlands shall be removed immediately.

E. Any waste asphalt from the project shall be removed to a proper disposal or recycling facility. Onsite stockpiling of waste asphalt shall not be allowed.

3.08 POST CONSTRUCTION CLEAN UP

A. The Contractor shall clean up all areas used for construction in accordance with the Section 01710. The disturbed areas shall be graded, filled and the entire area seeded unless otherwise indicated.

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

This work will not be measured for payment; its cost shall be distributed amongst bid items for the project.

4.02 BASIS OF PAYMENT

Payment for this item shall be distributed amongst bid items for the project.

END OF SECTION

SECTION 01600

MATERIAL TESTING & INSPECTION
QUALITY CONTROL/QUALITY ACCEPTANCE (QC/QA)

PART 1 – GENERAL

1.01 WORK INCLUDED:

A. The work of this section covers furnishing the services of an independent testing laboratory to perform testing specifically indicated on the Contract Documents and the City may at any other time elect to have materials and equipment tested for conformity with the Contract Documents.

1.02 REQUIREMENTS:

A. Cooperate with the laboratory to facilitate the execution of its required services.

B. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.

C. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approval of public authorities.

1.03 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY:

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract Documents.

2. Approve or accept any portion of the Work.

3. Perform any duties of the Contractor.

1.04 CONTRACTOR'S RESPONSIBILITIES:

A. The Contractor shall cooperate with laboratory personnel to provide access to work, and to manufacturer's operations.

B. Secure and deliver to the laboratory, adequate quantities of representative samples of materials proposed to be used which require testing.

C. Provide to the laboratory the preliminary data on materials and mixes which require control by the testing laboratory.

D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The Engineer may require the Contractor to provide statements or certificates from the manufacturers and fabricators stating the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be an obligation of the Contractor, and no extra charge to the City shall be allowed on account of such testing and certification.

E. Furnish incidental labor and facilities:

1. To provide access to work to be tested.

2. To obtain and handle samples at the project site or at the source of the product to be tested.

3. To facilitate inspections and tests.

4. For storage and curing of test samples.

F. Notify laboratory sufficiently in advance of operations to allow for laboratory assigning personnel and scheduling of tests.

1. When tests or inspections cannot be performed after such notice, reimburse the City for laboratory personnel and travel expenses incurred due to Contractor's negligence.

G. Employ and pay for the services of the same or a separate, equally qualified independent test laboratory to perform additional inspections, sampling and testing required for the Contractor's convenience.

1.05 BACKFILL MATERIAL & AGGREGATE TESTING

A. Backfill and aggregate inspection and testing shall be performed by a certified laboratory and engaged and paid for by the Contractor. At a minimum, approximately 75 tons of asphalt will be required for repaving consisting of approximately 47 tons of base course and 28 tons of top course. Two in-situ compaction tests of testing will be needed for each course of asphalt and/or each day of asphalt placement (minimum 4 tests total if passing).

B. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, soil and aggregate samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

C. QC/QA Prior to Construction:

1. All material required for earthwork shall be tested and certified prior to use that the material is processed in such a manner that the final gradation meets the requirements set forth in Section 02200.

2. Prior to construction, the Contractor shall provide laboratory soil test results certifying the material meets the gradation requirements at the following frequencies:

Material Type	Test Frequency
Backfill Material:	1 per material type
Sand / Choker Material	1 per material type
Crushed Stone:	1 per material type

Note: This is the minimum testing frequency required for Quality Acceptance. Any re-test required for failing or substandard material shall be done so at the Contractor's expense.

3. Sampling of soil and aggregates shall be done in accordance with ASTM D75 / D75M - 09 Standard Practice for Sampling Aggregates.

4. Gradation testing shall be done in accordance with ASTM C136 - 06 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates, ASTM C117 - 04 Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing and/or ASTM D6913 - 04(2009) Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.

5. All backfill material required for earthwork shall be tested to certify that the compacted material meets and/or exceeds the specified percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D 1557 (modified proctor); OR meets and/or exceeds the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesion- less soils) as determined in the field during construction.

6. Prior to construction, the Contractor shall provide laboratory maximum density (cohesive soils) and or relative density (cohesion-less soils) test results at the following frequencies:

Material Type	Test Frequency
Backfill Material:	1 per material type

D. QC/QA during Construction:

1. Compaction equipment required shall be a ten (10) ton (minimum) steel wheel roller or other equipment capable of achieving the specified density. The backfill material and/or aggregate base material will be thoroughly compacted with adequate compaction equipment to produce the percent compaction and uniform base density when compared to the modified Proctor Test of the materials. Water shall be applied to ensure optimum moisture content during compaction and to aid in achieving maximum compaction.

2. All materials of the work shall be subject to inspection by the Engineer. The Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the contractor as is required to make a complete inspection. If the Engineer requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed.

3. During construction, the Contractor shall provide laboratory maximum density (cohesive soils) and or relative density (cohesion-less soils) test results at the following frequencies:

Material Type	Test Frequency
Backfill Material:	1 test per 2,000 square feet installed per material type
Reclaimed Subgrade Material:	1 test per 2,000 square feet installed per material type
OR	
Amended Reclaim Material:	1 test per 2,000 square feet installed per material type

Note: This is the minimum testing frequency required for Quality Acceptance. Any re-test required for change in material characteristics, failing or substandard material shall be done so at the Contractor's expense.

4. After grading, compaction, and removal of excess material, the Contractor shall demonstrate to the Engineer that the thickness and density of the compacted backfill material, reclaimed subgrade material, amended reclaim material and/or aggregate base courses at intervals of not more

than 1,000 square feet or a minimum of one test per lift of backfill, meets the dimensions and density specified in Section 02200.

5. During construction, the Contractor shall demonstrate to the Engineer that the gradation of the backfill material and/or compacted base courses meets the requirements as determined at intervals and frequencies listed below:

Material Type	Test Frequency
Backfill Material:	1 test per 5,000 square feet installed per material type
Reclaimed Subgrade Material:	1 test per 5,000 square feet of material reclaimed
Amendment Material:	1 per material type
Amended Reclaim Material:	1 test per 5,000 square feet of material amended
Sand / Choker Material:	1 test per 5,000 square feet installed per material type

Note: This is the minimum testing frequency required for Quality Acceptance. Any re-test required for failing or substandard material shall be done so at the Contractor's expense.

6. Sampling of soil and aggregates shall be done in accordance with ASTM D75 / D75M - 09 Standard Practice for Sampling Aggregates.

7. Gradation testing shall be done in accordance with ASTM C136 - 06 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates, ASTM C117 - 04 Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing and/or ASTM D6913 - 04(2009) Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.

8. Work on backfill and base course shall not be permitted when air and base temperatures are less than 35 degrees F or when the subgrade is frozen or excessively wet. Any damage caused to the backfill material and or aggregate base course resulting from work performed during these adverse weather conditions shall be repaired and re-tested by the Contractor at his own expense.

1.06 HOT MIX ASPHALT TESTING

A. HMA inspection and testing shall be performed by a certified laboratory and engaged and paid for by the Contractor. At a minimum, approximately 75 tons of asphalt will be required for repaving consisting of approximately 47 tons of base

course and 28 tons of top course. Two in-situ compaction tests of testing will be needed for each course of asphalt and/or each day of asphalt placement (minimum 4 tests total if passing).

B. HMA Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, asphalt for samples, asphalt cores and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

C. QC/QA Prior to Construction:

1. The Contractor shall be responsible for development of all HMA job-mix formulas. The aggregate gradation structure and target PG Asphalt Binder content of each job-mix formula HMA intermediate courses and HMA surface courses shall conform to the master ranges in M3.11.03 – Table A. The aggregate gradation structure and target PG Asphalt Binder content shall conform to the master ranges in M3.11.03 – Table B. All HMA job-mix formulas will be submitted to the Engineer for final approval. Two or more job-mix formulas per HMA mixture type may be approved for a particular plant, however, only HMA conforming to one job-mix formula is permitted to be produced and placed on any given day.

2. The Contractor will provide the Supplier's Certificate of Compliance (COC) and corresponding certified AASHTO M320 test results for each Supplier Lot of PGAB from which the HMA Producer's PGAB was obtained.

3. The Contractor shall produce and place a Control Strip Lot for all HMA pavement courses, with the exception of Leveling Courses, on the first day of HMA production. The Control Strip will be used to verify that the HMA can be produced per specifications, to establish compaction patterns, and to verify that the equipment and processes for lay-down and compaction are capable of providing the HMA pavement course in conformance with specifications.

D. QC/QA During Construction:

1. The Engineer will perform Acceptance inspection of all HMA materials and placement in conformance with the contract requirements. Acceptance inspection is intended to visually assess the quality of each HMA Lot produced and placed and will address only the inspection components of Materials and Workmanship in support of the Town's final acceptance determination.

2. The Engineer will utilize a stratified random sampling of each Lot produced and placed to assure that all material within the Lot has an equal probability of being selected for testing. Lot shall equal one day's production. The Contractor's NETTCP certified QC personnel shall obtain random QC

samples at the minimum. In all cases, application of the specified QC sampling frequencies shall result in a minimum one random sample per Lot. Random sample locations shall be determined using the random number table and procedures contained in ASTM D 3665 or an electronic random number generator, as presented by the NETTCP. The determination of all random sample locations shall be documented on NETTCP Standard Test Report Form D3665. The Contractor will provide the Engineer with the random QC sampling locations selected and documented for each Lot prior to production and placement of the relevant Lots.

3. Acceptance testing of HMA pavement courses for In-place Density will be performed based upon 5 cores compared to a Theoretical Maximum Density determined by ASTM D6857-09. The Lot size and minimum frequency of Acceptance testing for In-place Density of HMA pavement courses by core will be randomly located based upon five sublots for each Lot. The sublot will be based on a 1/5 of the Lot's surface area. Cores will be tested for Bulk Specific Gravity. The Contractor shall demonstrate to the Engineer that the thickness and In-Place Density of the compacted HMA material meets the thicknesses and densities specified.

OR

4. Acceptance testing of HMA pavement courses for In-place Density will be performed based on In-Place Density Testing by Nuclear Methods ASTM D2922 and compared to a Theoretical Maximum Density determined by ASTM D6857-09. The Contractor shall demonstrate to the Engineer that the In-Place Density of the compacted HMA material at intervals of not more than 1,000 square feet or a minimum of one test per lift of HMA placement, meets the densities specified.

1.07 FIELD CONCRETE TESTING

A. Concrete inspection and testing shall be performed by an certified laboratory and engaged and paid for by the Contractor. One set of 3 test cylinders will likely be required for one 7-day and two 28-day breaks at a certified lab to confirm minimum compressive strength for each monolithic concrete pour.

B. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

C. QC/QA Prior to Construction:

1. The Contractor shall supply the Engineer copies of mix designs of each type and design strength of concrete to be placed prior to construction. Up to date standard compression test results shall be supplied with each of the

submitted mix designs.

2. The Contractor shall supply the Engineer copies of material certifications for all concrete materials including cement mill certificates, aggregate gradations (sand and crushed stone) and concrete admixture submittals for each type and design strength of concrete to be placed prior to construction.

D. QC/QA During Construction:

1. At least one slump test and one air content test shall be performed from each day's placement of concrete or for every 50 cubic yards of each type and design strength of concrete placed.

2. A minimum of three standard compression test cylinders shall be made and tested for each 100 cubic yards or monolithic pour of each type and design strength of concrete placed. One cylinder shall be tested at 7 days, and two at 28 days.

3. The Engineer shall have the right to reject concrete represented by low strength tests. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected shall be final. Replacement of concrete and subsequent re-testing shall be made at the Contractor's expense.

PART 2 – PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

Bid Item No.	Description	Unit of Measurement
13	Laboratory Testing - Allowance	Allowance

All laboratory testing for backfill and aggregate, hot mix asphalt, and concrete as described in this section shall be paid on a per each basis under allowances and shall include laboratory costs. Estimated totals for laboratory testing to paid for under the allowance include:

Backfill and aggregate

- Gradation testing prior to construction: 1 test
- Density testing prior to construction: 1 test
- Compaction testing during construction: 2 tests

Hot Mix Asphalt

- Plant testing to inform compaction: 1 test
- In-situ compaction testing during construction: 4 tests

Concrete (per monolithic pour)

- Slump test: 1 test
- Air content: 1 test
- Compression: 3 tests

4.02 BASIS OF PAYMENT

Payment for this item shall be paid per each under allowances for $10,000.

END OF SECTION

SECTION 01710

CLEANING UP

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor should be familiar with any Special Provisions, Section 01100, Section 01567, and Section 01720, as they pertain to this section.

B. The Contractor must employ at all times during the progress of his work adequate clean up measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon direction by the Engineer provide adequate material, equipment and labor to clean up and make safe any and all areas deemed necessary by the Engineer.

1.02 DAILY CLEAN UP

A. The Contractor shall clean up at least daily, all refuse, rubbish, scrap and surplus material, debris, and unneeded construction equipment resulting from the construction operations. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.

B. Upon written notification by the Engineer, the Contractor shall within 24 hours clean up those areas, which in the Engineer's opinion are in violation of this section and the above referenced sections of the specifications.

C. If in the opinion of the Engineer, the referenced areas are not satisfactorily cleaned up, the Engineer reserves the right to stop all other work on the project until the clean up is satisfactory.

1.03 MATERIAL OR DEBRIS IN DRAINAGE FACILITIES

Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

1.04 RESTORATION OF DAMAGED PROPERTY

The Contractor shall restore or replace, when and as directed, any property damaged by his work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall repair or replace all damaged property as necessary for highway or driveway, side walk and landscaping work.

Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

1.05 FINAL CLEAN UP

Before acceptance by the City, the Contractor shall perform a final clean up of the site to its original or specified condition. This clean up shall include removing all trash and debris off the site. Before acceptance, the condition of the site shall be approved by the Engineer.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

This work will not be measured for payment; its cost shall be included in the Lump Sum cost of "Mobilization and Demobilization".

4.02 BASIS OF PAYMENT

Payment for this item shall be included in the Lump Sum cost of "Mobilization and Demobilization".

END OF SECTION

SECTION 01720

CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor should be familiar with any Special Provisions, Section 01100, Section 01567, and Section 01710, as they pertain to this section.

B. This section provides information and procedures for terminating the agreement between the Contractor and the City at the completion of the Project.

1.02 PROJECT RECORD DOCUMENTS

A. The Contractor shall maintain on-site one complete set of record documents. These record documents shall indicate actual revisions to the Work. The Contractor shall ensure entries are complete and accurate, enabling future reference by the City. The set of record documents shall include: attachments; reviewed product data and samples; specifications; addenda; change orders and other modifications to the Contract; and material disposal records.

B. Information shall be recorded concurrent with construction progress. Failure to maintain current record attachments will be cause to delay payment.

1.03 SUBMITTALS

A. The Contractor shall prepare and submit stamped As Built drawings with any modifications to the stamped plans prepared prior to the start of work.

B. The Contractor shall prepare and submit an operation and maintenance manual that includes the following:

1. Operation and maintenance documentation directory.

2. Emergency manuals and contact numbers.

3. Operation manuals for systems, subsystems, and equipment.

4. Maintenance manuals for the care and maintenance of systems and equipment.

1.04 CLOSEOUT PROCEDURES

A. Submittals shall be provided to Engineer that are required by governing or other authorities, including copies of any permit reporting documentation or disposal waste slips.

B. For items of Work delayed beyond date of Substantial Completion, the Contractor shall provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

C. The Contractor shall supervise and direct the work, using his best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques and procedures and for coordinating all portions of the work under the Contract.

D. The Contractor shall carefully check his own work and that of subcontractors as the work is being performed. Unsatisfactory work shall be corrected immediately.

E. During the finishing stages of the project, the Contractor shall make frequent inspections with the subcontractors and the Engineer so as to progressively check for and correct faulty work.

F. When the Contractor determines that he is substantially complete, that he has less than one percent of his contract remaining to be completed, he shall prepare for submission to the Engineer a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all work in accordance with the Contract Documents.

G. Upon receipt of the Contractor's list of items to be completed or corrected, the Engineer will promptly make a thorough inspection and prepare a "punch list", setting forth in accurate detail any items on the Contractor's list and additional items that are not acceptable.

H. When the "punch list" has been prepared, the Engineer will arrange a meeting with the Contractor and subcontractors to identify and explain all "punch list" items and answer questions on the work which must be done before final acceptance.

