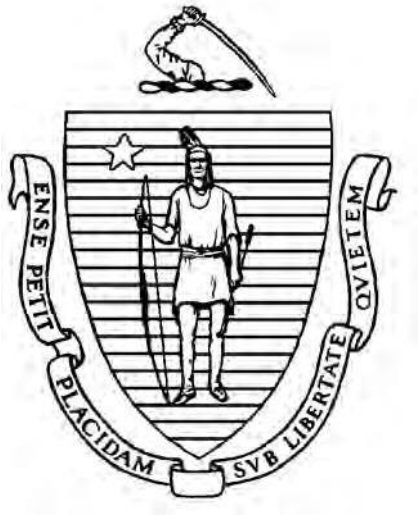


739 PALMER AVENUE SEPTIC SYSTEM REPLACEMENT PROJECT
BID PACKAGE

PART V

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS
TABLE OF CONTENTS

SECTION 00320

SUBSURFACE DATA

PART 1-GENERAL

1.01 SCOPE:

A. A subsurface exploration program consisting of soil test pits has been performed, with reasonable care. The results of the exploration program are appended hereto and are a part of the Contract Documents. If Contractors deem the subsurface information insufficient, they may, after obtaining Owner's permission and any required regulatory approvals, carry out additional subsurface explorations, at no expense to the Owner.

B. Subsurface information provided in the Contract Documents is limited by the methods used for obtaining and expressing such data, and is subject to various interpretations. The terms used to describe soils, rock, groundwater and such other conditions are subject to local usage and individual interpretation.

C. Groundwater levels reported on the Contract Documents are those measured in the field at the particular location and at the time measurements were made, and do not necessarily represent permanent groundwater elevations. Groundwater elevations may be affected by temperature, rainfall, tidal fluctuation, and other factors that may not have been present at the time the measurements were made. The Contractors should be aware that groundwater level fluctuations may affect methods of construction.

D. Subsurface exploration, soil and rock data are for the general information of the Contractors. The Contractors are obligated to examine the site, review soil reports, all available information and records of explorations, investigations and other pertinent data for the site, and then based upon their own interpretations and investigations decide the character of material to be encountered and excavated, the suitability of the materials to be used for backfilling and such other purposes, the groundwater conditions, difficulties or obstacles likely to be encountered, and other conditions affecting the work. The subsurface data is accurate only at the particular locations and times the subsurface explorations were made. No other warranty either expressed or implied by the Owner, Engineer or their agents is made as to the accuracy of the subsurface information and data shown on the drawings or presented in the Contract Documents.

PART 2- PRODUCTS

Not used.

PART 3-EXECUTION

Not used.

END OF SECTION

SECTION 00890

PERMITS

PART 1-GENERAL

1.01 DESCRIPTION:

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

1.02 RELATED WORK:

A. Section 312319, DEWATERING

A. Section 02546, ON-SITE SUBSURFACE WASTEWATER DISPOSAL SYSTEM

1.03 GENERAL REQUIREMENTS:

A. The Owner has obtained or will obtain and pay for the permits listed below, which are required for this project. The Contractor shall assist in obtaining certain permits, as indicated. The Contractor shall obtain and pay for all other permits required, as defined under the Permits subsection of Section 00700, GENERAL CONDITIONS.

| Permits by Owner | Status |
|---|---|
| | |
| Falmouth Conservation Commission Request for Determination of Applicability (RDA) Negative 2 determination. | Attached |
| | |
| BRP WP 63: Disposal System Construction Permit for State or Federal Facilities | Attached |
| | |
| U.S. EPA NPDES Construction Dewatering Permit | * |
| | |
| *Contractor shall preparepermit application and obtain thep ermit after contract is awarded, bearing all expenses. Owner will pay for and/or waive the permit application fee, if applicable. | |

1.04 Falmouth Conservation Commission RDA Determination

1. The Falmouth Conservation Commission has issued a Negative 2 determination in reponse to a Request for Determination of Applicability (RDA) for the work under this contract. This permit is to become a part of the Contract Documents and the Contractor shall perform all work in strict conformance with said permit. A copy of this permit is attached to this section

2. Disposal System Construction Permit:

Required by contractor from DEP

3. U.S. EPA NPDES Construction Dewatering Permit

The Contractor will be required to obtain a United States Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) General Permit for the discharge of effluent from construction dewatering practices. Laboratory costs associated with required sampling under this permit will be paid directly by the Owner. The Contractor shall be responsible for the collection of required samples, submission of samples to the laboratory for testing, and maintenance of records of sampling data on-site.

PART 2- PRODUCTS

Not Used.

PART 3- EXECUTION

3.01 PERFORM WORK IN ACCORDANCE WITH REQUIREMENTS:

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

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

END OF SECTION

SECTION 01014

SCOPE AND SEQUENCE OF WORK

PART 1- GENERAL

1.01 WORK INCLUDED:

A. The scope of work for this project consists of the replacement of existing septic system with new Presby System, replacement of paved driveway, tree clearing, loam and seeding, and related site work. Work will also include the regrading and landscaping of the adjacent areas disturbed by the work, as indicated on the plans.

1.02 RELATED WORK:

A. SECTION 01110 - CONTROL OF WORK AND MATERIALS

PART 2- PRODUCTS

Presby Wastewater

Treatment System

PART 3-

EXECUTION

3.01 GENERAL:

A. The Contractor shall be responsible for scheduling its activities and the activities of any subcontractors involved, to meet the completion date, or milestones, established for the contract. Scheduling of the work shall be coordinated with the Owner and Engineer.

B. The Construction Sequence Requirements shall be used by the Contractor to form a complete schedule for the project, which shall be coordinated with the Owner and Engineer. Prior to performing any work at the site, the Contractor shall submit a detailed plan to the Engineer for review. The plan shall describe the proposed sequence, methods, and timing of the work.

3.02 CONSTRUCTION SEQUENCING REQUIREMENTS:

A. Septic System- The Contractor shall construct the new septic system, during Spring 2023. Wastewater flow from the existing system shall online as needed during occupancy as noted in Part 4 Special Conditions until the new system is authorized by the Massachusetts Department of Environmental Protection to receive wastewater flow from the Facility. The Contractor shall be required to pump the septic tanks as required during construction to insure wastewater flow from the facility is properly discharged in accordance with 310 CMR 15.00 of the Massachusetts State Environmental Code.

B. Existing Wastewater System- The Contractor shall decommission the existing septic system in accordance with 310 CMR 15 of the Massachusetts State Environmental Code after the new septic disposal system has received a Certificate of Compliance from Mass DEP and begins discharging wastewater flow to the new soil absorption system. Decommissioning of the existing system shall be completed in Spring 2023.

C. Start-up Services- The start-up of the new wastewater system will be completed in June 2023.

END OF SECTION

SECTION 01110

CONTROL OF WORK AND MATERIALS

PART 1- GENERAL

Not Used.

PART 2-PRODUCTS

Not Used

PART 3-EXECUTION

3.01 HAULING, HANDLING AND STORAGE OF MATERIALS:

A. The Contractor shall, at its own expense, handle and haul all materials furnished by it and shall remove any of its surplus materials at the completion of the work.

B. The Contractor shall provide suitable and adequate storage for equipment and materials furnished by it that are liable to injury and shall be responsible for any loss of or damage to any equipment or materials by theft, breakage, or otherwise.

C. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such location as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

D. The Contractor shall be responsible for all damages to the work under construction during its progress and until final completion and acceptance even though partial payments have been made under the Contract.

3.02 OPEN EXCAVATIONS:

A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at its own expense, provide suitable and safe means for completely covering all open excavations and for accommodating travel when work is not in progress.