I. If the Contractor gives notice that a subcontractor has completed his "punch list" items, the Engineer will inspect that portion of the work and, if the items are found to be satisfactorily completed, advise the Contractor accordingly.

J. The Contractor shall correct all punch-list items or shall cause the correction of the punch list items within a time frame to be established

when the punch list is made. The time frame for the completion of the punch list shall not exceed the completion date of the contract.

1.05 GUARANTEES AND WARRANTIES

A. The Contractor shall guarantee the materials and workmanship under this contract to be free of defects for a period of one year from the date of acceptance agreeing to replace or repair any defective materials or work during such period, without additional cost to the City.

B. The Contractor shall obtain from all subcontractors a written guarantee that all materials and workmanship under this contract will be free of defects for a period of one year from the date of acceptance agreeing to replace or repair any defective materials or work during such period, without additional cost to the City.

C. The Contractor shall submit all warranty certificates signed by the manufacturers and suppliers with a written certification that nothing in the installation will render the warranty null and void.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

This work will not be measured for payment; its cost shall be distributed amongst bid items for the project.

4.02 BASIS OF PAYMENT

Payment for this item shall be distributed amongst bid items for the project.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Extent of earthwork is indicated on Drawings and includes grading, constructing embankments, miscellaneous earth excavation, temporary excavation support, all rehandling, hauling, and placing of stockpiled materials for backfilling activities, the removal and disposal off site of unsuitable material, and appurtenant work.

B. "Excavation" consists of removal of material encountered to subgrade elevations indicated, and subsequent relocation or disposal of materials removed.

1.02 QUALITY ASSURANCE

A. Codes and Standards:

1. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

2. The following standard forms a part of these specifications and indicates the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM D422	Method for Particle Size Analysis of Soils
ASTM D1557	Tests for moisture-density relations of soils and soil-aggregate mixtures using 10 pound rammer and 18-inch drop.
ASTM D4253	Test Methods for Maximum Index Density of Soils Using a Vibratory Table
ASTM D4254	Test Methods for Minimum Index Density of Soils and Calculation of Relative Density

The Commonwealth of Massachusetts

MassDOT 2025 Standard Specifications for Highways and Bridges

B. The Contractor will engage soil testing and inspection service for quality control testing during earthwork operations to be paid for under allowances.

1.03 JOB CONDITIONS

A. Existing Utilities:

1. Locate existing underground utilities in areas of work. Utility companies shall be contacted a minimum of 72 hours prior to excavation and/or site work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with the City and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

3. Do not interrupt existing utilities serving facilities occupied and used by the City or others, during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.

4. Provide minimum of 48-hour notice to Engineer, and receive written notice to proceed before interrupting any utility.

5. Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.

B. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights.

2. Operate warning lights as recommended by authorities having jurisdiction.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

4. Perform excavation within drip-line of large trees to protect the root system from damage or dryout to the greatest extent possible. Maintain

moist condition for root system and cover exposed roots with burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

5. In case of any damage or injury caused in the performance of the work, the Contractor shall, at its own expense, make good such damage or injury to the satisfaction of, and without cost to, the City. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to at least the condition that existed at the start of operations.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

C. Sand Borrow:

Sand shall consist of bank run sand conforming to the following requirements determined by ASTM D422:

Sieve Opening	Percent Passing Weight
1. inch	100
1/2-inch	50-100
No.20	20-95
No.50	10-60
No.200	0-8

D. Crushed Stone:

1. Crushed Stone shall not contain vegetation, masses of roots, loam and other organic matter, clay and other fine or harmful substances.

2. $^{3}/_{8}$- INCH PEA STONE:
Materials shall consist of natural, rounded, sound, durable sand and gravel, essentially free of organic matter, plastic fines (clay), debris and shall conform to and meet the requirements specified in this section with the gradation requirements listed below:

Sieve Opening	Percent Passing By Weight
½ -inch	100
⅜-inch	85-100
No. 4	20-50
No. 8	0-15
No. 16	0-5

3. ¾ -INCH CRUSHED STONE:
Materials shall conform to MHD M2.01.4 Crushed Stone and meet the requirements specified in this section with the gradation requirements listed below:

Sieve Opening	Percent Passing By Weight
1 -inch	100
¾ -inch	90-100
½ -inch	10-50
⅜ -inch	0-20
No. 4	0-5

4. 1½-INCH CRUSHED STONE:

Materials shall conform to MHD M2.01.1 Crushed Stone and meet the requirements specified in this section with the gradation requirements listed below:

Sieve Opening	Percent Passing By Weight
2 -inch	100
1½ -inch	95-100
1-inch	35-70
¾ -inch	0-25

E. Gravel Borrow:

Gravel Borrow shall consist of sound, durable sand and gravel, essentially free of organic matter, plastic fines (clay) and debris, and shall meet the gradation requirements below:

Sieve Opening	Percent Passing Weight
3-inch	100

1/2-inch	50-85
No. 4	40-75
No. 40	10-45
No. 200	0-8

F. Slope Drainage Aggregate: Drainage aggregate shall consist of angular, sound, durable stone as a product from crushing operations and shall be essentially free of organic matter, plastic fines (clay) and debris. Materials shall conform to MHD M2.01.6 Crushed Stone and meet the requirements specified in this section with the gradation requirements listed below:

Sieve Opening	Percent Passing By Weight
½ -inch	100
⅜-inch	85-100
No. 4	20-50
No. 8	0-15
No. 16	0-5

G. Ordinary Borrow: Shall consist of a material satisfactory to the engineer and not specified as gravel borrow, sand borrow or drainage aggregate. This material shall have the physical characteristics of soils designated as group A1, A-2-4 or A-3 under AASHTO M 145. It shall have properties such that it may be readily spread and compacted for the formation of embankments.

H. Base Fill: Shall consist of washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100% passing a 1-1/2" sieve and not more than 5% passing a No. 4 sieve.

I. Backfill Materials:

1. Backfill Materials shall conform to MHD M1.01.0 Ordinary Borrow as specified above. It shall have properties such that it may be readily spread and compacted for the formation of embankments.

2. Backfill Materials shall be satisfactory soil materials and meet the approval of the Engineer. Materials shall be of such a nature that they will form a stable dense fill. Materials shall not contain vegetation, masses of roots, individual roots more than 12 inches long or more than 1/2-inch in diameter, trash, clays, frozen materials, or plastic fines. Organic matter shall not exceed 2%. Non-plastic fines shall not exceed 20% (silts).

3. Backfill Materials shall be free of ice and shall not be frozen.

4. Backfill materials are subdivided according to the maximum allowable size of stone or blacktop pieces as follows:

Type	Largest Stone Diameter (inches)
1. Select Backfill	3
2. Class B Backfill	6
3. Class C Backfill	12

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavation includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

B. Unauthorized Excavation:

1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.

2. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

3. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing:

1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition, where required.

2. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

3. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

D. Dewatering:

1. Prevent surface water and subsurface or groundwater from flowing into

excavations and from flooding project site and surrounding area.

2. Do not allow water to accumulate in excavations. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

3. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

E. Material Storage:

1. Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.

2. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

3. Dispose of excess soil material and waste materials as herein specified.

F. Excavation for Pavements: Cut surface under pavements to comply with cross- sections, elevations, and grades as shown on Drawings.

G. Excavation for Trenches:

1. Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 9" clearance on both sides of pipe or conduit.

2. Trenches in pavement shall have the traveled way surface cut in a straight line by a concrete saw or equivalent method, to the full depth of pavement. Excavation shall only be between these lines. Cutting operations shall not be done by backhoe, gradall, or other ripping equipment.

3. Excavate trenches to depth indicated or required.

4. Where pipe is to be laid in crushed stone bedding or concrete cradle, the trench may be excavated by machinery to, or to just below the designated depth, provided that the material remaining at the bottom of the trench remains undisturbed.

5. If pipe is to be laid in embankments or other recently filled areas, the fill material shall first be placed to a height of at least 1 foot above the top of the pipe before excavation. Material under the pipe location shall

be compacted to 95 percent maximum density according to ASTM D1557, Method C.

6. Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel prior to installation of pipe.

H. Earth Excavation And Backfill Below Normal Grade

1. If, in the opinion of the Engineer existing material below trench grade is unsuitable for properly placing bedding material and laying pipe, the Contractor will excavate, remove, and dispose of the unsuitable material to the required width and depth and replace it with gravel borrow as directed by the Engineer.

2. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

3. For piping or conduit less than 2'-6" below surface of roadways, provide 4" thick concrete base slab support. After installation and testing of piping or conduit, provide minimum 4" thick encasement (sides and top) of concrete prior to backfilling or placement of roadway subbase.

I. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (one degree C).

3.02 BACKFILL AND FILL

A. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

1. In excavations, use backfill material in conformance with MHD M1.01.0 Ordinary Borrow.

2. Under grassed areas, use backfill material in conformance with MHD M1.01.0 Ordinary Borrow.

3. Under walks and pavements, use gravel borrow or select backfill, or combination of both.

4. Under piping and conduit, use crushed stone where crushed stone is indicated under piping or conduit; shape to fit bottom 90 degree of cylinder.

5. In Berm and Fill areas, use backfill material in conformance with MHD M1.01.0 Ordinary Borrow

6. In Slope Drain areas where excavation has occurred for structure installation, use backfill material in conformance with MHD M1.01.0 Ordinary Borrow up to 18 inches below finished grades. On top or ordinary borrow, use slope drain aggregate in a 12" layer and a 6" layer of top soil.

7. Any exposed cobbles or rocks greater than three (3) inches in diameter in Backfill material used within the reconstituted area shall be "culled-out" and removed from the site. The Contractor shall provide laboratory soil tests to test results certifying gradation material meet the above Gradation Table.

B. Backfill excavations as promptly as work permits, but not until completion of the following.

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

2. Inspection, testing, approval and recording locations of underground utilities.

3. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.

4. Removal of trash and debris.

5. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

C. Ground Surface Preparation:

1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

2. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

D. Placement and Compaction: Place backfill and fill materials in layers not more than 9" in loose depth for material compacted by heavy compaction equipment, and not more than 4"-6" in loose depth for material compacted by hand-operated tampers.

E. Backfilling:

1. In general, and unless other material is indicated on the Drawings or specified or classified as unsuitable material by the Engineer, material removed in-the course of making the construction excavation shall be suitable material for backfilling trenches.

2. If the material removed from the excavation is suitable for backfill with the exception that it contains stone or pavement sections having a maximum allowable size larger than that specified, the Contractor has the option to remove the oversized materials from the backfill or provide replacement backfill without additional compensation.

3. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.

F. Backfilling Pipe Trenches:

1. As soon as practicable after pipes have been laid, backfilling shall be started.

2. Select backfill shall be placed with care up to a level of 6 inches above the top of pipe. This area of backfill is considered the zone around pipe and shall be thoroughly compacted before the remainder of the trench is backfilled. Compaction of the zone around pipe shall be done by use of power-driven tampers weighing at least 20 pounds. Care shall be taken that material close to the bank, as well as in all other portions of the trench, is thoroughly compacted to densities required.

3. Class B backfill shall be placed from the top of the select backfill to grade. Compaction of backfill in the remainder of the trench shall be done in layers not exceeding 12 inches in depth, and by use of power-driven tampers weighing at least 20 pounds. In lieu of mechanical compaction equipment, water jetting may be used only when approved by the Engineer.

4. The Contractor shall maintain the trench surface as work progresses. If settlement takes place, he shall immediately deposit additional material to restore the level of the ground.

3.03 GRADING

A. Uniformly grade areas within limits of grading under this section, including

adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10’ above or below required subgrade elevations.

2. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10’ above or below required subgrade elevation.

3. Pavements: Shape surface of areas under pavement to line, grade and cross- section, with finish surface not more than 1/2” above or below required subgrade elevation.

C. Grading Surface of Fill Under Treatment Device Structures: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2” when tested with a 10’ straightedge.

D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.04 PAVEMENT SUBBASE COURSE

A. Subbase course consists of placing gravel borrow material, in layers of specified thickness, over subgrade surface to support a pavement base course.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least a 12” width of shoulder simultaneously with compacting and rolling of each layer of subbase course.

D. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations. The course shall be spaced in layers not more than a 6-inch thick subbase.

3.05 MAINTENANCE

A. Protection of Graded Areas:

1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
2. Repair and re-establish grades - in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.06 DISPOSAL OF EXCESS AND WASTE MATERIALS

Excavated material shall be transported off the City's property and disposed of at the Contractor's expense in a legal manner.

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

Bid Item No.	**Description**	**Unit of Measurement**
3	Regrading Area Behind Storage Garage	Lump Sum
4	Gravel Subbase to Grade	Per CY
5	Conduit Installation	Lump Sum
13	Laboratory Testing – Allowance	Allowance

The backfilling activities shall be measured on a Lump Sum basis and shall include all materials, labor, equipment and appurtenant work associated with completing the work in place and accepted by the City and Engineer.

The excavation work will not be measured for payment; its cost shall be included in the Lump Sum cost of "Regrading Area Behing Storage Garage".

Backfill and aggregate testing will be paid per each under the appropriate allowance as outlined in Section 01600.

4.02 BASIS OF PAYMENT

The backfilling of excavated areas shall be paid for by the unit Lump Sum. Included in the all costs shall be all materials, labor, permits, and equipment for this task.

Payment for excavation work shall be included in the Lump Sum cost of "Regrading Area Behing Storage Garage".

Backfill and aggregate testing will be paid per each under the appropriate allowance as outlined in Section 01600.

END OF SECTION

SECTION 02220

TRENCHING, BACKFILLING, AND COMPACTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals necessary to perform all trenching for pipelines and appurtenances, including drainage, filling, backfilling, disposal of surplus material, and restoration of trench surfaces and easements.

B. Excavation shall extend to the width and depth shown on the Drawings or as specified, and shall provide suitable room for installing pipe, structures and appurtenances.

C. The Contractor shall furnish and place all sheeting, bracing, and supports and shall remove from the excavation all materials which the Engineer may deem unsuitable for backfilling. The bottom of the excavation shall be firm, dry, and in all respects, acceptable. If conditions warrant, the Contractor may be ordered to deposit gravel for pipe bedding, or gravel refill for excavation below grade, directly on the bottom of the trench immediately after excavation has reached the proper depth and before the bottom of the trench has become softened or disturbed by any cause whatever. The length of open trench shall be related closely to the rate of pipe laying. All excavation shall be made in open trenches.

D. All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

E. Wherever the requirement for 92 percent compaction is referred to herein it shall mean “at least 92 percent of maximum density as determined by ASTM compaction tests, Designation D1557, Method D”.

F. Prior to the start of work the Contractor is required to submit his proposed method of backfilling and compaction to the Engineer for review.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 TRENCH EXCAVATION

A. Trench excavation shall include material of every description and of whatever substance encountered, except rock and boulders. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.

C. While excavating and backfilling is in progress, traffic shall be maintained, and all utilities and other property protected as provided in the General Conditions and General Requirements.

D. Trenches shall be excavated to the depth indicated on the Drawings, and in widths sufficient for laying the pipe, bracing, and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry and in all respects acceptable to the Engineer. Trench width shall be practical minimum.

E. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. The trench may be excavated by machinery to, or just below the designated subgrade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Subgrade soils which become soft, loose, “quick”, or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by screened gravel fill as required by the Engineer at the Contractor’s expense.

F. Clay and organic silt soils are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, the Contractor shall use a smooth-edge bucket to excavate the last one foot of depth.

G. Where pipe is to be laid in screened gravel bedding, the trench may be excavated by machinery to the normal depth of the pipe provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

H. Where pipe is to be laid directly on the trench bottom, final excavation at the bottom of the trench shall be performed manually, providing a flat-bottom true to grade upon undisturbed material. Bell holes shall be made as required.

3.02 DISPOSAL OF MATERIALS

A. Excavated material shall be stacked without excessive surcharge on the trench bank or obstructing free access to hydrants and gate valves. Inconvenience to traffic and abutters shall be avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.

B. It is expressly understood that no excavated material shall be removed from the

site of the work or disposed of by the Contractor except as directed by the Engineer. When removal of surplus materials has been approved by the Engineer, the contractor shall dispose of such surplus material in approved areas designated by the Contractor and at no cost to the owner.

C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided by the Contractor. When required, it shall be re-handled and used in backfilling the trench.

3.03 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.

3.04 EXCAVATION BELOW GRADE AND REFILL

A. Whatever the nature of unstable material encountered or the groundwater conditions, trench drainage shall be complete and effective.

B. If the Contractor excavates below grade through error or for his own convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the Engineer to excavate below grade as set forth in the following paragraph, in which case the work of excavating below grade and furnishing and placing the refill shall be performed at his own expense.

C. If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel notwithstanding effective drainage, the subgrade material shall be removed to the extent directed and the excavation refilled with a 6-in layer of coarse sand, or a mixture graded from coarse sand to the fine peastone, as approved by the Engineer, to form a filter layer preserving the voids in the gravel bed of the pipe. The composition and gradation of gravel shall be approved by the Engineer prior to placement. Screened gravel shall then be placed in 6-in. layers throughly compacted up to the normal grade of the pipe. If directed by the Engineer, bank-run gravel shall be used for refill of excavation below grade.

D. Geotextile filter fabric may be substituted for filter layer if approved by the Engineer. Filter fabric shall be Mirafi 140N, Supac equivalent, or equal.

3.05 BACKFILLING - PIPELINES

A. As soon as practicable after the pipe has been laid and jointed, backfilling shall begin and thereafter be prosecuted expeditiously. Bedding gravel, as specified for the type of pipe installed, shall be placed up to 1 ft over the pipe.

B. An impervious dam or bulkhead cutoff of clay or other impervious material shall be constructed in the trench as directed, to interrupt the unnatural flow of groundwater after construction is completed. The dam shall be effectively keyed into the trench bottom and sidewalls. Provide at least one clay or other impervious material dam in the pipe bedding between each manhole where directed or every 300 feet, whichever is less.

C. Where the pipes are laid cross country, the remainder of the trench shall be filled with common fill material in layers not to exceed 3 ft and mounded 6-in. above the existing grade or as directed. Where a loam or gravel surface exists prior to cross country excavations, it shall be removed, conserved, and replaced to the full original depth as part of the work under the pipe items. In some areas it may be necessary to remove excess material during the clean-up process, so that the ground may be restored to its original level and condition.

D. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until selected material or screened gravel has been placed and compacted to a level 1 ft over the pipe.

E. Backfill shall be brought up evenly on all sides. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping, to 92 percent compaction. If rolling is employed, it shall be by use of a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench.

F. Water jetting or puddling may be used unless the refill contains too great a proportion of clay or loam to permit satisfactory drying. Water jetting shall consist of using a suitable length of pipe at least 1¼-in. in diameter fitted with quick acting valve and sufficient hose to connect to hydrant or pump having adequate pressure and capacity. The full depth of backfill shall be thoroughly inundated by thrusting the pipe into the fill at frequent intervals with the valve open until all slumping ceases. Where backfill is compacted by puddling, it shall be done by depositing in water. Water for jetting or puddling may be obtained from Owner’s hydrants wherever possible. Water may be furnished by the Owner from these hydrants if reasonable care is exercised in its use and when approved by the Water Division.

G. If water restrictions are in force, the Contractor shall obtain his own water elsewhere, or compact the backfill by other approved methods at no additional cost to this Contract.

H. Where other methods are not practicable, compaction shall be by use of hand or pneumatic ramming with tools weighing at least 20 lbs. The material being spread and compacted in layers not over 6-in. thick. If necessary, sprinkling shall be employed in conjunction with rolling and ramming.

I. Backfill around structures shall be selected common fill material, and may be compacted by puddling where approved by the Engineer. All backfill shall be compacted, especially under and over pipes connected to the structures.

J. Subject to the approval of the Engineer, fragments of ledge and boulders smaller than 6-inches may be used in trench backfill providing that the quantity, in the opinion of the Engineer, is not excessive. Rock fragments shall not be placed until the pipe has at least 2 ft of earth cover. Small stones and rocks shall be place in thin layers alternating with earth to insure that all voids are completely filled. Fill shall not be dropped into the trench in a manner to endanger the pipe.

K. Bituminous paving shall not be placed in backfilling unless specifically permitted, in which case it shall be broken up as directed. Frozen material shall not be used under any circumstances.

L. All road surfaces shall be broomed and hose-cleaned immediately after backfilling. Dust control measures shall be employed at all times.

3.06 BACKFILLING - COMMON FILL

A. Common Fill may be used as fill against exterior walls of structures, as embankment fill or in other areas as designated by the Engineer. Material conforming to the requirements of common fill shall be placed in layers having a maximum thickness of 12-in measured before compaction.

B. Common Fill shall be compacted to at least 92 percent of maximum density as determined by ASTM Compaction Tests, Designation D1557, Method D.

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.

3.07 BACKFILLING - STRUCTURAL FILL

A. Structural Fill shall be placed in layers having a maximum thickness of 8-in. in open areas and 6-in. in confined areas including points where conduit and piping join structures, measured before compaction. Each layer of fill shall be compacted to at least 95 percent of maximum dry density determined by the ASTM Compaction Test, Designation D1557, Method D by methods approved by the Engineer.

B. 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.

C. Compaction of structural fill in open areas shall consist of a heavy vibratory roller, or any method approved by the Engineer. Compaction of structural fill in confined areas shall be accomplished by hand operated vibratory equipment or mechanical tampers approved by the Engineer. As a minimum, compaction of structural fill shall consist of four coverages of the approved equipment.

D. Working mat is required below all structures, as indicated on the Drawings, it shall consist of structural fill (12" min.).

3.08 RESTORING TRENCH SURFACE

A. Where trench occurs adjacent to paved streets, in shoulders, sidewalks, or in cross-country areas, the Contractor shall thoroughly consolidate the backfill and shall maintain the surface as the work progresses. If settlement takes place, he shall immediately deposit additional fill to restore the level of the ground.

B. In and adjacent to streets, the top 12-in layer (20-in in State Highways) of trench backfill shall consist of compacted processed gravel. Should the Contractor wish to use material excavated from the trench as gravel subbase for pavement replacement, the Contractor shall at his own expense have samples of the material tested by an independent testing laboratory at intervals not to exceed 500 feet, in order to establish its compliance with the specifications. Only material which has been tested by the Contractor and approved by the Engineer shall be allowed to be incorporated into the work.

C. The surface of any driveway or any other area which is disturbed by the trench excavation and which is not a part of the paved road shall be restored by the Contractor to a condition at least equal to that existing before work began.

C. In sections where the pipeline passes through grassed areas, the Contractor shall, at his own expense, remove and replace the sod, or shall loam and seed the surface to the satisfaction of the Engineer.

3.09 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 proof-rolled with at least two coverages of the specified equipment. (Refer to Paragraph 3.09D). The Engineer shall waive this requirement if, in his 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, proof-rolling, 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 before.

D. Excavation equipment shall be satisfactory for carrying out the work in accordance with the Specifications. 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 he 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 will be made on the basis of unit prices agreed upon by the Owner and the Contractor in accordance with the provisions of the contract documents.

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.

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

This work will not be measured for payment; its cost shall be included in the Lump Sum cost of "Conduit Installation".

4.02 BASIS OF PAYMENT

Payment for this item shall be included in the Lump Sum cost of "Conduit Installation".

END OF SECTION

SECTION 02241

EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.01 DESCRIPTION

A. This Section specifies equipment and materials for an erosion and sediment control program for minimizing erosion and siltation during the construction phase of the project. The erosion and sediment control provisions detailed on the Drawings and specified herein are the minimum requirements for installation and maintenance of erosion controls. The Contractor shall provide additional erosion and sediment control materials and methods as required to affect the erosion and siltation control principles specified herein.

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

a. Massachusetts Department of Public Works, and The Commonwealth of Massachusetts Department of Public Works; Construction Standards.
b. Massachusetts Department of Environmental Protection.

C. The following erosion control principles shall apply to the land grading and construction phases:

a. Stripping of vegetation, grading, or other soil disturbance shall be done in a manner which will minimize soil erosion.

b. Whenever feasible, natural vegetation shall be retained and protected.

c. Extent of area which is exposed and free of vegetation and duration of its exposure shall be kept within practical limits.

d. Temporary seeding, mulching, or other suitable stabilization measures shall be used to protect exposed critical areas during prolonged construction or other land disturbance. Prolonged exposure of unstabilized soil shall not exceed 60 days.

e. Drainage provisions shall accommodate increased runoff resulting from modifications of soil and surface conditions during and after development or disturbance. Such provisions shall be in addition to existing requirements.

f. Sediment shall be retained on-site.

D. Cut and fill slopes and stockpiled materials shall be protected to prevent erosion. Slopes shall be protected with permanent erosion protection when erosion exposure period is expected to be greater than or equal to two months, and temporary erosion protection when erosion exposure period is expected to be less than two months.

a. Permanent erosion protection shall be accomplished by seeding with grass and covering with an erosion protection material, as appropriate for prevailing conditions.

b. Temporary erosion protection shall be accomplished by covering with an erosion protection material, as appropriate for prevailing conditions.

c. Except where specified slope is indicated on Drawings, fill slopes shall be limited to a grade of 3:1 (horizontal: vertical) cut slopes shall be limited to a grade of 2:1.

PART 2 – PRODUCTS

2.01 MATERIALS

A. FILTER SOCK PRODUCTS

1) Filter sock for construction of erosion control devices shall be blown or placed media (mulch or compost) in twelve-inch diameter biodegradable filter sock.

2) Wooden stakes (2-in. by 2-in. by 36-in.) shall be placed 10 foot on center, driven a minimum of 12 inches into the ground. The filter sock shall be placed as directed by the Engineer and/or as shown on the Drawings and in accordance with the construction details on the Drawings.

B. DEWATERING (SILT) BAGS

1) Silt bags shall be utilized for trench dewatering activities. The silt bags shall be in accordance with the construction details on the Drawings.

C. SEDIMENTATION CONTROL AT CATCH BASINS

1) Silt sacks (or approved equal) shall be utilized at each catch basin for sedimentation control. The silt sacks (or approved equal) shall be in accordance with the construction details on the Drawings.

D. TEMPORARY SEED COVER

1) If required, seed mixture for temporary cover by hydroseeding application shall conform to the following

Quantity per 1000 sq. ft. Coverage	Material
27-1/2 lb.	Wood Fiber Mulch
4 lb	Seed
½ lb.	Annual Ryegrass
22 lb.	10-6-4 Fertilizer
69 gal.	Water

2) Hydroseeding equipment may be either portable or truck mounted, with dual agitation, a minimum working volume of 1000 gallons, and a minimum spray range of 80 ft.

3) Hydroseeding equipment must be capable of uniformly applying the slurry mix including wood fiber mulch if required, at the specified rate, and at the required locations.

4) Hydromulching equipment, either trailer or truck mounted, must be capable of uniformly applying straw or hay mulch at a minimum mulching rate of 8 tons per hour, at a distance of not less than 80 ft.

PART 3 – EXECUTION

3.01 HYDROSEEDING

1) If required for long-term disturbance greater than 60 days, seed for temporary cover shall be spread by the hydroseeding method, utilizing power equipment commonly used for that purpose. Seed, fertilizer, mulch and water shall be mixed and applied to achieve application quantities specified. Material shall be applied in 2 equal applications, with the equipment during the second pass moving perpendicular to direction employed during the first pass. Hydroseeding shall not be done when it is raining or snowing, or when Wind velocity exceeds 5 mph.

2) If the results of hydroseeding application are unsatisfactory, the mixture and/or application rate and methods shall be modified to achieve the required results.

3) After the grass has appeared, all areas and parts of areas which fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas seeded repeatedly until all areas are covered with a satisfactory growth of grass.

3.02 PERMEABLE COMPOST FILTER SOCK

1) Permeable Compost Filter Sock will be placed at locations indicated on plans as directed by the engineer. Socks should be installed parallel to the

base of the slope or other affected area, perpendicular to sheet flow. In extreme conditions (i.e., 2:1 slopes), or when sheet flow flows to the area from a parcel above the work zone, a second sock shall be constructed at the top of the slope in order to dissipate flows.

2) If the Sock is to be left as a permanent filter or part of the natural landscape, it may be seeded at time of installation for establishment of permanent vegetation. The Engineer shall specify seed requirements.

3) Socks may be used in direct flow situations within runoff channels not exceeding 3 feet in depth. Normally, 18" or 24" socks should be used. Be sure to follow staking details as identified by the manufacturer or approved installer.

3.03 MAINTENANCE

1) The Contractor shall maintain the erosion control in a functional condition at all times and it shall be routinely inspected. Wetland area, water courses, and drainage swales adjacent to construction activities shall be monitored continuously for evidence of silt intrusion and other adverse environmental impacts, which shall be corrected immediately upon discovery.

2) Where the siltation barrier requires repair, it will be routinely repaired.

3) The contractor shall remove sediment collected at the base of the siltation barrier when it has reached 1/2 of the exposed height of the sock, silt fence / straw bale or as directed by the Engineer. Alternatively, rather than create a soil disturbing activity, the engineer may call for additional siltation barrier to be added at areas of high sedimentation, placed immediately on top of the existing sediment laden sock.

3.04 PERFORMANCE

1) Contractor is responsible for establishing a working erosion control system and may, with approval of the Engineer, work outside the minimum construction requirements as needed.

2) Where the siltation barrier deteriorates or fails, it will be repaired or replaced with a more effective alternative.

3.05 FINAL INSPECTION AND ACCEPTANCE:

1) The Engineer reserves the right to have a manufacturer's representative inspect the installation process at any time during construction.

2) Any work found to be unsatisfactory by the manufacturer's representative shall be corrected at the Contractor's expense.

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

This work will not be measured for payment; its cost shall be distributed amongst bid items for the project.

4.02 BASIS OF PAYMENT

Payment for this item shall be distributed amongst bid items for the project.

END OF SECTION

SECTION 02513

ASPHALT PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including all Division l Specifications - General Requirements apply to the work in this section.

1.02 DESCRIPTION OF WORK

A. Pavement shall be replaced within the limit of work lines shown on drawings.

B. Pavement shall consist of temporary pavement repairs (2-inch) or permanent pavement repair (2½-inch thick binder/base course and 1½-inch thick top course).

1.03 SUBMITTALS

Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1.04 JOB CONDITIONS

A. Weather Limitations:

1. Apply prime and tack coats when ambient temperature is above 50 degrees F (10 degrees C), and when temperature has not been below 35 degrees F (1 degree C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

2. Construct asphalt concrete surface course when atmospheric temperature is above 40 degrees F (4 degrees C) and when base is dry. Base course may be placed when air temperature is above 30 degrees F (-l degree C) and rising.

B. Grade Control: Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Use locally available materials and gradations which exhibit a satisfactory record of previous installations.

B. The following standards form a part of these specifications and indicate the minimum standards required:

MassDOT 2025 Standard Specifications for Highways and Bridges

MHD	402	DENSE GRADED CRUSHED STONE FOR SUB-BASE
MHD	450	Hot Mix Asphalt Pavement
MHD	860	Reflectorized Pavement Markings
MHD	901	Cement Concrete

2.02 ASPHALT-AGGREGATE MIXTURE

A. Pavement shall consist of binder course and top course or surface treatment pavements as specified herein. The bituminous paving mixture, equipment, methods of mixing and placing, and the precautions to be observed as to weather, condition of base, etc., shall be in accordance with MHD 460. The bituminous concrete pavements shall consist of Class I Bituminous Concrete, Type 1-1.

B. The binder course mixture shall be within the composition limits of binder course as shown in MHD M3.11.03, and shall be 2-1/2 inches thick.

C. The top course or surface treatment pavement shall be within the composition limits as shown in MHD M3.11.03, and shall be placed as shown on the drawings or as specified.

D. The top course pavement shall be 1-1/2 inches thick in local streets.

2.03 BITUMINOUS CONCRETE CURBING & SIDEWALK

Bituminous concrete curbing and sidewalks shall be Class I conforming to Subsection M3.11.03, Table A of the Massachusetts Highway Department Standard Specifications for Highways and Bridges, 1988, and corresponding supplemental updates.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Proof roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

B. Notify Contractor of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

C. Tack Coat: Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gal. per sq. yd. of surface. Allow to dry until at proper condition to receive paving. Apply per manufacturer's instructions.