B. The length of open trench will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the Engineer.

C. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, then special construction procedures shall be taken, such as limiting the length of trench and prohibiting stocking excavated material on site.

D. All street excavations shall be completely closed at the end of each work day. Backfilling or use of steel plates of adequate strength to carry traffic shall be used.

3.03 MAINTENANCE OF TRAFFIC:

A. Unless permission to close the street is received in writing from the proper authority, all excavated materials and equipment shall be placed so that vehicular and pedestrian traffic may be safely maintained at all times.

B. Should the Chief of Police deem it necessary, uniformed officers will be assigned to direct traffic. The Contractor shall make all arrangements in obtaining uniformed officers required.

C. The Contractor shall at its own expense, as directed by the Police Traffic Control/Safety Officer, provide and erect acceptable barricades, barrier fences, traffic signs, and all other traffic devices not specifically covered in a bid item, to protect the work from traffic, pedestrians, and animals. The Contractor shall provide sufficient temporary lighting such as lanterns/flashers (electric battery operated) or other approved illuminated traffic signs and devices to afford adequate protection to the traveling public, at no additional cost to the Owner. See Section 01552, CONSTRUCTION ZONE SAFETY PLAN.

D. The Contractor shall furnish all construction signs that are deemed necessary by and in accordance with Part VI of the Manual on Uniform Traffic Control Devices as published by the U.S. Department of Transportation. In addition, the Contractor may be required to furnish up to 128 square feet of additional special construction warning signs. Size and exact wording of signs shall be determined by the Engineer during construction.

E. The intent of policing is to ensure public safety by direction of traffic. Police officers are not to serve as watchmen to protect the Contractor's equipment and materials.

F. Nothing contained herein shall be construed as relieving the Contractor of any of its responsibilities for protection of persons and property under the terms of the Contract.

3.04 CARE AND PROTECTION OF PROPERTY:

The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be promptly restored by the Contractor, at its expense, to a condition similar or equal to that existing before the damage was done, to the satisfaction of the Engineer.

3.05 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

A. All existing buildings, utilities, pipes, poles, wires fences, curbings, property line markers and other structures which the Engineer decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the Contractor. Should such property be damaged, it shall be restored by the Contractor, at no additional cost to the Owner.

B. The Contractor shall determine the location of all underground structures and utilities (including existing water services, drain lines, electrical lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by Contractor.

C. When fences interfere with the Contractor's operations, it shall remove and (unless otherwise specified) promptly restore them in accordance with Section 01564, EXISTING FENCES.

D. On paved surfaces the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels which are shaped so as to cut or otherwise damage such surfaces.

E. All property damaged by the Contractor's operations shall be restored to a condition at least equal to that in which it was found immediately before work was begun. Suitable materials and methods shall be used for such restoration.

F. Restoration of existing property and structures shall be carried out as promptly as practicable and shall not be left until the end of the construction period.

3.06 MAINTENANCE OF FLOW:

A. The Contractor shall at its own cost, provide for the flow of sewers and drains interrupted during the progress of the work, and shall immediately cart away and dispose of all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.

B. All existing drainage facilities including, but not limited to; brooks, streams, canals, channels, ditches, culverts, catch basins and drainage piping shall be adequately safeguarded so as not to impede drainage or to cause siltation of downstream areas in any manner whatsoever. If the Contractor damages or impairs any of the aforesaid drainage facilities, it shall repair the same within the same day.

C. At the conclusion of the work, the Contractor shall remove all silt in drainage structures caused by its operations as described in Section 01740, CLEANING UP.

3.07 REJECTED MATERIALS AND DEFECTIVE WORK:

A. Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor, and shall not be made use of elsewhere in the work.

B. Any errors, defects or omissions in the execution of the work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Engineer.

C. The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or its employees, as determined by the Engineer, occurring previous to the final payment.

3.08 SANITARY REGULATIONS:

Sanitary conveniences for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers, in such manner, and at such locations as may be approved. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the committing of nuisances within, on, or about the work. Any employees found violating these provisions shall be discharged and not again employed on the work without the written consent of the Engineer. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

3.09 SAFETY AND HEALTH REGULATIONS:

This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et. seq.)." The Contractor shall be familiar with the requirements of these regulations.

3.10 SITE INVESTIGATION:

The Contractor acknowledges that it has satisfied itself as to the conditions existing at the site of the work, the type of equipment required to perform this work, the quality and quantity of the materials furnished insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint itself with available information will not relieve it from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner.

3.11 HANGERS, PADS, AND SUPPORTS:

A. Unless otherwise indicated, hangers and supports shall be by the trade providing the supported item.

B. Except where detailed or specified, design of hangers and supports shall be the responsibility of the Contractor. All parts of such hangers or supports shall be designed in accordance with accepted engineering practice, using a factor of safety of at least 2½.

C. When proprietary hangers, etc., are supplied, satisfactory evidence of the strength of such items shall be furnished.

D. Hangers for items hung from steel and concrete shall be centered on the vertical center of gravity of the beam.

E. Locations and sizes of openings, sleeves, concrete pads, steel frames, and other equipment supports are indicated on the drawings for bidding purposes only. Final sizes and locations of such items shall be obtained from the shop drawings.

3.12 SLEEVES, HOLES, HANGERS, INSERTS, ETC.:

A. Except where holes and openings are dimensioned, and hangers, inserts, and supports are fully called for on the architectural and structural drawings (or reference is made thereon to drawings containing such information) to accommodate mechanical or electrical items, they shall be by the mechanical or electrical trade concerned.

B. Sleeves, inserts, anchors, etc., supplied under the mechanical and electrical contracts in sufficient time to so permit, shall be set in concrete, masonry, etc., or fastened to steel deck, etc., by the respective architectural or structural trade. Where not supplied in sufficient time, installation of such items shall be the responsibility of the mechanical or electrical trade involved.

C. Nothing shall be suspended from the steel roof deck and no fastenings made to it, except with the prior permission of the Engineer. Request for permission shall be accompanied by full details of the hanger or fastener, including the weight of the item to be suspended.

D. Nailers and other wood members attached to steel or masonry, for which fasteners are not indicated on the design drawings or in the specification, shall be fastened with the equivalent of ½-inch diameter bolts at 3 feet o.c.

E. Openings for mechanical and electrical items in finished areas of the building shall be closed off with near escutcheon plates or similar closures. These closures shall be by the mechanical or electrical trade involved.

3.13 ELECTRIC SERVICE:

A. The Contractor shall make all necessary applications and arrangements and pay for all fees and charges for electrical energy for power and light necessary for the proper completion of this contract during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.

B. There shall be sufficient electric lighting so that all work may be done in a workmanlike manner where there is not sufficient daylight.

3.14 HAZARDOUS WASTE:

Should the Contractor, while performing work under this contract, uncover hazardous materials, as defined in Massachusetts Hazardous Waste Regulations 310 CMR 30.00, he shall immediately notify the Engineer. The Contractor is not, and has no authority to act as, a handler, generator, operator or disposer of hazardous or toxic substances found or identified at the site, and the Owner shall undertake all such functions.

END OF SECTION

SECTION 01330

SUBMITTALS

PART 1-GENERAL

1.01 WORK INCLUDED:

A. The Contractor shall provide the Engineer with submittals as required by the contract documents.

1.02 RELATED WORK:

A. Division 1 – 46 of these specifications that require submittals.

PART 2-PRODUCTS

NOT USED

PART 3-EXECUTION

3.01 GENERAL:

A. As required by the General Conditions, Contractor shall submit a schedule of shop and working drawing submittals.

B. The Contractor shall submit the shop and working drawing submittals either electronically or hard copy.

3.02 ELECTRONIC SUBMITTALS:

A. In accordance with the accepted schedule, the Contractor shall submit promptly to the Engineer by email (jkubick@woodsholegroup.com) or on Compact Disc (mail to Woods Hole Group, Inc. 107 Waterhouse Road, Bourne, MA 02532, ATTN: Joel Kubick), one electronic copy in Portable Document Format (PDF) of shop or working drawings required as noted in the specifications, of equipment, structural details and materials fabricated especially for this Contract.