3.02 PLACING MIX

A. General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225 degrees F (107 degrees C).

B. Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

C. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

D. Surface treatment pavement over trenches shall be feathered to meet existing paved surfaces.

3.03 ROLLING

A. General: Begin rolling when mixture will bear roller weight without excessive displacement.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.04 FIELD QUALITY CONTROL

A. General: Test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Engineer.

B. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:
   1. Base Course: 1/2”
   2. Surface Course: 1/4”

C. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10’ straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.
   1. Base Course Surface: 1/4”.
   2. Wearing Course Surface: 3/16".

D. Check surface areas at intervals as directed by Engineer.

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

Bid Item No.	**Description**	**Unit of Measurement**
7	Repave UST Area and Around Concrete Pad Fuel Island	Lump Sum
13	Laboratory Testing - Allowance	Allowance

The paving shall be measured on a Lump Sum basis and shall include all materials, labor, equipment and appurtenant work associated with completing the work in place and accepted by the City and Engineer.

Asphalt testing will be paid per each under the appropriate allowance as outlined in Section 01600.

4.02 BASIS OF PAYMENT

The paving shall be paid for by the unit Lump Sum. Included in the all costs shall be all materials, labor, permits, and equipment for this task.

Asphalt testing will be paid per each under the appropriate allowance as outlined in Section 01600.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Extent of concrete work is shown on drawings. Contractor is responsible for design and installation of all concrete slabs and foundations designed to support the pre-engineered structures as shown on the plans.

B. The Contractor shall furnish all of the materials for and shall place all concrete, inclusive of all required from work, for the structures shown on the Contract Drawings and such other concrete masonry as may be necessary to fully complete the work called for by this Contract.

1.02 REFERENCES

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

A. American Society for Testing and Material (ASTM):

ASTM A82	Steel Wire, Plain, for Concrete Reinforcement
ASTM A185	Steel Welded Wire Fabric, Plain for Concrete Reinforcement
ASTM A496	Steel Wire, Deformed for Concrete Reinforcement
ASTM A497	Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A615	Deformed Billet-Steel Bars for Concrete Reinforcement
ASTM C33	Concrete Aggregates
ASTM C94	Ready-Mixed Concrete
ASTM C138	Weight per Cubic Foot, Yield and Air Content (Gravimetric) of Concrete
ASTM C143	Slump of Portland Cement Concrete
ASTM C150	Portland Cement
ASTM C171	Spec. for Waterproof Paper for Curing Concrete

ASTM C231 Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C260 Air Entraining Admixtures for

Concrete ASTM C494 Chemical Admixtures

for Concrete

ASTM C618 Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

ASTM D994 Preformed Expansion Joint Filler for Concrete (Bituminous Types)

B. American Concrete Institute (ACI):

ACI 301 Curing of the Cement Concrete

ACI 305 Recommended Practice for Hot Weather Concreting

ACI 306 Recommended Practice for Cold Weather Concreting

ACI 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures

ACI 318 Building Code Requirements for Reinforced

Concrete ACI 347 Recommended Practice for Concrete

Framework

C. Corps of Engineers (COE) Publications:

CRD C621 Factory Pre-Mixed Grout

D. U.S. Department of Commerce Commercial Standard:

CS238-61 Polyethylene Sheeting (Construction, Industrial and Agricultural)

E. American Welding Society (AWS):

AWS D1.4 Structural Welding Code – Reinforcing Steel

F. Concrete Reinforcing Steel Institute (CRSI):

CRSI DA4 Manual of Standard Practice

1.03 GENERAL REQUIREMENTS

The work covered under this section shall consist of the furnishing of all labor, materials, and equipment necessary to complete all plain and reinforced cast-in-place concrete work, as called for on drawings and as hereinafter specified.

1.04 SUBMITTALS

A. Six (6) copies of the statement of materials constituting the design of mixes for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the Contract.

B. Drawings: Contractor shall submit detailed drawings showing reinforcing sizes, grades, and splicing and bending details. Drawing shall show support details including types, sizes and spacing.

C. Certifications: Contractor shall submit certified copies of mill reports attesting that the reinforcing steel meets the requirements specified prior to installation of reinforcing steel.

D. Materials List: Contractor shall submit a complete list of all materials proposed to be furnished and installed under this section, demonstrating complete conformance with requirements specified.

E. Reports: Contractor shall submit concrete test reports detailing the testing performed.

1.05 QUALIFICATIONS OF INSTALLERS

Throughout the progress of installation of the work of this section, provide at least one person who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills, and who shall be present at the site and shall direct all work performed under this section. In actual installation of the work for this section, use adequate numbers of skilled workmen to ensure installation in strict accordance with the approved design. In acceptance or rejection of the work performed under this section, the Contracting Officer will make no allowance for lack of skill on the part of the workmen.

1.06 STORAGE OF MATERIALS

A. Cement: Cement shall be stored so as to prevent deterioration or contamination. Cement which has become caked, partially set or otherwise deteriorated,

damaged or contaminated shall be rejected and removed from the site.

B. Aggregates: The aggregate shall be stored and handled so as to preserve the gradation and cleanliness of the material. Segregation and/or contamination are cause for rejection and the deficient material shall be removed from the site and replaced.

C. Storage of Metal Reinforcement: Metal reinforcement shall be blocked up from the ground at least 4 inches and piled compactly. When required, it shall be placed under cover, as directed.

PART 2 - PRODUCTS

2.01 CONCRETE

A. All concrete, reinforced or non-reinforced shall have a 28-day compressive strength of 5,000 psi unless otherwise noted on the design drawings. A minimum of 6 sacks of cement per cubic yard and a maximum water cement ratio of 5.5 gallons per sack shall be used.

B. Concrete shall conform to ASTM C94. The Contractor shall be responsible for the design of the concrete mixtures. Slump shall be a maximum of 4 inches and a minimum of 2 inches, determined in accordance with ASTM C143.

C. No additional admixtures shall be used unless approved by the Engineer.

D. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

E. The use of calcium chloride is not permitted.

2.02 CEMENT

Portland cement used in this work shall be an approved brand of tested Portland cement meeting the requirements of ASTM C150, Type IA, unless otherwise acceptable to the Contracting Officer. One brand of cement will be used throughout the project.

2.03 FLY ASH

ASTM C618, Type C or Type F. Limit use of fly ash to not exceed 25 percent of cement content by weight.

2.04 NORMAL WEIGHT AGGREGATES

A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.

B. Maximum size aggregate shall be 3/4-inch.

C. Fine aggregate shall conform to ASTM C40.

2.05 WATER

Potable.

2.06 ADMIXTURES

Calcium chloride or admixture containing more than 0.1 percent ions are not permitted.

A. Air Entraining Admixture: ASTM C260. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. "Sika Aer"; Sika Corp. or approved equal.

2. "MB-VR or MB-AE"; Master Builders or approved equal.

3. "Dorex AEA"; W.R. Grace or approved equal.

4. "EDOCO 2001 or 2002"; EDOCO Technical Products or approved equal.

B. Water Reducing Admixture: ASTM C494, Type B, and contain not more than 0.1 percent chloride ions. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. "EUCON WR-75"; Euclid Chemical Co. or approved equal.

2. "Pozzolith 344"; Mater Builders or approved equal.

3. "Plastocrete 160"; Sika Chemical Corp. or approved equal.

4. "Chemtard"; Chem-Masters Corp. or approved equal.

C. High Range Water Reducing Admixture (Super Plasticizers): ASTM C494, Type F or Type G, and contain not more than 0.1 percent chloride ions. Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. "WDRDA 19"; W.R. Grace or approved equal.

2. "PSP"; Protex Industries, inc. or approved equal.

3. “Super P”; Anti-Hydro or approved equal.

4. “Sikament”; Sika Chemical Corp. or approved equal.

5. “Mighty 150”; ICI Americas Corp. or approved equal.

6. “Eucon 37”; Euclid Chemical Corp. or approved equal.

7. “PSI Super”; Gifford-Hill or approved equal.

8. “Pozzolith 400”; Master Builders or approved equal.

D. Water Reducing, Non-Chloride Accelerator Admixture: ASTM C494, Type E, and containing not more than 0.1 percent chloride ions. Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. “Accelguard 80”; Euclid Chemical Co. or approved equal.

2. “Pozzolith 500”; Master Builders or approved equal.

E. Water Reducing, Retarding Admixture: ASTM C494, Type A, and containing not more than 0.1 percent chloride ions. Subject to compliance with requirements, products which may be incorporated in the work, include, but are not limited to, the following:

1. “EDOCO 20006”; Edoco Technical Products or approved equal.

2. “Pozzolith 300-R”; Master Builders or approved equal.

3. “Eucon Retarder 75”; Euclid Chemical Co. or approved equal.

4. “Daratard”; W.R. Grace or approved equal.

5. “Plastiment”; Sika Chemical Co. or approved equal.

2.07 METAL REINFORCEMENT

Reinforcing bars for the slab on grade shall conform to the requirements of ASTM specifications A615 Grade 60 Deformed.

Welded wire mesh for the slab on grade shall conform to the requirements of ASTM A185. Support for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI Specifications unless otherwise acceptable.

2.08 NON-SHRINK GROUT

GRD-C621, factory pre-mixed grout. Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. Non-Metallic

   "Masterflow 713"; Master Builders or approved equal. "Sonogrout"; Sonneborn-Contech or approved equal. "EUCO-NS"; Euclid Chemical Co. or approved equal. "Crystex"; L&M Const. Chemical Co. or approved equal.
   "Sure-Grip Grout"; Dayton Superior Corp. or approved equal.
   "Horngrout"; A.C. Horn or approved equal.
   "Five-Star Grout"; Five-Star Products, Inc. or approved equal. "Sika Grout 212"; Sika Corp. or approved equal.

2. Metallic grout will not be allowed.

2.09 LIQUID MEMBRANE FORMING CURING COMPOUND

Type I, Class A. Provide curing compound by one of the following:

1. "Masterseal"; Master Builders or approved equal.

2. " A-H 3 Way Sealer"; Anti-Hydro Waterproofing Co. or approved equal.

3. "Kure-N-Seal"; Sonneborn-Contech or approved equal.

2.10 SHEET MATERIALS

(Moisture Retaining Cover) one of the following complying with ASTM C171.

1. Waterproof Paper

2. Polyethylene Film

3. Polyethylene Coated

4. Burlap

PART 3 - EXECUTION

3.01 FORMWORK

General: Detailed recommendations are given in "Recommended Practice Concrete

Formwork" (ACI 347). Earth cuts shall not be used as forms for vertical surfaces. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the contractor.

3.02 CONCRETE

A. Composition: The concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, water, and the admixture, if approved for use.

B. Design of Mixtures: The contractor, at his expense, shall have the approved testing or inspection laboratory prepare the mix designs for the specified concretes. Submit written reports to the Contracting Officer of each proposed mix of concrete at least fifteen (15) days prior to start of work. Do not begin concrete production until mixes have been reviewed by the Contracting Officer.

C. Strength of Concrete: Concrete shall be proportioned and mixed for a strength of 5,000 psi at 28 days for the reinforced foundations.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by contractor when characteristics or materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to the City, and as accepted by Contracting Officer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Contracting Officer before using in work.

E. Water-Cement Ratio: Provide cement for following conditions with maximum water- cement (WC) ratios as follows:

1. Subjected to freezing and thawing: WC 0.50

F. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps, slabs, and sloping surfaces: Not more than 3".

2. Concrete containing HRWR (High Range Water-Reducing) admixture (super plasticizer): Not more than 8" after addition of HRWR to verified 2"-3" slump concrete.

3. Other Concrete: Not more than 4".

3.03 ADMIXTURES

Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

A. Use water-reducing admixture for high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.

B. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50°F (10°C).

C. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of ±1½ % within following limits:

D. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or subjected to hydraulic pressure:

5.0% (moderate exposure): 6.0% (severe exposure) ¾" maximum aggregate.

3.04 CONCRETE MIXES

A. Job Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one CY or smaller capacity, continue mixing at least 1½ minutes, but not more than 5 minutes after ingredients are in mixer before any part of batch is released. For mixers of capacity larger than 1 CY, increase minimum 1½ minutes of mixing by 15 seconds for each additional cubic yard or fraction thereof.

B. Provide batch ticket for each discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

C. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 1½ hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.

3.05 PLACING CONCRETE

Concrete shall be placed or deposited in accordance with the following:

A. Depositing: Concrete shall be deposited at slumps not greater than those specified in Paragraph 8.1.5 as nearly as practicable, in its final position so as to avoid segregation due to rehandling or flowing. The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the spaces between the bars. No concrete that has partially hardened or been

contaminated by foreign material shall be deposited, nor shall retempered concrete be used.

B. Time Schedule: When concreting is started, it shall be carried on as a continuous operation until the placing of the panel or section is completed; fresh concrete shall not be deposited on concrete which has hardened sufficiently to cause formation or seams and planes of weakness within the section. The top surface shall be generally level. When construction joints are necessary, they shall be made as specified hereinafter.

C. Compaction: All concrete shall be thoroughly compacted by suitable means during placing, and shall be thoroughly worked around the reinforcement and embedded into fixtures and corners of forms. Vibrators shall be used to aid in the placement of concrete and they shall be used under experienced supervision, and the forms shall be designed to withstand their action. Where conditions make compacting difficult, or where the reinforcement is congested, batches of mortar containing the same proportions of cement-to-sand as used in the concrete shall first be deposited in the forms to a depth of at least 1 inch.

3.06 TESTING

A. Concrete inspection and testing shall be performed by a certified laboratory and engaged and paid for by the Contractor.

B. Test cylinders of the concrete shall be made by or under the supervision of the contractor's superintendent. Unless otherwise noted, the tests of fresh and hardened concrete will be at the expense of the Contractor paid for under the appropriate allowance item.

C. Tests of Fresh Concrete: Except as otherwise directed by the Contracting Officer, at least 1 test shall be made on fresh concrete for each 50 cubic yards of concrete (or fraction thereof) placed in any one day and in any event not less than 1 test each day concrete is used. Slump shall be determined in accordance with ASTM C143. Air content shall be determined in accordance with ASTM C138 or C231.

D. Tests of Hardened Concrete: When a test of fresh concrete is conducted as noted herein, specimens shall also be molded for compressive tests in accordance with MassDOT Standard Specifications, not less than three specimens shall comprise a strength test. Compressive strength tests shall be made in accordance with MassDOT Standard Specifications or the latest ASTM test guidance.

E. Age of Strength Test: The age of test for strength shall be one at 7 days and two at 28 days.

Strength Test Conformance of Molded Specimens: To conform to the requirements of the specifications, the average strength of laboratory cured specimens as well as the average of any 5 consecutive strength tests shall be equal to or greater than the specified strength, and not more than 1 strength test in 10 shall have an average value less than 90 percent of the specified strength.

F. Test Data: All test data shall be furnished to the Engineer, in duplicate, for verification.

3.07 PREPARATION OF EQUIPMENT AND PLACE OF DEPOSIT

A. Before placing concrete, all equipment for mixing and transporting the concrete shall be cleaned, all debris and ice shall be removed from the spaces to be occupied by the concrete, forms shall be thoroughly wetted (except where the surrounding atmosphere is below 40°F) of oiled, and the reinforcement shall be thoroughly cleaned of ice or other coatings. Water shall be removed from place of deposit before concrete is placed. All reinforcement, forms, ground, and other surfaces with which the concrete is to come in contact shall be free from frost. Concrete shall not be deposited during rain unless adequately protected and, in any case, preparation shall be on hand to protect newly placed concrete from rain until it has hardened sufficiently so that it will not be damaged.

B. Conveying: Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent the separation or loss of the materials. Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to insure a practically continuous flow of concrete at the delivery end and without separation of the materials.

3.08 CURING

Concrete shall be cured as follows:

A. Normal Conditions: Concrete shall be prevented from drying for at least the first 7 days after placing. If the use of an (approved) admixture promotes an early strength gain, moist curing may be discontinued after 3 days. See Paragraph 13 of this section.

B. Cold Weather Conditions: Whenever the temperature of the surrounding air is below 40°F, all concrete shall be maintained at a temperature of not less than 50°F for at least 72 hours, or for as much time as is necessary to insure proper curing of the concrete. The housing, covering, or other protection used in connection with curing shall remain in place and intact at least 72 hours after the artificial heating is discontinued. No dependence shall be placed on salt or other chemicals for the prevention of freezing. The approved practices for winter concreting shall be as outlined in ACI 306. The use of plastic ("Visqueen" or equal) covering will not be permitted.

C. Hot Weather Conditions: Protection against loss of moisture from the surface of the concrete shall be accomplished by keeping the surface continuously wet. One or more of the following methods shall be used:

1. Surface remaining in contact with the forms.

2. Covering with burlap or cotton mats kept continuously wet.

3. Covering with paper of suitable type.

4. Continuous sprinkling of the exposed surfaces.

5. Use of an impervious membrane consisting of approved liquid sealing compound applied in an atomized form after surface water has entirely disappeared but surface is still moist. Compounds shall form an effective seal which will prevent evaporation of moisture from concrete for the full curing period. Compound shall be approved by the Contracting Officer.

3.09 METAL REINFORCEMENT

A. Unless otherwise indicated, reinforcing steel shall be handled and placed in accordance with the recommendations of the Building Code Requirements, ACI 315. Steel reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety.

B. Welded Wire Fabric: Welded wire fabric shall conform to ASTM A185 or ASTM A497.

C. Wire Ties: Wire ties shall be 16-gauge or heavier black annealed steel wire.

D. Cleaning, Straightening, and Rebending: Metal reinforcement at the time the concrete is placed, shall be free from rust, scale, or other coating that will destroy or reduce the bond. Metal reinforcement shall not be straightened or rebent without the approval of the Engineer. Bars may not be straightened by reheating. Bars with kinks or improperly fabricated shall not be used; they shall be returned to the fabricator and new material provided at no additional cost.

E. Placing Reinforcement: Metal reinforcement shall be accurately placed and adequately secured in position by wire ties and metal chairs and spacers in conformance with ACI 315, Chapter 7. Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318 at

locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

F. In no case shall the clear distance between bars be less than 1 inch, nor less than 1 1/3 times the maximum size of the coarse aggregate.

G. Splices in Reinforcement: Splices of reinforcement shall conform to ACI 318 and shall be made only as required or indicated. Splicing shall be by lapping or by mechanical connection. Necessary splices not shown on drawings shall be lapped sufficiently to develop the strength of the bars by bond, and the bars shall be securely wired. Splices in adjacent bars shall be staggered. Adjacent sheets of wire mesh shall be lapped at least 6 inches and securely wired. The clear distance between bars shall also apply to the clear distance between a contact splice and adjacent contact splices or bars. Mechanical butt splices shall be in accordance with the recommendation of the manufacturer of the mechanical splicing device. Butt splices shall develop 125 percent of the specified minimum yield tensile strength of the spliced bars of the smaller bar in transition splices.

H. Supports: Bar supports for formed surfaces shall be designed and fabricated in accordance wit CRSI DA4 and shall be steel or precast concrete blocks. Precast concrete blocks shall be not less than 4 inches square when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports within ½ inch of concrete surface shall be plastic protected or of stainless steel. Concrete supports used in concrete exposed to view shall have the same color and texture as the finish surface. For slabs on grade, supports shall be precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.

I. Welded-Wire Fabric: Welded-wire fabric shall be placed in slabs as indicated. Fabric placed in slabs on grade shall be continuous between expansion, construction, and contraction joints. Lap splices shall be made in such a way that the overlapped area equals the distance between the outermost crosswires plus 2 inches. Laps shall be staggered to avoid continuous laps in either direction. Fabric shall be wired or clipped together at laps at intervals not to exceed 4 feet. Fabric shall be positioned by the use of supports.

J. Dowels: Dowels shall be installed in slabs on grade at locations indicated and at right angles to joint being doweled. Dowels shall be accurately aligned parallel to the finished concrete surface and rigidly supported during concrete

placement. One end of dowels shall be coated with a bond breaker.

3.10 DEFECTIVE MATERIALS AND/OR WORKMANSHIP

Concrete work which is not properly formed, true, plumb or level, or which fails to meet specified minimum compressive strength, shows poor workmanship, or contains foreign substances shall be deemed to be defective and shall be removed from the site as directed by the Contracting Officer, and replaced with new material, at no additional cost to the City.

3.11 JOINTS

A. Expansion joints between concrete slabs and joints that abut against vertical surfaces, and joints in walkways where indicated, shall have premolded joint filler strips ½ inch thick the full depth of the slab. Edges of joints shall be finished slightly rounded.

B. Construction joints not specifically indicated shall be so made and located so as to avoid any unnecessary impairment of the strength of the structure. Where a construction joint is to be made, the surface of the placed concrete shall be thoroughly cleaned and all laitance removed.

C. Construction joints not specifically indicated shall be provided in large slabs on grade by pouring each slab in alternate checkerboard sections approximately 625 square feet in area, or contraction joints may be sawed or formed by the insertion of fiber expansion joint strips after concrete has been placed. Sawed joints shall be cut approximately ¼ the thickness of the slab. Fiber joint strips shall be held in alignment with special metal forms designed for the purpose. The metal forms shall be removed after concrete has taken its initial set.

3.12 CONCRETE FINISHING

A. Rough Form Finish:

1. Provide as-cast rough form finish to formed concrete surfaces that are to be concealed in the finish work or by any other construction.

2. Standard rough form finish shall be the concrete surface having the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched, and all fins and other projections exceeding ¼ inch in height rubbed down or chipped off.

B. Smooth Form Finish:

1. Provide as-cast rough form finish for formed concrete surfaces that are to be exposed to view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to

concrete, such as waterproofing, dampproofing, painting, or other similar system.

2. Produce a smooth form finish by selecting form material to impart a smooth, hard, uniform texture and arranging them orderly and symmetrically with a minimum of seams.

3. Repair and patch defective areas with all fins and other projections completely removed and smoothed.

3.13 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified. Provide moisture curing by following methods:

1. Keep concrete surface continuously wet by covering with water.

2. Continuous water-fog spray.

3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4” lap over adjacent absorptive covers.

Provide moisture-cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3” and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

Provide curing and sealing compound to interior slabs with resilient flooring, carpet over cushion, or left exposed; and to exterior slabs, walks, and curbs, as follows:

1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply

uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

2. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Contracting Officer.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and flat surfaces by application of appropriate curing method.

1. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

3.14 SEALER AND DUSTPROOFER

Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.

3.15 OVERLOADING

No part of the work shall be overloaded by placing materials thereon before concrete has attained sufficient hardness to support same. Contractor will be held responsible for all overloading.

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

Bid Item No.	**Description**	**Unit of Measurement**
6	Raised Concrete Base and Concrete Pad Fuel Island Installation	Lump Sum
13	Laboratory Testing - Allowance	Allowance

The raised concrete base and the concrete pad fuel island installation shall be measured on a Lump Sum basis and shall include all materials, labor, equipment and appurtenant work associated with completing the work in place and accepted by the City and Engineer.

Concrete testing will be paid per each under the appropriate allowance as outlined in Section 01600.

4.02 BASIS OF PAYMENT

The raised concrete base and the concrete pad fuel island installation shall be paid for by the unit Lump Sum. Included in the all costs shall be all materials, labor, permits, and equipment for this task.

Concrete testing will be paid per each under the appropriate allowance as outlined in Section 01600.

END OF SECTION

SECTION 13120

FUEL FACILITY

PART 1- GENERAL

1.01 SUMMARY

A. The Contractor shall install a complete and operational fuel facility, acceptable to the City, which conforms with the lines, grades, dimensions, and details shown on the plans and as described herein.

B. The Contractor is responsible for providing Professional Engineer stamped plans for a complete installation. Parts and materials outlined herein do not constitute a complete list of what may be required for a complete installation.

1.02 SUBMITTALS

A. Stamped Fuel System Design Plans: Prior to mobilization, the Contractor shall provide stamped AST Plans outlining the complete installation.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, and dimensions of individual components and profiles. Also include, where applicable, rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Stairway Plan: Include plans, elevations, sections, and details of supports and anchors. Indicate all critical dimensions

D. Shop Drawings: For storage tanks, include plans, elevations, sections, and details of supports and anchors. Indicate all critical dimensions, locations of all fittings, and accessories, etc. Detail fabrication, installation, piping layout, materials and finishes, system interconnections, and utility connections of equipment assemblies. Indicate dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

E. Wiring diagrams detailing power and control wiring and differentiating clearly between manufacturer-installed wiring and field-installed wiring.

F. Seismic Qualification Certificates: For ASTs, accessories, and components, from manufacturer.

G. Brazing Certificates

H. Welding Certificates

I. Field quality control reports

J. Sample warranty.

K. Stamped As Built Drawings: At the completion of the work, provide stamped As Built drawings outlining any modifications to Contractor provided AST Plans.

L. Closeout: Operation and maintenance data. Provide a complete parts list, operating instructions, and maintenance manual covering equipment at time of installation.

1.03 QUALITY ASSURANCE

A. EPA Compliance: Comply with EPA and state and local authorities having jurisdiction.

B. Electrical Installer Qualifications: An experienced electrician capable of wiring, installing, and troubleshooting all related portions of a fuel facility as specified in this Section.

C. Pipe Welding Qualifications: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code.

D. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. All components shall be factory tested and documented to operate as a complete system.

G. Quality Assurance submittals will include:

1. Certification that tank test equipment conforms to State and Federal requirements and that the persons performing the tests are qualified on said test equipment.

2. Field quality control test reports.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Lift tanks in accordance with manufacturer’s instructions and with the proper equipment. Do not use chain or cables around tanks at any time. If tanks have to be moved, set on smooth ground free of rocks and foreign objects.

Do not drop or roll tanks. Do not allow tanks to be impacted.

B. Other Tank Materials: Store material in a clean dry area protected from damage. Materials may be stored outside only with the written approval of the Engineer.

1.05 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace storage tanks that fail in materials or workmanship within specified warranty period.

1. Storage Tanks:

a. Failures include, but are not limited to, the following when used for storage of fuel at temperatures not exceeding 150 deg F:

1) Structural failures including cracking, breakup, and collapse.

2) Corrosion failure including external and internal corrosion of tanks.

B. Warranty Period: 30 years from the issuance of the Certificate of Compliance.

PART 2 – PRODUCTS

2.01 PROFESSIONAL ENGINEER STAMPED FUEL SYSTEM DESIGN PLANS

A. The Contractor shall prepare stamped plans for a complete installation.

B. The installation must adhere to the following:

1. National Fire Protection Agency (NFPA) Codes and Standards
   a. NFPA 30 Flammable and Combustible Liquids Code
   b. NFPA 30A Code for Motor Fuel Dispensing Facilities and Repair Garages
2. National Electrical Code (NEC)
3. Massachusetts Fire Prevention Regulations 527 CMR 1.00 and 80.00
4. CommTank Secondary Containment Requirements for Massachusetts ASTs (April 2017)
5. OSHA and local safety regulations
6. PEI RP200 Recommended Practices for Installation of Aboveground Storage Systems for Motor Vehicle Fueling
7. 40 CFR Protection of the Environment Section 112 Oil Pollution Prevention, Mandates, and SPCC Plan.

C. These plans must outline the following key equipment including the make and model. This list may not constitute a complete list of that which may be required for a complete installation.

1. Fireguard UL2085, double-wall, horizontal, 4,000-gallon, steel tank, combined compartment storage tank: Highland Tank, Modern Welding Company, Ace Tank, or equivalent
2. Spill Container
3. Overfill Prevention Valve: Morrison or an approved equal
4. Mechanical Tank Gauge: Morrison or an approved equal
5. Stickport cap
6. Gauge stick
7. Fill adaptor and cap
8. Diesel vent
9. Gasoline vent
10. EVR Vapor Cap
11. Swivel Vapor Adaptor
12. Solenoid Valve
13. Emergency Valve
14. Ball Valve
15. Flex Connector
16. Dispenser Pedestal
17. Pressure Regulator Valve
18. Emergency Electrical Disconnect
19. ATG Cap and Adaptor
20. In-Tank Monitoring Probe, Gasoline Float Kit, and Diesel Float Kit: Veeder-Root
21. Interstitial Monitor: Veeder Root
22. High Level Alarm and Reset: Veeder Root
23. Fuel Management System: SmartFill
24. Gasoline Pump: Great Plain Industries G-PRO pump or equivalent
25. Diesel Pump: Great Plain Industries G-PRO pump or equivalent

D. Items listed in this Section are for reference only and may not be inclusive of all items the Professional Engineer includes in stamped plans.

2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design restraint and anchors for ASTs, and equipment, including comprehensive engineering analysis, using performance requirements and design criteria indicated.

B. Seismic Performance: Factory-installed support attachments for AST shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be

fully operational after the seismic event."

2.03 SYSTEM DESCRIPTION

A. Valves: Comply with UL 842 and have service mark initials "WOG" permanently marked on valve body.

B. Comply with requirements of the EPA and of state and local authorities having jurisdiction. Include recording of piping.

2.04 PIPES, TUBES, AND FITTINGS:

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M, for butt and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

a. Material Group: 1.1.
b. End Connections: Threaded or butt welding to match pipe.
c. Lapped Face: Not permitted underground.
d. Gasket Materials: Asbestos free, ASME B16.20 metallic, or ASME B16.21 nonmetallic, gaskets.
e. Bolts and Nuts: ASME B18.2.1, cadmium-plated steel.

2.05 PIPING SPECIALTIES

A. Metallic Flexible Connectors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Flexible Hose Co., Inc.
b. Flexicraft Industries.
c. FLEX-ING, Inc.
d. Hose Master, Inc.
e. Metraflex Company (The).
f. Proco Products, Inc.
g. Tru-Flex Metal Hose Corp.
h. Unaflex.

2. Listed and labeled for aboveground and underground applications by an NRTL acceptable to authorities having jurisdiction.

3. Stainless-steel bellows with woven, flexible, bronze or stainless-steel, wire-reinforcing protective jacket.
4. Minimum Operating Pressure: 150 psig.
5. End Connections: Socket, flanged, or threaded end to match connected piping.
6. Maximum Length: 30 inches
7. Swivel end, 50-psig maximum operating pressure.
8. Factory-furnished anode for connection to cathodic protection.

B. Nonmetallic Flexible Connectors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Flexible Hose Co., Inc.
    b. Flexicraft Industries.
    c. FLEX-ING, Inc.
    d. Tru-Flex Metal Hose Corp.

2. Listed and labeled for underground applications by an NRTL acceptable to authorities having jurisdiction.
3. PFTE bellows with woven, flexible, bronze or stainless-steel, wire-reinforcing protective jacket.
4. Minimum Operating Pressure: 150 psig.
5. End Connections: Socket, flanged, or threaded end to match connected piping.
6. Maximum Length: 30 inches
7. Swivel end, 50-psig maximum operating pressure.
8. Factory-furnished anode.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

D. Basket Strainers

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

E. T-Pattern Strainers

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 60-mesh startup strainer and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig.

F. Manual Air Vents

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

2.06 JOINING MATERIALS:

A. Per manufacturer recommendations unless otherwise noted.

B. Joint Compound and Tape for Threaded Joints: Suitable for gasoline and diesel.

C. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.07 SPECIALTY VALVES

A. Pressure Relief Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anderson Greenwood; Pentair, Ltd.
    b. Fulflo Specialties, Inc.
    c. OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company.
    d. Webster Fuel Pumps & Valves; a division of Capital City Tool, Inc.

2. Listed and labeled for gasoline and diesel service by an NRTL acceptable to authorities having jurisdiction.
3. Body: Brass, bronze, or cast steel.
4. Springs: Stainless steel, interchangeable.
5. Seat and Seal: Nitrile rubber.
6. Orifice: Stainless steel, interchangeable.

7. Factory-Applied Finish: Baked enamel.
8. Maximum Inlet Pressure: 150 psig.
9. Relief Pressure Setting: 60 psig.

B. Emergency Shutoff Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. EMCO Wheaton.
    b. Franklin Fueling Systems.
    c. OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company.

2. Listed and labeled for gasoline and diesel service by an NRTL acceptable to authorities having jurisdiction.
3. Single poppet valve.
4. Body: ASTM A 126, cast iron.
5. Disk: FPM.
6. Poppet Spring: Stainless steel.
7. Stem: Plated brass.
8. O-Ring: FPM.
9. Packing Nut: PTFE-coated brass.
10. Fusible link to close valve at 165 deg F.
11. Thermal relief to vent line pressure buildup due to fire.
12. Air test port.
13. Maximum Operating Pressure: 0.5 psig.

2.08 MECHANICAL LEAK-DETECTION VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Franklin Fueling Systems.
2. Red Jacket Pumps.