B. Each electronic copy of the shop or working drawing shall be accompanied by the Engineer's standard shop drawing transmittal form, included as Exhibit 1 of this section (use only for electronic submittals), on which is a list of the drawings, descriptions and numbers and the names of the Owner, Project, Contractor and building, equipment or structure.

C. The Contractor shall receive a shop drawing memorandum with the Engineer's approval or comments via email.

3.03 HARD COPY SUBMITTALS:

A. In accordance with the accepted schedule, the Contractor shall submit promptly to the Engineer by mail (to Woods Hole Group, Inc. 107 Waterhouse Road, Bourne, MA 02532, ATTN: Joel Kubick), six (6) copies each of shop or working drawings required as noted in the specifications, of equipment, structural details and materials fabricated especially for this Contract.

B. Each shipment of drawings shall be accompanied by the Engineer's (if applicable) standard shop drawing transmittal form on which is a list of the drawings, descriptions and numbers and the names of the Owner, Project, Contractor and building, equipment or structure.

3.04 SHOP AND WORKING DRAWINGS:

A. Shop and working drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish of shop coat, grease fittings, etc., depending on the subject of the drawings. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for this Contract.

B. All shop and working drawings shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from his subcontractors and returning reviewed drawings to them. All shop and working drawings shall be prepared on standard size, 24-inch by 36-inch sheets, except those, which are made by changing existing standard shop or working drawings. All drawings shall be clearly marked with the names of the Owner, Project, Contractor and building, equipment or structure to which the drawing applies, and shall be suitably numbered. Each shipment of drawings shall be accompanied by the Engineer's (if applicable) standard shop drawing transmittal form on which is a list of the drawings, descriptions and numbers and the names mentioned above.

C. Only drawings that have been prepared, checked and corrected by the fabricator should be submitted to the Contractor by his subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the Contract Documents in all respects. Shop drawings shall be reviewed and marked with the date, checker's name and indication of the Contractor's approval, and only then shall be submitted to the Engineer. Shop drawings unsatisfactory to the Contractor shall be returned directly to their source for correction, without submittal to the Engineer. Shop drawings submitted to the Engineer without the Contractor's approval stamp and signature will be rejected. Any deviation form the Contract Documents indicated on the shop drawings must be identified on the drawings and in a separate submittal to the Engineer, as required under subsection 6.17 Shop Drawings and Samples; D. Submittal Procedures, Paragraph 3 of the 1996 General Conditions.

D. The Contractor shall be responsible for the prompt submittal and resubmittal, as necessary, of all shop and working drawings so that there will be no delay in the work due to their absence of such drawings.

E. The Engineer will review the shop and working drawings as to their general conformance with design concept of the project and general compliance with the information given in the Contract Documents. Corrections of comments made on the drawings during the review do not relieve the Contractor from compliance with the requirements of the Contract Documents. The Contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; And performing his work in a safe and satisfactory manner. The review of the shop drawings is general and shall not relieve the contractor of the responsibility for details of design, dimensions, code compliance, etc., necessary for interfacing with other components, proper fitting and construction of the work required by the Contract and for achieving the specified performance. The Engineer will review submittals two times: once upon original submission and a second time if the Engineer requires a revision or corrections. The Contractor shall reimburse the Owner amounts charged to the Owner by the Engineer for performing any review of a submittal for the third time or greater.

F. With few exceptions, shop drawings will be reviewed and returned to the Contractor within 10 days of submittal.

G. No material or equipment shall be purchased or fabricated especially for this Contract nor shall the Contractor proceed with any portion of the work, the design and details of which are dependent upon the design and details of equipment or other features for which review is required, until the required shop and working drawings have been submitted and reviewed by the Engineer as to their general conformance and compliance with the project and its Contract Documents. All materials and work involved in the construction shall then be as represented by said drawings.

H. Two copies of the shop and working drawings and/or catalog cuts will be returned to the Contractor. The Contractor shall furnish additional copies of such drawings or catalog cuts when he needs more than two copies or when so requested.

3.05 SAMPLES:

A. Samples specified in individual sections include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols, and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the work.

B. The number of samples submitted shall be as specified. Submittal and processing of samples shall follow the procedures outlined for shop and working drawings unless the specifications call for a field submittal or mock-up.

C. Acceptance of samples will be acknowledged via a copy of the transmittal noting status. When samples are not acceptable, prompt resubmittal will be required.

3.06 OPERATING AND MAINTENANCE MANUALS AND SPARE PARTS LISTS:

A. Submit operation and maintenance manuals and spare parts lists in accordance with Section 01329 SUBMITTAL OF OPERATION AND MAINTENACE MANUALS.

END OF SECTION

EXHIBIT 1 TO SECTION 01330 SUBMITTALS
SHOP DRAWING TRANSMITTAL FORM

# Shop Drawing Transmittal

Woods Hole Group, Inc.

**Instructions for Preparing Transmittal**

No action will be taken on any item unless accompanied by this form.
TRANSMITTAL NOS. to be consecutive (1, 2, 3, etc.).
Each resubmittal of the same item shall use same number with suffix letter (A, B,etc.)
SPEC. SECT. NO: Only one spec. section no. to each transmittal.
DESCRIPTION: Complete identification of document or group of documents.
SOURCE: Originator of document(s) being submitted.

DRAWING NO: Identification of document(S)
CONTRACT DRAWING REFERNCE: Contract drawing number(s) showing details of document(s).
SPECIAL INSTRUCTIONS: Special cases and emergencies, changes in distribution and special handling requests, et. Should be entered here.
SIGNATURE OF CONTRACTOR: Signature of individual who reviews and approves material prior to submittal to engineer.

THIS SECTION TO BE COMPLETED BY CONTRACTOR

| TRANSMITTAL NO. | SPEC. SECT. NO. | DATE | CONTRACTORS JOB NO. | WHG PROJECT NO. |
|---|---|---|---|---|
| | | | | |

| PROJECT NAME & CONTRACT NO. | LOCATION |
|---|---|
| | |

| | | | |
|---|---|---|---|
| TO | Attention: Joel Kubick (jkubick@woodsholegroup.com)<br>Woods Hole Group, Inc.<br>107 Waterhouse Road<br>Bourne, MA 02532 | FROM | |

| | | | | | | By WHG | |
|---|---|---|---|---|---|---|---|
| ITEM NO. | DESCRIPTION | SOURCE | DRAWING NO. CATALOG NO. BROCHURE, ETC. | NO. OF COPIES | CONTRACT DRAWING REF. | ACTION CODE | REVIEWED BY |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |

| THIS CERTIFIES THAT ALL ITEMS SUBMITTED HEREWITH HAVE BEEN CHECKED BY THE CONTRACTOR, ARE IN CONFORMANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, EXCEPT AS NOTED, AND ARE APPROVED BY THE CONTRACTOR FOR THIS PROJECT. | SIGNATURE & TTILE | |
|---|---|---|

THIS SECTION TO BE COMPLETED BY WOODS HOLE GROUP, INC

| ACTION CODE: | Woods Hole Group, Inc. |
|---|---|
| 1. NO EXCEPTIONS TAKEN<br>2. MAKE CORRECTIONS NOTED<br>3. AMEND AND RESUBMIT<br>4. REJECTED. SEE REMARKS<br>5. ACKNOWLEDGEMENT<br>6. SUBMITTAL NOT REQUIRED. RETURNED WITHOUT REVIEW | a. INSTALLATION SHALL PROCEED INLY WHEN ACTION CODE IS 1 OR 2.<br>b. ACTION CODE 3 SHALL BE RESUBMITTED WITHIN TIME LIMIT SET IN CONTRACT<br>c. REVIEW DOES NOT RELIEVE CONTRACTOR FROM RESPONSIBILITY OF COMPLAINCE WITH ALL REQUIREMENTS OF THE CONTRACT DOCUMENTS. |

SECTION 01380

HEALTH AND SAFETY PLAN

PART 1-GENERAL

1.01 WORK INCLUDED:

A. Prior to the start of work on the site, Contractor shall prepare and submit a site-specific health and safety plan that includes consideration of all known and potential hazards at the site. Work may not proceed at the project site until the Contractor's health and safety plan has been received and reviewed by the Engineer.

1.02 REFERENCES:

A. OSHA 29 CFR 1910.120.

1.03 RELATED WORK:

A. Section 02220 Demolition

PART 2-PRODUCTS

2.01 HEALTH AND SAFETY PLAN:

A. The health and safety plan shall include, but not necessarily be limited to the following:

1. Identification of Contractor's Site Safety Officer.
2. Identification of Hazards and Risks Associated with Project.
3. Contractor's Standard Operating Procedures, Including Personnel Training and Field Orientation.
4. Respiratory Protection Training Requirements.
5. Levels of Protection and Selection of Equipment Procedures.
6. Type of Medical Surveillance Program.
7. Personal Hygiene Requirements and Guidelines.
8. Zone Delineation of the Project Site.
9. Site Security and Entry Control Procedures.
10. Field Monitoring of Site Contaminants.
11. Contingency and Emergency Procedures.
12. Listing of Emergency Contacts.

PART 3-EXECUTION

3.01 PERSONAL PROTECTIVE EQUIPMENT:

The personal protective equipment required to provide the appropriate level of dermal and respiratory protection shall be determined based on the results of continuous air

monitoring performed by the Contractor and the standards set forth in the Contractor's health and safety plan. The Engineer may conduct duplicate air monitoring for quality control purposes. Modified Level D protection shall be the minimum requirement for all on-site personnel.

END OF SECTION

SECTION 01550

SIGNAGE (TRAFFIC CONTROL)

PART 1-GENERAL

1.01 WORK INCLUDED:

This Section covers furnishing and installing traffic control signs and other devices.

1.01 SYSTEM DESCRIPTION:

The Contractor shall furnish and install all construction signs deemed necessary by and in accordance with the latest edition of Part VI of the Manual on Uniform Traffic Control Devices(MUTCD) as published by the U.S. Department of Transportation.

PART 2-PRODUCTS

1.01 TRAFFIC WARNING AND REGULATING DEVICES:

Contractor shall provide warning signs, barricades and other devices in accordance with the specifications provided in the MUTCD. Size of signs, lettering, colors, method of support and other factors prescribed in the MUTCD shall be adhered to.

PART 3-EXECUTION

3.01 INSTALLATION:

A. Contractor shall erect barricades, barrier fences, traffic signs, and other traffic control devices as required by the MUTCD, or as required by the Engineer, to protect the work area from traffic, pedestrians, and animals.

B. Contractor shall relocate barricades, signs and other devices as necessary as the work progresses.

C. Unless extended protection is required for specific areas, when the work has been completed, all temporary warning and regulatory devices used by the Contractor shall be removed so that traffic can move unimpeded through the area.

END OF SECTION

SECTION 01552

CONSTRUCTION ZONE SAFETY PLAN

PART 1-GENERAL

1.01 WORK INCLUDED:

A. This Section covers the provisions for complying with Commonwealth of Massachusetts requirements for construction zone safety plans on public works projects.

1.02 DESCRIPTION:

A. The Contractor shall implement traffic safety and control measures through the construction zone through road closures and detours and mitigate impacts on traffic outside of the construction zone in accordance with these contract documents.

1.03 RELATED WORK:

A. SECTION 01110, CONTROL OF WORK AND MATERIALS (MAINTENANCE OF TRAFFIC)

B. SECTION 01550, SIGNAGE (TRAFFIC CONTROL)

1.04 REFERENCES:

701 CMR 7.00 Use of Road Flaggers and Police Details on Public Works Projects

Massachusetts Department of Transportation Standard Specifications for Highways and Bridges – latest edition

PART 2-PRODUCTS

2.01 Traffic control devices utilized by the Contractor shall meet the requirements of these contract documents and the latest Massachusetts Department of Transportation (MassDOT) Standard Specifications and Manual On Uniform Traffic Control Devices (MUTCD).

PART 3-EXECUTION

3.01 OPERATION:

A. Contractor shall be responsible for providing all temporary traffic control devices including barricades, barrier fences, signs, drums, cones, impact attenuators and other traffic control devices in accordance with typical traffic management plans and details shown on the drawings or as required by the Engineer.

B. The Contractor shall prepare temporary traffic management plans and details that deviates significantly from the typical plans shown on the drawings and submit to the Engineer for review and approval prior to the start of work.

C. Contractor shall relocate barricades, signs and other devices as necessary as the work progresses as required by the Owner's Traffic Control Officer or the Engineer.

3.02 ALTERNATIVE PLAN:

A. In accordance with 701 CMR 7.06(6), whenever required police details/road flaggers do not arrive on time or fail to show up for work, the Alternative Plan will be implemented by the Contractor.

B. The Alternative Plan for this project is as follows:

1. Contact local police department and municipality to inform them that the scheduled police detail has failed to show up at the project site and that road flaggers are being utilized.

2. If construction zone is within a high-speed area (>40mph) the Contractor cannot use road flaggers and must stop work until police details arrive. If construction zone is within a low-speed area (<40mph) the Contractor can use road flaggers who have been trained and certified in temporary roadway flagging.

3. Redeploy crew to work in areas not requiring temporary traffic control (if available).

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1-GENERAL

1.01 DESCRIPTION:

This section of the specification covers the control of dust via calcium chloride and water, complete.

PART 2-PRODUCTS

2.01 CALCIUM CHLORIDE:

A. Calcium chloride shall conform to the requirements of AASHTO-M 144, Type I or Type II and Specification for Calcium Chloride, ASTM D98. The calcium chloride shall be packaged in moisture proof bags or in airtight drums with the manufacturer, name of product, net weight, and percentage of calcium chloride guaranteed by the manufacturer legibly marked on each container.

B. Calcium chloride failing to meet the requirements of the aforementioned specifications or that which has become caked or sticky in shipment, may be rejected by the Engineer.

2.02 WATER:

A. Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

PART 3-EXECUTION

1.01 APPLICATION:

A. Calcium chloride shall be applied when ordered by the Engineer and only in areas which will not be adversely affected by the application. See Section 01570, ENVIRONMENTAL PROTECTION.

B. Calcium chloride shall be uniformly applied at the rate of 1-1/2 pounds per square yard or at any other rate as required by the Engineer. Application shall be by means of a mechanical spreader, or other approved methods. The number and frequency of applications shall be determined by the Engineer.

C. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar.

D. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

END OF SECTION

SECTION 01564

EXISTING FENCES

PART 1-GENERAL

1.01 DESCRIPTION:

A. This section of the specification covers the removal and resetting of existing fences. Where the removal of existing fences, at locations shown on the plans and where required by the Engineer, is required, the Contractor shall remove and reset such fences as required by the Engineer.

PART 2-PRODUCTS

2.01 FENCING:

A. The materials removed shall be utilized to reset the fence. Where necessary, new posts and bases shall be furnished and installed by the Contractor. Any materials damaged or lost during or subsequent to removal shall be replaced by the Contractor without additional compensation.