B. Listed and labeled for gasoline and diesel service by an NRTL acceptable to authorities having jurisdiction.
C. Body: ASTM A 126, cast iron.
D. O-Rings: Elastomeric compatible with gasoline and diesel.
E. Piston and Stem Seals: PTFE.
F. Stem and Spring: Stainless steel.
G. Piston Cylinder: Burnished brass.
H. Indicated Leak Rate: Maximum 3 gph at 10 psig.
I. Leak Indication: Reduced flow.

2.09 DOUBLE-WALL STEEL, AST

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Ace Tank & Fueling Equipment, LLC.
2. Adamson Global Technology Corporation.
3. Brown Tank.
4. Buffalo Tank Company, Inc.
5. Cardinal Tank Corp.
6. Clawson Tank Company.
7. Hall Tank Co.
8. Highland Tank & Manufacturing Company, Inc.
9. Modern Welding Company, Inc.
10. Palmer Manufacturing and Tank Company.
11. Safe-T-Tank Corp.
12. Steel Tank and Fabricating.
13. Watco Tanks, Inc.
14. We-Mac Manufacturing, Inc.

B. Description: Fireguard UL2085, double-wall, horizontal, 4,000-gallon, steel tank, combined compartment storage tank. The AST shall consist of a primary steel tank covered by a minimum of ¼" thick insulation. The tank containment system must be designed to hold 110% of the container's storage capacity. The secondary containment shall consist of a 30 mil thick high-density polyethylene membrane enclosing the steel tank and insulation material.

C. Construction: The protected and insulated AST systems shall contain no cold joints or heat sinks (heat transfer points). The AST must be shop fabricated and tested in accordance with UL 2085.

D. Supports: Manufacturer's standard structural steel welded to tank.

E. Supports: Manufacturer's standard type and number, steel or cast-iron cradles, for field installation.

F. Protection: The AST's shall be suitable for operation at atmospheric pressure; fabricated to meet the following criteria:

1. Provide two (2) hour fire protection in accordance with UL 2085
2. Vehicle Impact Resistance: Tanks shall be designed to have a low center of gravity that can withstand vehicle impact and tipping during earthquakes and other natural disasters.
3. Ballistic Resistance: Tanks shall withstand bullet resistance tests in compliance with UL 2085.
4. Lightning Protection: The protected and insulated AST systems shall have two (2) bolts for connecting grounding conductors for lightning

protection. Grounding conductor and grounding rod materials and installation shall be in accordance with NFPA 780.

G. Physical Protection: Impact protection required by barriers. Steel posts of 4" diameter, concrete filled, spaced 4' on centers, 3' deep in concrete, protruding 3' above grade are required.

H. The primary steel tanks shall include an atmospheric vent and emergency venting in accordance with NFPA 30 Code requirements.

2.10 SHOP PAINTING OF AST

A. Apply manufacturer's standard prime coat to exterior steel surface of AST and supports.

B. Prepare exterior steel surface of AST and tank supports.

C. Shop Cleaning: After fabrication, blast clean according to SSPC-SP 10/NACE No. 2.

D. After cleaning, remove dust or residue from cleaned surfaces.

E. If surface develops rust before prime coat is applied, repeat surface preparation.

F. Apply manufacturer's standard prime coat to shop-cleaned, dry surface same day as surface preparation.

G. Apply manufacturer's standard two-component, epoxy finish coats, per the manufacture specifications and warranty.

2.11 AST ACCESSORIES

A. Threaded pipe connection fittings on top of tank for fill, vapor recovery, submersible pump, vent, in-tank probe, and gauging, in locations and of sizes indicated on the Plans.

B. 24” Manway Assembly for access to inside the tank with 8” Emergency Vent. The emergency vent relief system shall relieve the pressure of the primary tank if the tank pressure exceeds 1/2 psig.

C. Striker Plates: Inside tank, on bottom below fill, vent, sounding, gage, and other tube openings.

D. Lifting Lugs: For handling and installation.

E. Supply Tube: Extension of supply piping fitting into tank, terminating 6 inches above tank bottom and cut at a 45-degree angle.

F. Sounding and Gage Tubes: Extension of fitting into tank, terminating 6

inches above tank bottom and cut at a 45-degree angle.

G. Tank Fill Assembly: 7-gallon powder coated, UL listed spill containment. The assembly shall include a normally closed drain valve to release spilled product into the primary tank and a stick port for manual gauging.

H. Tank Charts: Provide (3) copies. Mount 1 copy in a glass frame secured to the wall with 4 screws as directed by the City. Charts shall be calibrated to show tank capacity in gallons from feet and inches, graduated by eighths.

I. Morrison Model 818 clock gauges or equivalent that meets the following specifications:

1. Easy to install and calibrate in a 2″ tank top opening
2. Easily read from 30 feet away
3. Accurate to ⅛ of an inch
4. Vapor tight and fog-free construction
5. Gauge rotates 360° for placement in the desired orientation
6. Visual indicator decals for high level (red) and low level (green) are included with the dial face cover

J. Stair Assembly: Tank manufacturer's standard galvanized steel stairway for access to the top of the tank. Stairs and railings shall comply with OSHA Standards.

K. Tie-Down Straps: Tank manufacturer's standard 3-1/2" x 3/8" galvanized steel tiedown straps.

L. Seismic Restraints: Tank manufacturer's standard galvanized steel tank leg restraints.

M. Emergency Response Identification: Hazard sign that meets the requirements of NFPA 704. Hazard rating numerals shall be a minimum of 3 inches high. Sign shall be vinyl with self adhesive backing, intended for outdoor use.

2.12 TANK INSTALLATION MATERIALS

A. Grout: Non-shrink type.

B. Compacted Granular Fill: Refer to MassDOT Standard Specifications for material and construction methods required.

C. Concrete Pads: Comply with the requirements in CSI Division 03 Section 033000, “Cast- in-Place Concrete.”

2.13 STORAGE TANK SPECIALTIES

A. Overfill Prevention:

1. Overfill Prevention Valve: Suitable for installation in aboveground fuel storage tanks, provide a Morrison Overfill Valve or an approved equal.
2. Lower Drop Tube: Fiberglass, compatible with overfill prevention valve, as manufactured by NOV Fiber Glass Systems, or an approved equal. Drop tube shall terminate 6-inches above the bottom of the tank, with the end of drop tube cut off at a 45-degree angle.

B. Fill Adaptor and Cap: 2-inch Tank Inlet Spout Adaptor Model No. 633AST with 2inch locking dust cap, Model No. 634BK as manufactured by OPW, or an approved equal

C. Vent Cap

1. Open atmospheric type, corrosion-resistant, internal wire screen designed to protect vent lines from water, debris, and insects, Model No. 23 as manufactured by OPW, or an approved equal.

D. Ball Valves: Full Port Two-Way as manufactured by OPW, or an approved equal.

E. Tank Monitoring Assemblies:

1. Probe Cap and Adaptor: Bronze, side-sealing adaptor, side sealing cap (tapped), wire grommet to secure cables, Model No. 62M as manufactured by OPW, or an approved equal.

2.14 SOURCE QUALITY CONTROL

A. Pressure test and inspect fuel storage tanks, after fabrication and before shipment, according to ASME and the following:

1. Horizontal, Insulated, Steel AST: UL2085

B. Affix standards organization's code stamp.

2.15 DISPENSING DEVICES

A. Dispensing shall be by UL-listed off-tank pump

B. An approved emergency disconnect switch shall be located within 100 feet of, but not less than 20 from the fuel dispensers, which stop the transfer of fuel to the fuel

dispensers in the event of a fuel spill or other emergency. Such devices shall be distinctly labeled as: “Emergency fuel shut off”; made of plastic, light gauge aluminum with white reflective letters on red reflective background lettering 1.5 inches. Height. The height of the emergency disconnect switch shall be located between 42 inches and 48 inches from the floor level to the activating button.

C. Class I and II liquids shall be transferred from tanks by means of fixed pumps designed and equipped to allow control of the flow and prevent leakage or accidental discharge.

D. Dispensing devices, except those installed on top of a protected aboveground tank that qualifies as vehicle-impact resistant, shall be protected against physical damage by mounting on a concrete island 6 inches or more in height, or shall be protected vehicle impact protection. Dispensing devices shall be installed and securely fastened to their mounting surface in accordance with the dispenser manufacturer’s instructions.

E. Fuel distribution will include two fill stations with Great Plain Industries G-PRO pumps and SmartFill systems for advanced fuel management. Equivalent pumps that meet the requirements of these specifications are acceptable substitutes.

1. Specifications for the G-PRO pumps are attached. The following specifications must be met for the pumps installed:
    a. Maximum Flow Rate: 35 GPM
    b. Voltage Input: Dual Voltage Configurable, 115V and 230V
    c. Pump Technology: Sliding Vane
    d. Motor HP: 0.75
    e. Maximum Discharge Pressure: Up to 25 PSI
    f. Pump Housing: Power Coated Cast Iron
    g. Internal Check Valve that keeps the pump head primed
    h. Warranty: 5 year pump warranty

2.16 LIGHTING

A. A Twin LED Light Pole will be installed as shown on the plans. The basis of the plans is the PK0942 LED Light Pole Kit with Two LED Area Lights and the specification sheet is attached.

B. A base foundation will be required as shown on the specification sheet. 12” threaded rods shall be embedded in the concrete pad for the light pole base.

C. The selected pole height is 20 feet.

D. The selected lighting must be dimming capable and diming control must be installed.

2.17 ELECTRICAL

A. Provide sealoffs in conduit as required.

B. Provide emergency shutoff valve (shear valve) at each dispenser and emergency push-button shutoff greater than 20 feet and within 100 feet of dispenser. Provide sign at location of emergency push-button shutoff.

1. Emergency shut off shall disconnect power to all dispensing devices, to all remote pumps serving the dispensing devices, to all associated power, control, and signal circuits, and to all other electrical equipment in the locations surrounding the fuel dispensing devices. Resetting from an emergency shut off shall require manual intervention.

C. Make all connections to electrical equipment as required for proper operation of storage tank system, including but not limited to motor starters, pumps, dispensers, and pulser units.

D. Make all connections through conduit to be installed as shown on Drawings. The Contractor is responsible for wiring, including wall penetrations, sealing, necessary handholes, junction boxes, etc.

PART 3 - EXECUTION

3.01 PREPARATION

A. Comply with NFPA 30, NFPA 30A, and NFPA 31 requirements.

3.02 EXCAVATION AND BACKFILL

A. Compacted Granular Fill shall be installed in accordance with MassDOT Standard Specifications beneath the concrete pads and apron as indicated on the plans. Protect buried items during compaction.

1. Concrete Pads: Provide a minimum of 12-inches of compacted granular fill for concrete pads, compacted to support the concrete pad installation.

B. No backfilling over any underground piping or electrical connections may take place until the work is inspected by the Director of Facilities and the authorities having jurisdiction. Failure to have work inspected will result in the Contractor uncovering work to allow for inspection.

3.03 FUEL TANK INSTALLATION

A. Installation shall be in accordance with manufacturer’s written instructions and as noted.

B. Contractor is responsible for initial filling of all tanks.

C. Shutoff and check valves are to be equipped with a pressure-reliving device that will relieve the pressure generated by thermal expansion back to the tank.

3.04 OUTDOOR PIPING INSTALLATION

A. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining, to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer. Review protective coating damage with Architect prior to repair.
3. Replace pipe having damaged PE coating with new pipe.

B. Install vent pipe at a minimum slope of 2 percent downward toward gasoline and diesel storage tank sump.

C. Assemble and install entry boots for pipe penetrations through sump sidewalls for liquid-tight joints.

D. Install metal pipes and tubes, fittings, valves, and flexible connectors at piping connections to AST.

E. Install fittings for changes in direction in rigid pipe.

F. Install system components with pressure rating equal to or greater than system operating pressure.

3.05 VALVE INSTALLATION

A. Install manual shutoff valves on branch connections to appliance.

B. Install valves in accessible locations.

C. Protect valves from physical damage.

D. Install oil safety valves at inlet of each oil-fired appliance.

E. Install pressure relief valves in distribution piping between the supply and return lines.

F. Install one-piece, bronze ball valve with hose end connection at low points in piping.

G. Install manual air vents at high points in piping.

H. Install emergency shutoff valves at dispensers.

3.06 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Bevel plain ends of steel pipe.
2. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.07 INSTALLATION OF HANGERS AND SUPPORTS

A. Install hangers for steel piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

B. Support horizontal piping within 12 inches of each fitting and coupling.

C. Support vertical runs of steel piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.08 CONNECTIONS

A. Where installing piping adjacent to equipment, allow space for service and maintenance.

B. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment having threaded pipe connection.

C. Connect piping to equipment with shutoff valve and union. Install union

between valve and equipment.

D. Install flexible piping connectors at final connection to burners or oil-fired appliances.

3.09 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on or near each service regulator, service meter, and earthquake valve.

1. Text: In addition to identifying unit, distinguish between multiple units; inform operator of operational requirements; indicate safety and emergency precautions; and warn of hazards and improper operations.

3.10 FIELD QUALITY CONTROL

A. Pressure Test Piping: Minimum hydrostatic or pneumatic test-pressures measured at highest point in system:

1. Distribution Piping: Minimum 5 psig for minimum 30 minutes.
2. Suction Piping: Minimum 20-in. Hg for minimum 30 minutes.
3. Isolate storage tanks if test pressure in piping will cause pressure in storage tanks to exceed 10 psig.

B. Inspect and test piping according to NFPA 31, "Tests of Piping" Paragraph; and according to requirements of authorities having jurisdiction.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Bleed air from piping using manual air vents.

E. Piping and equipment will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.11 OUTDOOR PIPING SCHEDULE

A. Aboveground Piping: Steel pipe, steel or malleable-iron threaded fittings, and threaded joints.

3.12 SHUTOFF VALVE SCHEDULE

A. Valves for Aboveground Distribution Piping:

1. One-piece, bronze ball valve with bronze trim.

B. Valves in Branch Piping:

1. One-piece, bronze ball valve with bronze trim.

2. Two-piece, full-port, bronze ball valves with bronze trim.

3.13 AST INSTALLATION

A. Excavate as described herein and as shown on the Plans.

B. Install tank bases and supports.

C. Set tank on concrete pad and grout legs in accordance with manufacturer's instructions. Install seismic restraints on legs as shown on the Plans and in accordance with manufacturer recommendations.

D. Each component of the storage tank system shall be installed as shown on the Plans and in accordance with manufacturer recommendations. Additional installation requirements of the storage tank system are described in subsequent portions of this Section where applicable.

E. Install tank tie-down straps as shown on the Plans and in accordance with manufacturer recommendations.

F. Connect piping and vent fittings.

G. Install ground connections.

H. Install tank leak-detection and monitoring devices.

I. Pressure Testing of Tank and Piping.

J. Coordinate with the City for Filling of Tank

K. Apply Hazard Sign directly to tank in a visible location

3.14 FIELD PAINTING OF AST

A. Prepare and touch up damaged exterior surface of AST and supports.

B. Prepare exterior steel surface of AST and tank supports.

C. Field Cleaning: After fabrication, blast clean according to SSPC-SP 10/NACE No. 2.

D. After cleaning, remove dust or residue from cleaned surfaces.

E. If surfaces develop rust before prime coat is applied, repeat surface preparation.

3.15 SOURCE QUALITY CONTROL

A. Pressure test and inspect storage tanks, after fabrication and before shipment, according to ASME.

B. Affix standards organization's code stamp.

3.16 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Tanks: Hydrostatic or compressed-air test pressures for horizontal, shop-fabricated, aboveground storage tanks. Isolate product piping from the tanks during testing. In-tank probes shall not be installed in the tanks during testing. Maintain the test pressure for one hour.

    a. Primary Tanks: Minimum 3 psig and maximum 5 psig.
    b. Interstitial Space: Minimum 3 psig and maximum 5 psig, or 5.3-in. Hg vacuum.

2. Piping: Minimum hydrostatic or pneumatic test-pressures measured at highest point in system. Soap pipe fittings.
    a. Product Piping: Minimum 1.5 times the designed working pressure but not less than 50 psig nor more than the manufacturer's recommended pressure rating for minimum 3 hours.
    b. Isolate storage tanks if test pressure in piping will cause pressure in storage tanks to exceed 10 psig.

B. Piping and equipment will be considered defective if it does not pass tests and inspections. Defective piping and equipment shall be repaired or replaced, and then retested.

C. Prepare test and inspection reports.

3.17 PIPING SCHEDULE

A. Product Piping, Aboveground: 1-inch black steel pipe and pipe fittings.

B. Thermal Pressure Relief Piping: 1/2-inch black steel pipe and pipe fittings.

C. AST Pipe Risers: 4-inch galvanized steel pipe and fittings.

D. AST Vent Pipe and Fittings, Aboveground: 2-inch galvanized steel pipe and pipe fittings.

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

Bid Item No.	Description	Unit of Measurement
2	Professional Engineer Stamped Fuel System Design Including Piping/Conduit/Control/ Power Complete per Contract Performance Criteria and Applicable Code	Lump Sum
8	Furnish and Install AST, including signage as applicable, operational testing, lighting protection, electrical connection, and relief valves	Lump Sum
9	Furnish and Install Fuel Dispensers and Spill Kits, including fuel distribution and vent piping	Lump Sum
12	Preparation and Submittal of As Built Drawings, Fuel Facility Product Data, Stairway Plan, Wiring Diagrams, Seismic Qualification Certificates, Brazing Certificates, Welding Certificates, Field Quality Control Reports, Sample Warranty	Lump Sum

These tasks shall be measured on a Lump Sum basis and shall include all materials, labor, equipment and appurtenant work associated with completing the work in place and accepted by the City and Engineer.

4.02 BASIS OF PAYMENT

The tasks shall be paid for by the unit Lump Sum. Included in the all costs shall be all materials, labor, permits, and equipment necessary for the satisfactory completion of the work.

END OF SECTION

SECTION 13121

TANK MONITORING

PART 1- GENERAL

1.01 SUMMARY

A. This Section includes the complete tank monitoring system for aboveground storage tanks as indicated on the Plans.

1. Furnish and install complete tank monitoring system as described herein.

1.02 SUBMITTALS

A. Product Data: Include rated capacities of selected model clearly indicated, furnished specialties and accessories; wiring diagrams; and installation and start-up instructions.

1. Spare Parts: Include name, address, and telephone number of in-state supplier of spare parts. No out-of-state suppliers shall be permitted.

1.03 QUALITY ASSURANCE

A. The Tank Monitoring System Installer shall be a factory certified Veeder-Root Installer and shall provide the engineering, installation, calibration, software programming and check-out necessary for a complete and fully operational tank monitoring system.

B. The Tank Monitoring System Installer shall also be certified to program and start-up the system.

C. The Tank Monitoring System Installer shall have:

1. Adequate experience and verifiable history in the installation of tank monitoring systems matching the criteria defined in this Specification.

2. Proven expertise and experience in dealing with coordination of installing tank monitoring systems for municipal fuel storage facilities.

PART 2 – PRODUCTS

2.01 EXISTING SYSTEM:

A. The existing Tank Monitoring System includes a Veeder-Root TLS 350. All products incorporated into the proposed work must be compatible with this system, and all existing monitoring must be maintained throughout construction.

2.02 IN-TANK PROBES:

A. The probes shall be magnetostrictive type suitable for leak detection and inventory management in both underground and aboveground storage tanks. Unless otherwise noted, probes shall include 2 floats (product and water), and shall also include a minimum of 5 temperature sensors along its length to allow product temperature averaging.

1. Temperature measurement accuracy of +/- 0.5.
2. Level measurement accuracy of +/- .0005-inch

B. The probes shall be gasoline, ethanol, benzene, and oil-resistant. The probes shall be UL-listed as intrinsically safe and shall utilize digital or time-based transmission techniques for high noise immunity and fault detection.

C. Leak Detection: Capable of manually or automatically performing a static tank tightness test to an accuracy of 0.1-gph, with a 99% probability of detection [P(D)] and a 1% probability of false alarm [P(FA)]

3. System shall be third-party certified to be in accordance with EPA standards for 0.1-gph annual tightness test and for 0.2-gph monthly monitoring.

D. The probes shall be capable of continuously gauging the water level from within 0.75- inch off of the bottom of the tank to a depth of at least 10-inches for riser pipe installations.

E. For oil-water separator applications, the probes shall be capable of continuously gauging the product and water levels from within 3-inches off the bottom of the tank. The system shall automatically calculate and output the volume (gallons) and level (inches) of product and of water in the oil-water separator.

F. The probes shall be supplied with the manufacturer's standard probe installation kits and wiring

2.03 INTERSTITIAL SENSORS:

A. Wet Monitoring

1. The hydrostatic sensors shall perform automatic, continuous leak sensing by monitoring the liquid level in the reservoir of a brine-filled interstitial space (annulus) of double-wall tanks, to detect a breach in the inner or outer shell. Single float sensors shall include a float and reed switch assembly. The contact shall be a normally closed dry contact.
2. The sensors shall be unaffected by hydrocarbon vapors, and shall be easily installed and removed without damage. Sensors shall be field replaceable, reusable, and testable for regulatory purposes.

3. The sensors shall be supplied with a lockable, watertight riser cap to prevent accidental spills into the tank reservoir. The cap shall be equipped with a vent tube to vent air out of the reservoir area and prevent liquids from entering into the reservoir.
4. The sensors shall be supplied with the manufacturer's standard sensor installation kits and wiring.

B. Dry Monitoring

1. The sensors shall perform automatic, continuous leak sensing by monitoring the dry interstitial space (annulus) of double wall tanks. Sensors shall be a non- discriminating type, sensing only wet or dry conditions.
2. The sensors shall be unaffected by hydrocarbon vapors, and shall be easily installed and removed without damage. Sensors shall be field replaceable, reusable, and testable for regulatory purposes.
3. The sensors shall be supplied with the manufacturer's standard sensor installation kits and wiring.

2.04 TANK OVERFILL ALARM

A. Remote external audible and visual overfill alarm annunciator shall be housed in a weatherproof enclosure. The overfill alarm shall activate if a tank product level reaches the overfill alarm setpoint of 90% capacity.

B. Remote alarm acknowledges unit shall be housed in a weatherproof enclosure. Acknowledge unit shall silence audible and visual overfill alarms.

2.05 PROGRAMMING

A. Re-program and/or Update Existing Veeder-Root TLS 350 as required to accept additional tank monitoring probes and to provide Alarms and Reports as specified by the City.

2.06 RELATED ELECTRICAL WORK

A. For each tank monitoring system, furnish and install shielded cable, without splices, within control conduit from each new probe and sensor to the Veeder-Root console.

B. Explosionproof Fittings: Threaded, recessed-type, close-up plugs, Model No. EYSF75 as manufactured by Appleton, or an approved equal. Screwdriver slotted close-up plugs shall not be accepted.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which the tank monitoring system is to be installed. Do not proceed with work until unsatisfactory conditions have been

corrected in manner acceptable to the Tank Monitoring Installer.

3.02 INSTALLATION REQUIREMENTS

A. All probe and leak sensor inputs shall be protected against damage from short circuit conditions due to inadvertent field wiring errors.

B. In-tank Probes.

1. Probes, probe installation kits, and wiring shall be installed according to manufacturer-supplied installation manuals and Plans.
2. Probe assemblies for monitoring product and water levels are required for all storage tanks as indicated on the Plans.
3. Probe assemblies in underground storage tanks shall top-mount from a 4-inch diameter probe riser pipe. Riser installation is not work of this Section; risers shall be installed by the applicable CSI Section and as indicated on the Plans.
4. Probe leader cables to connect inside watertight junction box, sealed off with an explosion proof fitting, for connection to console.

C. Interstitial Sensors.

1. Sensors and wiring shall be installed according to manufacturer-supplied installation manuals and plans.
2. Sensors for monitoring the interstitial spaces are required for all double-wall underground storage tanks as indicated on the Plans.
3. Sensor assemblies in underground storage tanks shall top-mount in a 4-inch diameter sensor riser pipe installed in the annulus of the tank. Riser installation is not work of this Section; risers shall be installed by the applicable CSI Section and as indicated on the Plans.
4. Sensor leader cables to connect inside watertight junction box, sealed off with an explosion proof fitting, for connection to console.

D. Tank Overfill Alarm

1. Remote alarm annunciator and acknowledge unit wiring shall be installed according to manufacturer-supplied installation manuals.
2. The alarm light shall be visible and the alarm horn shall be audible within the fuel tank filling area.
3. The acknowledge unit shall be accessible to the tank filling attendant.
4. Remote alarm annunciator and acknowledge unit shall be mounted near the tank filling site as indicated on the Plans.

E. Related Electrical Work: Install conduit. Seal E.Y. fittings. Leave close-up plugs hand tight after sealing to provide for inspection of these fittings.

3.03 FIELD QUALITY CONTROL

A. Engage a factory-authorized service representative to inspect and test the system and to perform start-up service. Power shall not be applied to the system prior to start-up.

B. Perform all necessary testing and run diagnostic tests to ensure proper operation. Test equipment as recommended by manufacturer. Generate all software and enter all database information necessary to perform the sequence of control and specified software routines

1. An acceptance test shall be performed in the presence of the Director of Facilities.

C. The manufacturer shall provide a written certification of installation, start-up, and calibration of the complete system.

D. The manufacturer shall supply third-party documentation for all products certifying that the performance meets or exceeds EPA requirements.

3.04 TRAINING

A. Engage a factory-authorized service representative for an 8-hour on-site class to train the City's maintenance personnel on all installation, programming, troubleshooting, operating, routine maintenance, and service procedures.

PART 4 – PAYMENT

4.01 METHOD OF MEASUREMENT

Bid Item No.	**Description**	**Unit of Measurement**
10	Furnish and Install clock gauges, tank level, and interstitial space monitoring probes	Lump Sum
11	Reprogramming of Veeder Root System	Lump Sum

The reprogramming of the Veeder Root system shall be measured on a Lump Sum basis and shall include all materials, labor, equipment and appurtenant work associated with completing the work in place and accepted by the City and Engineer.

4.02 BASIS OF PAYMENT

The tasks shall be paid for by the unit Lump Sum. Included in the all costs shall be all materials, labor, permits, and equipment necessary for the satisfactory completion of the work.

END OF SECTION

Bid Form

BID FORM

PART I- BASE BID ITEMS

NO.	BID ITEMS SCHEDULE DESCRIPTION	EST. QUANTITY	UNIT BID PRICE (WORDS)		(FIGURES)		EXTENDED AMOUNT
1	Mobilization and Demobilization	1 L.S.		Dollars	($)	per L.S.	$
2	Professional Engineer Stamped Fuel System Design Including Piping/Conduit/Control/ Power Complete per Contract Performance Criteria and Applicable Code	1 L.S.		Dollars	($)	per L.S.	$
3	Regrading Area behind Storage Garage	1 L.S.		Dollars	($)	per L.S.	$
4	Gravel Subbase to Grade	135 CY		Dollars	($)	per CY	$
5	Conduit Installation	1 L.S.		Dollars	($)	per L.S.	$
6	Raised Concrete Base and Concrete Pad Fuel Island Installation	1 L.S.		Dollars	($)	per L.S.	$
7	Repave UST Area and Around Concrete Pad Fuel	1 L.S.		Dollars	($)	per L.S.	$
8	Furnish and Install AST, including signage as applicable, operational testing, lighting protection, electrical connection, all wiring, and relief valves	1 L.S.		Dollars	($)	per L.S.	$
9	Furnish and Install Fuel Dispensers and Spill Kits, including fuel distribution and vent piping	1 L.S.		Dollars	($)	per L.S.	$
10	Furnish and Install clock gauges, tank level, and interstitial space monitoring probes	1 L.S.		Dollars	($)	per L.S.	$
11	Reprogramming of Veeder Root System	1 L.S.		Dollars	($)	per L.S.	$
12	Preparation and Submittal of As Built Drawings, Fuel Facility Product Data, Stairway Plan, Wiring Diagrams, Seismic Qualification Certificates, Brazing Certificates, Welding Certificates, Field Quality Control Reports, Sample Warranty	1 L.S.		Dollars	($)	per L.S.	$
13	Laboratory Testing - Allowance	1 L.S.	Ten Thousand	Dollars	$10,000	per L.S.	$ 10,000.00
			Base Bid Item Page 1 Total				**$**

BID FORM

PART I- BASE BID ITEMS
BASE BID ITEMS SUMMARY

Figures Summary:

Page 1 (Figures) Total: $ _____

Total Base Bid Price (Figures): $ _____

Total Base Bid Price (in words):

_____

COMPANY NAME: _____

CONTRACTOR NAME: _____

DATE: _____

Conservation Commission Determination of Applicability

Massachusetts Department of Environmental Protection
Bureau of Water Resources - Wetlands

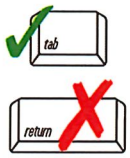
WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

HOLDEN
Municipality

A. General Information

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



From:

HOLDEN
Conservation Commission

To: Applicant

Jonathon Gervais
Name
20 East Worcester Street
Mailing Address
Worcester | MA | 01604
City/Town | State | Zip Code
508 929-1300
Phone Number
GervaisJP@worcesterma.gov
Email Address

Property Owner (if different from applicant):

City of Worcester DPW&P
Name
Mailing Address
City/Town | State | Zip Code
Phone Number
Email Address (if known)

1. Project Location:

55 Moy Ranch Road
Street Address
Holden
City/Town

How to find Latitude and Longitude

42.33446
Latitude (Decimal Degrees Format with 5 digits after decimal e.g. XX.XXXXX)
-71.89326
Longitude (Decimal Degrees Format with 5 digits after decimal e.g. -XX.XXXXX)

and how to convert to decimal degrees

155
Assessors Map/Plat Number
1
Parcel/Lot Number

2. Date Request Filed:

9-18-2025

B. Determination

Pursuant to the authority of M.G.L. c. 131, § 40, the Conservation Commission considered your Request for Determination of Applicability, with its supporting documentation, and made the following Determination.

Project Description (if applicable):

The removal of an existing underground fuel storage tank (UST) and the placement of a new above-ground storage tank within the 100-foot buffer of BVW. The existing UST is located outside the buffer and adjacent to the maintenance garage building.

Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

Title	Date
RDA Project Narrative - City of Worcester DPW&P Fuel Tank Replacement	9/2025
USGS Site Location Map	9/2025
Figure 2 Proposed Site Work Plan, Moy Ranch Facility	9/11/2025

B. Determination (cont.)

The following Determination(s) is/are applicable to the proposed site and/or project relative to the Wetlands Protection Act and regulations:

Positive Determination
Note: No work within the jurisdiction of the Wetlands Protection Act may proceed until a final Order of Conditions (issued following submittal of a Notice of Intent or Abbreviated Notice of Intent) has been received from the issuing authority (i.e., Conservation Commission or the Department of Environmental Protection).

☐ 1. The area described on the referenced plan(s) is an area subject to jurisdiction under the Act. Removing, filling, dredging, or altering of the area requires the filing of a Notice of Intent.

☐ 2a. The boundary delineations of the following resource areas described on the referenced plan(s) are confirmed as accurate. Therefore, the resource area boundaries confirmed in this Determination are binding as to all decisions rendered pursuant to the Wetlands Protection Act and its regulations regarding such boundaries for as long as this Determination is valid.

☐ 2b. The boundaries of Wetlands Resource Area(s) and Buffer Zone(s) listed below are not confirmed by this Determination, regardless of whether such boundaries are contained on the plans attached to this Determination or to the Request for Determination.

☐ 3. The work described on referenced plan(s) and document(s) is within an area subject to jurisdiction under the Act and will remove, fill, dredge, or alter that area. Therefore, said work requires the filing of a Notice of Intent.

☐ 4. The work described on referenced plan(s) and document(s) is within the Buffer Zone and will alter an Area subject to jurisdiction under the Act. Therefore, said work requires the filing of a Notice of Intent

☐ 5. The area and/or work described on referenced plan(s) and document(s) is subject to review and approval by:

Name of Municipality

Pursuant to the following municipal wetland ordinance or bylaw:

Name

Ordinance or Bylaw Citation

B. Determination (cont.)

☐ 6. The following area and/or work, if any, is subject to a municipal ordinance or bylaw but not subject to the Massachusetts Wetlands Protection Act:

☐ 7. If a Notice of Intent is filed for the work in the Riverfront Area described on referenced plan(s) and document(s), which includes all or part of the work described in the Request, the applicant must consider the following alternatives. (Refer to the wetland regulations at 10.58(4)(c) 2. for more information about the scope of alternatives requirements):

- ☐ Alternatives limited to the lot on which the project is located.
- ☐ Alternatives limited to the lot on which the project is located, the subdivided lots, and any adjacent lots formerly or presently owned by the same owner.
- ☐ Alternatives limited to the original parcel on which the project is located, the subdivided parcels, any adjacent parcels, and any other land which can reasonably be obtained within the municipality.
- ☐ Alternatives extend to any sites which can reasonably be obtained within the appropriate region of the state.