B. All new materials required shall be equal in quality and design to the materials in the present fences.

PART 3-EXECUTION

3.01 REMOVAL OF EXISTING FENCES:

A. If the Contractor determines that removal of a portion of the existing fence is necessary to complete the construction of the proposed septic system, the portion of fence shall be carefully removed together with all appurtenances and satisfactorily stored and protected until required for resetting.

3.02 ERECTION:

A. Fences shall be reset plumb and to the grades required and shall conform to the original fence or as the Engineer requires. Backfilling around the posts shall consist of suitable material satisfactorily compacted. If the fence posts were originally set in concrete bases they shall be reset in concrete bases.

3.03 PAINTING:

A. Painting, if required, shall be done as required by the Engineer.

END OF SECTION

SECTION 01570

ENVIRONMENTAL PROTECTION

PART 1-GENERAL

1.01 DESCRIPTION:

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

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

C. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the Environmental Protection program.

1.02 RELATED WORK:

A. Section 00890, PERMITS

B. Section 01330, SUBMITTALS

C. Section 01562, DUST CONTROL

D. Section 311100, SITE CLEARING

E. Section 312319, DEWATERING

F. Section 02252, SUPPORT OF EXCAVATION

G. Section 02300, EARTHWORK

H. Section 02921, SURFACE RESTORATION OF CROSS COUNTRY AREAS

1.03 SUBMITTALS

A. The Contractor shall submit for approval six sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of wetlands or across areas designated as wetlands.

PART 2-PRODUCTS

2.01 STRAW WATTLES:

A. Straw wattles shall consist of a 100% biodegradable exterior jute or coir netting with 100% wheat straw interior filling as manufactured by Granite Environmental, Inc., Sebastian, FL (Phone 888-703-9889, website: www.GraniteEnvironmental.com), or approved equal.

2.02 CATCH BASIN PROTECTION:

A. To trap sediment and prevent sediment from clogging drainage systems, catch basin protection in the form of a siltation sack (Siltsack As manufactured by ACF environmental, Inc., or approved equal) shall be provided as approved by the Engineer.

PART 3-EXECUTION

3.01 NOTIFICATION AND STOPPAGE OF WORK:

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

3.02 AREA OF CONSTRUCTION ACTIVITY:

A. Insofar as possible, the Contractor shall confine 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.

3.03 PROTECTION OF WATER RESOURCES:

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

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

3.04 CONSTRUCTION IN AREAS DESIGNATED AS WETLANDS ON THE DRAWINGS:

A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within areas designated as wetlands or within 100-feet of wetland resource areas. Total easement widths shall be limited to the width shown.

B. The Contractor shall perform his work in such a way that these areas are left in the condition existing prior to construction.

C. The elevations of areas designated as wetlands shall not be unduly disturbed by the Contractor's operations outside of the trench limits. If such disturbance does occur, the Contractor shall take all measures necessary to return these areas to the elevations which existed prior to construction.

D. Excavated materials shall not be permanently placed or temporarily stored in areas designated as wetlands. Temporary storage areas for excavated material shall be as required by the Engineer.

3.05 PROTECTING AND MINIMIZING EXPOSED AREAS:

A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.

B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to ensure that materials used for temporary vegetation are adaptive to the sediment control period materials to be used for temporary vegetation shall be approved by the Engineer.

3.06 LOCATION OF STORAGE AREAS:

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

B. No excavated materials or materials used in backfill operations shall be deposited within wetlands. Adequate measures for erosion and sediment control such as the placement of straw waddles around the downstream areas from siltation.

C. There shall be no storage of equipment or materials in areas designated as wetlands.

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

3.07 PROTECTION OF LANDSCAPE:

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall in any event be responsible for any damage resulting from such use.

B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portion shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees will be treated and healed or removed and disposed of under the provisions of section 311100, SITE CLEARING.

D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

3.08 SITE CLEARING:

A. The Contractor shall clear and grub only on the Owner's land or the Owner's easements, and only the area required for construction operations, as approved by the Engineer. Removal of mature trees (4 inches or greater DBH) will not be allowed on temporary easements.

B. The Contractor shall not remove trees in the Owner's temporary easements without permission of the Engineer.

3.09 DISCHARGE OF DEWATERING OPERATIONS:

A. Any water that is pumped and discharged from the trench and or excavation as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.

B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.

C. The pumped water shall be filtered through filter fabric and baled straw to trap sediment occurring as a result of the construction operations. Accumulated sediment shall be cleared from the channel periodically.

3.10 DUST CONTROL:

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material as directed. Calcium chloride shall be as specified under Section 01562, DUST CONTROL.

B. Calcium chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

3.11 SEPARATION AND REPLACEMENT OF TOPSOIL:

A. Topsoil shall be carefully removed from cross country areas where excavations are to be made., and separately stored to be used again as directed. The topsoil shall be stored in an area acceptable to the Engineer and adequate measures shall be employed to prevent erosion of said material.

3.12 SURFACE RESTORATION OF CROSS COUNTRY AREAS:

A. Plantings detailed in Section 02921 shall be conducted when construction has been completed within the area designated. A one-year guarantee of maintenance will be required on these plantings to ensure that they establish in the area.

3.13 CATCH BASIN PROTECTION:

A. Catch basin protection shall be used for every catch basin, shown on the plans or as required by the Engineer, to trap sediment and prevent it from clogging drainage systems and entering wetlands. Siltation sacks shall be securely installed under the catch basin grate. Care shall be taken to keep the siltation sacks from breaking apart or clogging. All deposited sediment shall be removed periodically and at times prior to predicted precipitation to allow free drainage flow. Prior to work in areas where catch basins are to be protected, each catch basin sump shall be cleaned of all debris and protected. The Contractor shall properly dispose of all debris at no additional cost to the Owner.

3.14 STRAW WATTLES:

A. The wattles will be placed in a shallow trench (2-3 inches deep) and staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.

END OF SECTION

SECTION 01740

CLEANING UP

PART 1-GENERAL

1.01 DESCRIPTION:

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

1.02 RELATED WORK:

A. Section 01110 CONTROL OF WORK AND MATERIALS

B. Section 01140 SPECIAL PROVISIONS

C. Section 01570 ENVIRONMENTAL PROTECTION

PART 2-PRODUCTS

Not applicable

PART 3-EXECUTION

3.01 DAILY CLEANUP:

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

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

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

3.02 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.

3.03 REMOVAL OF TEMPORARY BUILDINGS, STRUCTURES AND EQUIPMENT:

A. On or before completion of the work, the Contractor shall, unless otherwise specifically required or permitted in writing, tear down and remove all temporary buildings and structures it built; shall remove all temporary works, tools and machinery or other construction equipment it furnished; shall remove all rubbish from any grounds which it has occupied; shall remove silt fences and hay bales used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by its operations in a neat and satisfactory condition.

3.04 RESTORATION OF DAMAGED PROPERTY:

A. The Contractor shall restore or replace, when and as required, any property damaged by its work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk and landscaping work. Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

3.05 FINAL CLEANUP:

A. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing all trash and debris off of the premises. Before acceptance, the Engineer shall approve the condition of the site.

END OF SECTION

SECTION 01760

OPERATION AND MAINTENANCE MANUALS

PART 1-GENERAL

1.01 SCOPE OF WORK:

A. This section includes procedural requirements for compiling and submitting operation and maintenance data required to complete the project.