Negative Determination

Note: No further action under the Wetlands Protection Act is required by the applicant. However, if the Department is requested to issue a Superseding Determination of Applicability, work may not proceed on this project unless the Department fails to act on such request within 35 days of the date the request is post-marked for certified mail or hand delivered to the Department. Work may then proceed at the owner's risk only upon notice to the Department and to the Conservation Commission. Requirements for requests for Superseding Determinations are listed at the end of this document.

☐ 1. The area described in the Request is not an area subject to jurisdiction under the Act or the Buffer Zone.

☐ 2. The work described in the Request is within an area subject to jurisdiction under the Act, but will not remove, fill, dredge, or alter that area. Therefore, said work does not require the filing of a Notice of Intent.

■ 3. The work described in the Request is within the Buffer Zone, as defined in the regulations, but will not alter an Area subject to jurisdiction under the Act. Therefore, said work does not require the filing of a Notice of Intent, subject to the following conditions (if any).

☐ 4. The work described in the Request is not within an Area subject to jurisdiction under the Act (including the Buffer Zone). Therefore, said work does not require the filing of a Notice of Intent, unless and until said work alters an Area subject to jurisdiction under the Act.

C. Authorization (cont.)

This Determination is valid for **three years** from the date of issuance (except Determinations for Vegetation Management Plans which are valid for the duration of the Plan). This Determination does not relieve the applicant from complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.

This Determination must be signed by a majority of the Conservation Commission. As noted above, a copy must be sent to the appropriate DEP Regional Office (see https://www.mass.gov/service-details/massdep-regional-offices-by-community) and the property owner (if different from the applicant) on the same date that the Applicant is issued this Determination.

Holden Conservation Commission
Issuing Authority

Signatures:

Signature	Michael Scott Printed Name
Signature	Kenneth Strom Printed Name
Signature	Elizabeth Parent Printed Name
Signature	Heather Parry Printed Name
Signature	Denise Lindberg Printed Name
Signature	Vacant Seat Printed Name
Signature	Printed Name
Signature	Printed Name

D. Appeals

The applicant, owner, any person aggrieved by this Determination, any owner of land abutting the land upon which the proposed work is to be done, 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 Department of Environmental Protection Regional Office (see https://www.mass.gov/service-details/massdep-regional-offices-by-community) to issue a Superseding Determination of Applicability. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and Fee Transmittal Form (see 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 Determination. 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. The request shall state clearly and concisely the objections to the Determination which is being appealed. To the extent that the Determination is based on a municipal ordinance or bylaw and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.

B. Determination (cont.)

☐ 5. The area described in the Request is subject to jurisdiction under the Act. Since the work described therein meets the requirements for the following exemption, as specified in the Act and the regulations, no Notice of Intent is required:

Exempt Activity (site applicable statutory/regulatory provisions)

☐ 6. The area and/or work described in the Request is not subject to additional review and approval by:

Name of Municipality

Pursuant to a municipal wetlands' ordinance or bylaw.

Name | Ordinance or Bylaw Citation

C. Authorization

This Determination is issued to the applicant and delivered as follows:

☒ By hand delivery on 10/8/2025
Date

☐ By certified mail, return receipt request on
Date

Certified Mail Number

A copy of this Determination has been sent on the same date, considered the date of issuance, **to** the appropriate DEP Regional Office and the property owner (if not the applicant) in the manner as follows:

DEP

☐ By eDEP DOA Submittal Platform (Attach this form and supporting documents)

☒ By USPS mail 10/8/2025
Date

☐ By hand delivery
Date

Property Owner (if not applicant)

☒ By mail
Date

☐ By hand delivery
Date

Lighting Spec Sheet

PK0822

LED Light Pole Kit with Two LED Area Lights, Selectable Wattage 185/240/300 & Color Temperature, 20-30 Foot Pole Height Options

Energy Light, Inc.

Job: _____

Job Site: _____ State: _____ Client Name: _____

Notes: _____ Approvals: _____ Date: _____

Commercial-grade LED Light Pole Assembly Includes:

Square steel light pole, 2 LED lights complete with mounting brackets and hardware, set of anchor bolts and a base cover.

Light Pole:

Pole Shaft: Commercial grade steel with minimum yield strength of 55,000 psi. 20 ft. poles: 4" square X 11 gauge; 25 ft. poles: 4" square X 7 gauge; 30 ft poles: 5" square X 7 gauge.

Pole Height: Standard pole height is 20 ft. Optional heights are 25 ft. and 30 ft. Custom heights are also available.

Anchor Bolts: A set of 4 galvanized steel anchor bolts is provided. Each anchor bolt includes 2 nuts and 2 washers.

Bolt Circle: 4"sq. Pole: 8-1/2" Bolt Circle (Slotted base for 8-11" Bolt Circle). 30 ft poles: 11" Bolt Circle (Slotted base for 10.5" - 12" Bolt Circle)

Handhole: Handhole is located 18" above the base plate for 20 ft and 25 ft pole. 21" above the base plate for 30 ft pole. A 3" X 5" steel handhole cover is included.

Color: Dark Bronze

Base Cover: ABS Plastic base cover with rivets.

LED Fixture:

Material: Aluminum construction with integrated fins to maximize heat dissipation.

Color: Dark Bronze.

Preset Power: 300 Watts

Voltage: 120-277 Volt standard.

Preset Color Temperature: 5000K

Light Distribution: Type 3 standard. Type 4 and Type 5 options as special order.

Photocell: Photocell is optional.

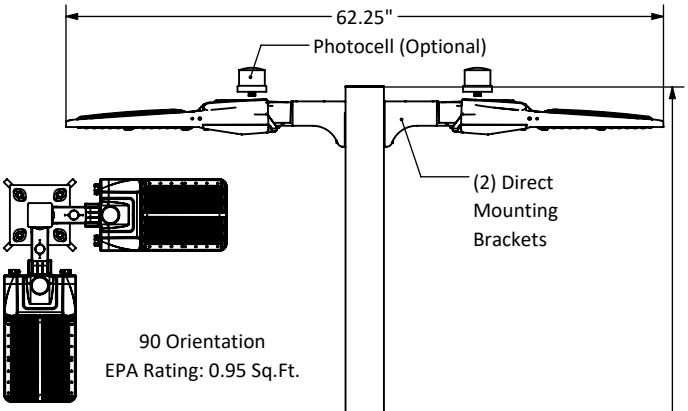
Dimming: 0-10V Dimming Capable. Dimming control not provided (field install).

ETL Listing: ETL Listed for Wet Locations.

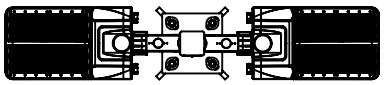
DLC Listing: DLC Premium.

IP Rating: IP65

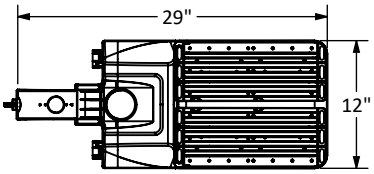
Weight: 16 lbs. (per fixture).



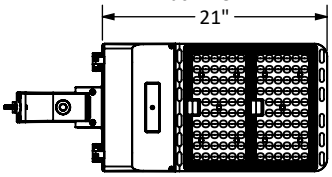
90 Orientation
EPA Rating: 0.95 Sq.Ft.



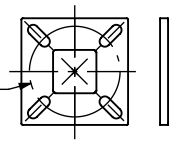
180 Orientation
EPA Rating: 1.10 Sq.Ft.



LED Fixture
Back View

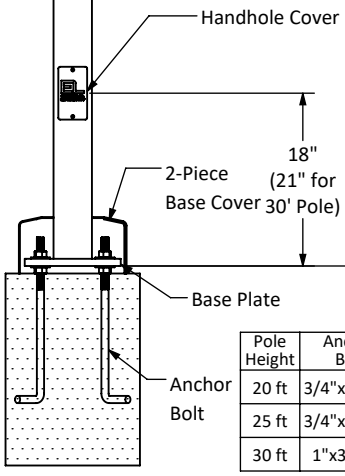


LED Fixture
Front View



Base Plate

Pole Height	Base Plate Dim	Slot Dim	Bolt Circle
20 ft, 25 ft	10" Sq.x 0.75"	0.98" x 2.5"	8.5"
30 ft	11" Sq. x 1"	1.15" x 1.9"	11.0"



Pole Height	Anchor Bolt
20 ft	3/4"x17"x3"
25 ft	3/4"x30"x3"
30 ft	1"x36"x4"

TOTAL POWER (W)	LOW			MID			HIGH		
	2x185=370			2x240=480			2x300=600		
TOTAL AMPS	120V	2x1.62=3.24		120V	2x2.11=4.22		120V	2x2.63=5.26	
	277V	2x0.70=1.40		277V	2x0.91=1.82		277V	2x1.14=2.28	
COLOR TEMPERATURE (K)	3000	4000	5000	3000	4000	5000	3000	4000	5000
LUMENS	2x26,825= 53,650	2x29,600= 59,200	2x27,750= 55,500	2x34,800= 69,600	2x38,400= 76,800	2x36,000= 72,000	2x43,500= 87,000	2x48,000= 96,000	2x45,000= 90,000
LUMENS/WATT	145	160	150	145	160	150	145	160	150

IP65 WET LOCATION Dimmable

Disclaimer: All dimensions and specifications are subject to change without any notice. Light Pole Foundation should be designed by an engineer familiar with local soil and wind conditions as well as local code where the light pole will be installed.

PRO 35 Pump Spec Sheet

PRO35

Heavy-Duty, **Carbon Vane Pump**
for stationary applications fueling large equipment

GPRO®
PROFESSIONAL GRADE
PERFORMANCE

35 GPM | **132** L/min

115V/230V AC
Dual Voltage Configurable

DELIVERING
PROFESSIONAL GRADE PERFORMANCE
TO YOUR PROFESSIONAL GRADE JOB.

The PRO35 carbon vane pump is ready to take on your fueling demands. It's the pump of choice for large, stationary tanks to keep your operations fueled and ready to go! The PRO35's high-pressure performance makes it compatible with hose reel applications.

PERFORMANCE
The powerful ¾ horsepower motor produces an output flow rate of 35 GPM to quickly refuel heavy-duty equipment.

SMART DESIGN
Thermally protected motor, vacuum breaker ready. Center-based Inlet includes check valve and easy access to fuel strainer.

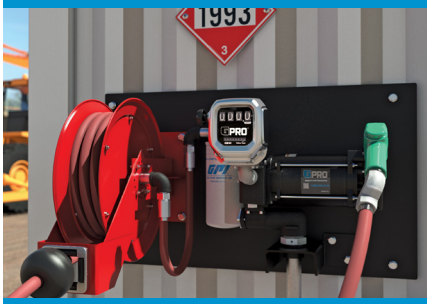
BUILT TO LAST
Powder-coated cast iron pump housing stands up to tough environments. Long-lasting finish resists corrosion and withstands chipping, scratching, fading, and wearing.

EASY MAINTENANCE
Field replaceable switch and vanes.

STATIONARY FUELING

HIGH-PRESSURE Performance
35 GPM

Suitable for gasoline up to E15, diesel fuel up to B20, and kerosene

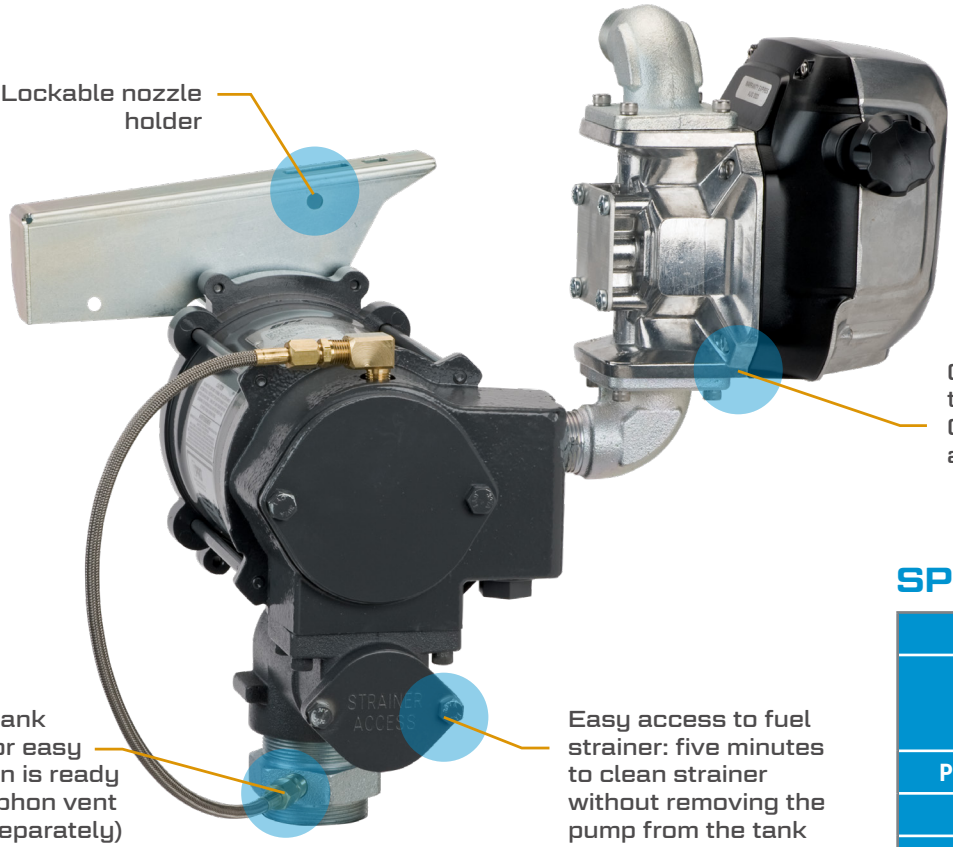


GREAT PLAINS INDUSTRIES GPI®

PRO35

Heavy-Duty, **Carbon Vane Pump**
for stationary applications fueling large equipment

GPRO®
PROFESSIONAL GRADE
PERFORMANCE



SPECS (ALL MODELS)

Max. Flow Rate:		35 GPM | 132 L/min
Voltage, Input:		115V (AC) 60Hz, 230V (AC) 60Hz *Dual Voltage Configurable*
Pump Technology:		Sliding Vane
Motor HP:		0.75
Duty Cycle:		30 min. on / 30 min. off
Max. Discharge Pressure:		Up to 25 PSI (1.72 bar)
Suction Pipe:		Not Included
At Sea Level 70° F (21.1° C)	**Suction Lift:**	Up to 15 ft. (4.5 m)
	Discharge Lift:	Up to 18 ft. (5.5 m)
Pump Housing:		Powder Coated Cast Iron
Warranty:		Five-Year Pump Warranty

ADDITIONAL FEATURES:

- Dual voltage configurable (115V/230V)
- Internal check valve keeps pump head primed and ready to work, reduces wear avoiding dry prime conditions
- Extreme Temperature (XT) models are capable of operation in temperatures as low as -40°F (-40°C)

FLUIDS[+]

Gasoline up to E15 | Diesel Fuel up to B20 | Kerosene | Avgas (100LL)* | Jet A* | Jet A-1*

[+]See fluid compatibility of each pump model

**For ground-based refueling only. Do not use or mount in or on the aircraft. For use with aviation gasoline (Avgas 100LL), Jet A, and Jet A-1. User should consult NFPA 407 Standard for Aircraft Fuel Servicing for safety requirements during ground fuel servicing of aircraft using liquid petroleum fuels. This product has no actual or implied compliance with this standard. Owners and operators are responsible for compliance to all applicable regulations.*

5 YR PUMP WARRANTY

MADE IN THE U.S.A. of Globally Sourced Components

See Available Models

c UL us LISTED
POWER OPERATED PUMP FOR PETROLEUM PRODUCTS

CSA® CERTIFIED MOTOR

UL us LISTED
MOTOR FOR HAZARDOUS LOCATIONS