1.02 RELATED WORK:

A. General Requirements in their entirety

B. Individual Technical Specification Sections Specific for Operation and Maintenance Data.

C. Section 01330, SUBMITTALS

1.03 FORMAT:

A. Prepare data in form of an instructional manual.

B. Binders: Commercial quality, 8 1/2 x 11 inch three-ring binders with hardback, washable, plastic covers; two inch maximum ring size. When multiple binders are used, correlate data into related, consistent groupings. Provide a table of contents in each binder.

C. Cover: Identify each binder cover and spine with typed or printed title OPERATION AND MAINTENANCE INSTRUCTION; list title of Project facility; identify subject matter of contents.

D. Arrange contents by systems under section numbers and sequence of Table of Contents.

E. Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer’s printed data, or typewriter date - on 20-pound paper.

G. Drawings: Provide with reinforced punched, binder tab. Bind in with text; fold larger drawings to size of text pages.

H. Submit certification that the data and drawings provided pertain exactly to the model, size, and series product and equipment installed in the work.

I. All documents will be electronically scannable.

J. All products, systems, and drawings must be cross-referenced with tag ID numbers.

K. The manual for each piece of equipment shall be a separate document with the following specific requirement:

1. Contents:

   Table of Contents and Index

   Brief description of each system and components

   Starting and stopping procedures

   Special operating instructions

   Routine maintenance procedures

   Manufacturer's printed operating and maintenance instructions, parts list, illustrations, and diagrams

   One copy of each wiring diagram

   One copy of each approved shop drawing and each Contractor's

   coordination and layout drawing

   List of spare parts, manufacturer's price, and recommended quantity

   Name, address and telephone number of local service representatives.

2. Material

   Loose leaf on 60 pound, punched paper

   Holes reinforced with plastic cloth or metal

   Page size, 8 ½ x 11 inches

   Diagrams, illustrations and attached foldouts as required, of original

   quality, reproduced by dry copy method

   Covers: oil, moisture and wear resistant 9 x 12 size

1.04 QUALITY ASSURANCE:

A. Prepare instructions and data by personnel experienced in maintenance and operations of described products.

1.05 CONTENTS, EACH VOLUME (BINDER):

A. Table of Contents: Provide title of Contract, schedule of products and systems, indexed to content of the volume. A listing of all relevant tag ID numbers for each volume shall be placed immediately after the Table of Contents.

B. For each product or systems: List names, addresses, and telephone numbers of subcontractors and suppliers, including local source of suppliers and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

E. Text: As required to supplement product data, provide logical sequence of instructions for each procedure incorporating manufacturer's instructions.

F. Warranties, Guarantees, and Bonds: Bind copy of each

G. See O&M Manual Review Checklist at end of this specification section.

1.06 MANUAL FOR MATERIALS AND FINISHES:

A. Building Products, Applied Materials, and Finishes: Include product data with catalog number, size composition, and color and texture designations. Provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: As specified in individual product specification sections.

1.07 MANUAL FOR EQUIPMENT AND SYSTEMS:

A. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

B. Data submitted on all equipment shall include complete maintenance instructions (including preventive and corrective maintenance) and parts lists in sufficient detail to facilitate ordering replacements.

C. All products, systems, equipment, electrical wiring, instrumentation wiring, personnel protection systems wiring, presented in this manual will have tag numbers corresponding to contract drawings and specifications. In the event, numbers do not exist; the Engineer will specify a series of numbers.

D. Panelboard Circuit Directories: Provide electrical service characteristics, controls and communications.

E. Include color-coded wiring diagrams as installed.

F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequence. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter and any special operating instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required. Cross-reference lubricants to products offered by at least three major lubricant suppliers.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage

O. Include test and balancing reports, calibration data, alignment records, and other information.

P. Additional Requirements: as specified in individual product specification sections.

Q. Provide a listing in table of Contents for design data with tabbed flysheet and space for insertion of data.

R. Incorporation of all Physical Checkout information obtained through the field- testing and correction phases of the Work. Input must be specific to the actions and information obtained during those phases.

1.08 SUBMITTALS:

A. Submit draft and final copies of operation and maintenance manuals as described in Section 01329 SUBMITTAL OF OPERATION AND MAINTENANCE MANUALS.

PART 2-PRODUCTS

Not used.

PART 3-EXECUTION

Not used.

Note to Specifier: Review the attached Checklist and add items that are required or delete items not relative to this project.

**OPERATION AND MAINTENANCE MANUAL REVIEW CHECKLIST**

1. Name, address, telephone/fax number of the manufacturer ☐
2. Name, address, contact name, telephone/fax of local representative ☐
3. Name, address, telephone/fax number of the contractor ☐
4. Exploded view/general arrangement of materials of construction ☐
5. Description of operation/operating principal ☐
6. Project specific Operating parameters ☐
7. Wiring Diagrams (If Applicable) ☐
8. Troubleshooting checklist ☐
9. Recommended spare parts list with prices, and ordering instructions ☐
10. Model number and the serial number of the model provided ☐
11. Performance curves or tabulated data ☐
12. Routine Maintenance instructions/service instructions with recommended Intervals ☐
13. Assembly and disassembly instructions ☐
14. Recommended lubricates and lubrication schedule. ☐
15. Approved copies of Shop Drawings are to be included in the manual ☐
16. Startup/break-in and adjustment instructions ☐
17. Warranty information ☐

Reviewed By: _____Date: _____
Woods Hole Group, Inc.

END OF SECTION

SECTION 01770

PROJECT CLOSEOUT

PART 1-GENERAL

1.01 WORK INCLUDED:

A. This Section covers administrative and procedural requirements for closing out the project, including, but not limited to:

1. Project as-built documents
2. Checkout and Certification
3. Startup and Testing
4. Final Cleaning
5. Substantial Completion
6. Closeout Procedures
7. Final Completion
8. Correction/Warranty Period
9. Closeout checklist to be completed by the Engineer.

1.02 RELATED WORK:

A. General Requirements in their entirety.

B. Section 01740, CLEANING UP

C. Section 01750, EQUIPMENT CHECKOUT AND TESTING

D. Section 01752, STARTUP AND TESTING

E. Division 2 through Division 16.

1.03 AS-BUILT DOCUMENTS:

A. Contractor shall maintain on site, separate from the documents used for construction, one set of the documents listed below, and as construction progresses, shall legibly record on these documents all changes made during construction.

1. Contract Drawings.
2. Specifications.
3. Addenda.

4. Change Orders and other Modifications to the Contract.

5. Reviewed shop drawings, product data, and samples.

6. Written interpretations and clarifications.

7. Field Orders.

8. Field test reports properly verified.

9. The completed set of as-built documents shall be submitted to the Engineer with the final Application for Payment.

1.04 CHECKOUT AND CERTIFICATIONS:

A. Prior to checkout and certifications the following tasks shall be completed:

1. Construction shall be complete. For this purpose, completion of construction is defined as follows:

a. The Contractor has completed construction and erection of the work in conformance with the Contract Drawings and Specifications.

b. The Contractor has installed and adjusted operating equipment, systems, or facilities, as applicable, as defined by the manufacturers' erection, installation, operation and maintenance instructions.

2. All shop drawings shall have final approval.

3. All shop tests shall be complete and approved test results submitted to the Engineer.

B. Refer to Section 01750 for requirements regarding equipment checkout and certification.

1.05 START-UP AND TESTING:

A. Prior to start-up the following tasks shall be complete:

1. All checkout and certifications shall be satisfactorily completed,

2. All operations and maintenance manuals shall be approved,

3. All preliminary training by the manufacturer's representative shall be completed,

4. An approved start-up procedure shall be in place.

B. Refer to Section 01751 for start-up and testing requirements.

1.06 FINAL CLEANING:

A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

1. Clean the site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to smooth, even textured surfaces.

2. Remove waste and surplus materials, rubbish, fencing equipment, temporary utilities and construction facilities from the site, unless otherwise required by the Engineer.

3. Comply with requirements of Section 01740 CLEANING UP.

1.07 SUBSTANTIAL COMPLETION:

A. Substantial Completion is officially defined in the General and Supplementary Conditions. The date of substantial completion will be certified by the Engineer. This date will notbe certified until the following requirements have been satisfied by the Contractor:

1. All Contract requirements are coordinated into a fully operational system. All individual units of equipment and treatment are fully operative and performing at specified efficiencies. Where efficiencies are not specified, performance shall meet acceptable standards for the particular unit.

2. All field tests have been satisfactorily completed and reports forwarded to the Engineer.

3. All final training has been completed by the manufacturers' representatives.

4. All spare parts and lubricants have been satisfactorily delivered to the Owner. Spare parts are for the exclusive use of the Owner when the facility has been turned over. Contractor is responsible for all maintenance and repair materials required until the facility is accepted by the Owner.

1.08 CLOSEOUT PROCEDURES:

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and is complete in accordance with Contract Documents and ready for Engineer's and Owner's inspection.

B. Accompany Engineer and Owner on inspection to verify conformance with the Contract Documents. Prepare a punch list of work items that have been determined by inspection to not conform to Contract Documents. Punch list items shall include work items that are missing, incomplete, damaged, incorrect items, or improperly installed or constructed. The Contractor shall correct the punch list deficiencies by re-work, modifications, or replacement, as appropriate, until the items conform to the Contract Documents. The initial punch list shall be produced by the Contractor, with copies to the Engineer and Owner. When the Contractor has reduced the number of deficient items to a reasonable level, the Engineer will develop a definitive punch list for the use of the Contractor.

C. Provide submittals to Engineer that are required by governing or other authorities.

D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due. The Contractor shall submit the following documents with or prior to Final Application for Payment: Set of as-built documents, Contract Completion and Acceptance Certificate, Consent of Surety to Final Payment, Release and Waiver of Liens and Claims, Affidavit of Payment of Debts and Claims, and remaining releases, waivers, warranties/guarantees, and all other data required by the Contract Documents.

1.09 FINAL COMPLETION:

A. Prior to final completion, the following tasks shall be completed:

1. All items in the punch list shall be completed.

2. All Contract closeout documentation shall be submitted to and accepted by the Engineer.

1.10 CORRECTION/WARRANTY PERIOD:

A. During the correction period, the Contractor shall correct all deficiencies in equipment and materials.

B. During the warranty period, the Contractor shall perform all corrective work on warranty deficiencies.

C. Corrective work will be identified by the Engineer or Owner, as appropriate. The Contractor will be notified of the item(s) requiring corrective work.

D. The Contractor shall begin work on all corrective work within ten days of being notified of the deficiency by the Engineer and shall then work continuously until the deficiency is corrected. Upon completion of the corrective work, the Contractor shall submit a letter report to the Engineer describing the deficiency and the corrective action that was taken.

E. The Contractor shall coordinate all corrective work with the Engineer and/or the Owner.

1.11 COMPLETION CHECKLIST:

A. When the project has been fully completed, Final Payment can be approved.

## PROJECT COMPLETION CHECKLIST

Owner _____ Job No._____

Project:

As part of the project closeout, all items listed below must be checked off as being complete or otherwise accounted for. The person verifying completion of the item shall list the completion date and his/her initials.

| **Project Closeout Checklist** | | |
|---|---|---|
| | Date Completion Verified | Verified by |
| AS-BUILT DOCUMENTS HANDED OVER | | |
| 1. Contract Drawings | | |
| 2. Specifications | | |
| 3. Addenda | | |
| 4. Change Orders/Contract Modifications | | |
| 5. Reviewed Shop Drawings, Product Data and Samples | | |
| 6. Written Interpretations/Clarifications | | |
| 7. Field Orders | | |
| 8. Field Test Reports | | |
| EQUIPMENT CHECKOUT AND CERTIFICATIONS | | |
| 1. Construction Complete per Drawings/Specifications | | |
| 2. Equipment Installed and Adjusted | | |
| 3. All Shop Drawings have Final Approval | | |
| 4. All Shop Tests Complete and Results Submitted | | |

| Project Closeout Checklist | | |
|---|---|---|
| | Date Completion Verified | Verified By |
| START-UP AND TESTING | | |
| 1. All Checkout and Certifications Complete | | |
| 2. All O&M Manuals Approved | | |
| 3. All Preliminary Training by Manufacturers Rep. Completed | | |
| FINAL CLEANING | | |
| 1. All Construction Facilities Removed | | |
| 2. All Construction Debris Removed | | |
| 3. All Areas Swept/Cleared | | |
| SUBSTANTIAL COMPLETION | | |
| 1. All Items Coordinated Into a Fully Operational System | | |
| 2. All Equipment Units Operational at Specified Efficiencies | | |
| 3. All Field Tests Completed and Reports Submitted | | |
| 4. All Final Training by Manufacturer's Rep. Completed | | |
| 5. All Spare Parts and Lubricants Provided | | |
| CLOSEOUT PROCEDURES | | |
| 1. Written Certification Submitted that Work is Ready for Owner & Engineer Inspector | | |
| 2. Inspection by Owner, Engineer, Contractor completed | | |
| 3. Punch List of Nonconforming Items Prepared | | |
| 4. Documents Required by Governing or Other Authorities Submitted (List Them) | | |
| 5. Final Application for Payment Received | | |
| 6. Contact Completion and Acceptance Certificate | | |

| | | |
|---|---|---|
| Submittal | | |
| 7. Consent of Surety to Final Payment Submittal | | |
| 8. Release and Waiver of Liens and Claims Submitted | | |
| 9. Affidavit of Payment of Debts and Claims Submitted | | |

| **Project Closeout Checklist** | | |
|---|---|---|
| | Date Completion Verified | Verified By |
| 10. Warranties/Guarantees Submitted | | |
| 11. Other Required Releases and Waivers Submitted (List Them) | | |
| 12. Permits Submitted (List Them) | | |
| 13. Weekly Payrolls Submitted as Required by Law | | |
| FINAL COMPLETION | | |
| 1. All Items in Punch List Completed | | |
| 2. All Other Required Documentation Submitted (List It) | | |
| CORRECTION/WARRANTY PERIOD | | |
| Correction Period Start Date: _____<br>End Date: ___ | | |
| 2. Specific Warranties Provided<br><br>Item: Warranty Duration: | | |

Full name of persons signing their initials on this checklist:

_____

_____

_____

_____

_____

END OF SECTION

SECTION 02071

GEOTEXTILE FABRICS

PART 1-GENERAL

1.01 WORK INCLUDED:

This Section covers furnishing of all labor, materials, and equipment necessary to install specified geotextile fabrics in locations shown on the drawings and as required by the Engineer.

1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Six (6) sets of shop drawings or working drawings and material specifications shall be submitted to the Engineer for review for each type of geotextile fabric furnished. General installation practices and installation schedule shall be included.

PART 2-PRODUCTS

2.01 FILTER/DRAINAGE FABRIC:

A. The filter/drainage fabric shall be composed of continuous-filament fibers bonded together to form a sheet. The fabric shall be an average of 20 mils thick and possess the characteristics of Tencate Mirafi 140N.

B. The filter/drainage fabric shall be Tencate Mirafi 140N as manufactured by Tencate Geosynthetics, Pendergrass, GA; Foss-65 by Foss Manufacturing Co., Hampton, NH; US 120NW, as manufactured by US Fabrics, Cincinnati, OH, or approved equal.

PART 3-EXECUTION

3.01 INSTALLATION:

A. GENERAL:

Installation of geotextile fabrics shall be strictly in accordance with manufacturer's instructions and specific layout plans and details reviewed by the Engineer.

B. FILTER/DRAINAGE FABRIC:

1. The filter/drainage fabric shall be installed at locations shown on the drawings or designated by the Engineer.

3.02 FINAL INSPECTION AND ACCEPTANCE:

A. The Contractor shall notify the Engineer upon installation of the filter fabric and at least 24 hours prior to backfilling in order to allow for the Engineer to inspect the work at completion of the installation. Any work found to be unsatisfactory shall be corrected at the Contractor's expense.

B. The Engineer, at the Contractor's expense, reserves the right to have a manufacturer's representative inspect the installation process at any time during construction.

END OF SECTION

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SECTION 02220

DEMOLITION

PART 1- GENERAL

1.01 WORK INCLUDED:

A. Demolish and remove existing structures and equipment as shown on the drawings and as specified.

B. Remove and dispose of the designated equipment and fixtures as shown on the drawings including but not limited to:

1. Existing septic system components designated for removal on the drawings.

C. Owner shall have the option of retaining ownership of equipment and materials being removed.

1.02 REGULATORY REQUIREMENTS:

A. Conform to applicable codes and requirements for demolition of structure, safety of adjacent structure, dust control, service utilities, and discovered hazards.

B. Dispose or recycle all demolition debris in accordance with all applicable regulations.

1.03 RELATED WORK:

A. Section 01014, SCOPE AND SEQUENCING OF WORK

B. Section 02300, EARTHWORK

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Submit six (6) copies of a demolition plan to the Engineer for review at least two weeks prior to the start of work, describing the proposed sequence, methods, and equipment required for the demolition and disposal. Also, indicate measures to be taken to protect new work, and structures and facilities to remain.

B. Do not proceed with the demolition until the Engineer has given written acceptance of the demolition plan. Also, no demolition work shall proceed until the new facility is complete, fully operational, and beneficial occupancy has been obtained by the Owner.

PART 2- PRODUCTS

(Not Used)

PART 3- EXECUTION

3.01 PREPARATION:

A. Provide, erect, and maintain temporary barriers and security devices.

B. Notify Owner of procedures which may affect property, of potential noise, utility outage, or disruption. Coordinate with Owner.

C. Erect and maintain weatherproof airtight closures for exterior openings.

D. Erect and maintain temporary partitions to prevent spread of dust, odors and noise to permit continued Owner occupancy.

E. Protect existing items which are not indicated to be removed.

F. Arrange with, pay for all required fees, and perform work required by utility companies and municipal departments for discontinuance or interruptions of utility services due to demolition work.

3.02 DEMOLITION REQUIREMENTS:

A. Conduct demolition in accordance with approved plan, so as to minimize interference with adjacent areas.

B. Under no circumstances shall explosives be used.

C. Conduct operations with minimum interference to public or private accesses.

D. Maintain protected access and egress at all times. Do not close or obstruct roadways without permits.

E. Cease operations immediately if adjacent structure appears to be in danger. Notify Engineer.

3.03 SELECTIVE DEMOLITION:

A. Demolish and remove components in an orderly and careful manner, in sequence as indicated on Drawings.

B. Protect existing supporting structural members and equipment.

3.04 CLEAN UP:

A. Remove demolished materials from site as work progresses.

B. Leave areas of work in clean condition.

END OF SECTION

SECTION 02252

SUPPORT OF EXCAVATION

PART 1- GENERAL

1.01 WORK INCULDED:

A. This section of the specification covers wood sheeting and bracing for support of excavations. The requirements of this section shall also apply, as appropriate, to other methods of exaction support and underpinning which the Contractor elects to use to complete the work.

B. The Contractor shall furnish and place timber sheeting of the kinds and dimensions required, complying with these specifications, where indicated on the drawings or required by the Engineer.

1.02 RELATED WORK:

A. Section 312319, DEWATERING.

B. Section 02300, EARTHWORK.

1.03 QUALITY ASSURANCE:

A. Thisproject issubject to the Safety and Health regulations ofthe U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Safety and Department of Labor, Division of Occupational Safety "Excavation & Trench Safety Regulation (520 CMR 14.00)" and"Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et seq.)." Contractors shall befamiliar with the requirements of these regulations.

B. Theexcavation support system shallbeofsufficient strength andbeprovidedwithadequate bracing to support all loads to which it will be subjected. The excavation support system shall be designed to prevent anymovement of earththatwoulddiminishthewidthofthe excavation or damage or endanger adjacent structures.

PART 2- PRODUCTS

2.01 MATERIALS:

A. Timber sheeting shall be sound spruce, pine, or hemlock, planed on one side and either tongue and grooved or splined. Timber sheeting shall not be less than nominal 2-inches thick.

B. Timber and steel used for bracing shall be of such size and strength as required in the excavation support design. Timber or steel used for bracing shall be new or undamaged used material which does not contain splices, cutouts, patches, or other alterations which would impair its integrity or strength.

PART 3- EXECUTION

3.01 INSTALLATION:

A. Work shall not be started until all materials and equipment necessary for their construction are either on the site of the work or satisfactorily available for immediate use as required.

B. The sheeting shall be securely and satisfactorily braced to withstand all pressures to which it may be subjected and be sufficiently tight to minimize lowering of the groundwater level outside the excavation, as required in Section 312319, DEWATERING.

C. The sheeting shall bedriven by approved means to the design elevation. No sheeting may be left so as to create a possible hazard to safety of the public or a hindrance to traffic of any kind.

D. If boulders or very dense soils a reen countered, making it impractical to drive a section to the desired depth, the section shall, as required, be cut off.

E. The sheeting shall be left in place where indicated on the drawings or required by the Engineer in writing. At all other locations, the sheeting may be left in place or salvaged at the option of the Contractor. Steel or wood sheeting permanently left in place shall be cut off at a depth of not less than two feet below finish grade unless otherwise required.

F. All cut-off will become the property of the Contractor and shall be removed by him from the site.

G. Responsibility for the satisfactory construction and maintenance of the excavation support system, complete in place, shall rest with the Contractor. Any work done, including incidental construction, which is not acceptable for the intended purpose shall be either repaired or removed and reconstructed by the Contractor at his expense.

H. The Contractor shall be solely responsible for repairing all damage associated with installation, performance, and removal of the excavation support system.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1- GENERAL

1.01 WORK INCLUDED:

The Contractor shall make excavations of normal depth in earth for trenches and structures, shall backfill and compact such excavations to the extent necessary, shall furnish the necessary material and construct embankments and fills, and shall make miscellaneous earth excavations and do miscellaneous grading.

1.02 RELATED WORK:

A. Section 00890, PERMITS

B. Section 01110, CONTROL OF WORK AND MATERIALS

C. Section 01570, ENVIRONMENTAL PROTECTION

D. Section 02071, GEOTEXTILE FABRICS

E. Section 311100, SITE CLEARING

F. Section 312319, DEWATERING

G. Section 02252, SUPPORT OF EXCAVATION

H. Section 02324, ROCK EXCAVATION AND DISPOSAL

I. Section 02745, PAVING

J. Section 02921, SURFACE RESTORATION OF CROSS COUNTRY AREAS

1.03 REFERENCES:

American Society for Testing and Materials (ASTM)

| | | |
|---|---|---|
| ASTM | C131 | Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine. |
| ASTM | C136 | Method for Sieve Analysis of Fine and Coarse Aggregates. |
| ASTM | C330 | Specification for Lightweight Aggregate for Structural Concrete. |
| ASTM | D1556 | Test Method for Density of SoilinPlacebytheSandConeMethod. |
| ASTM | D1557 | Test Methods for Moisture-density Relations of Soils and Soil Aggregate Mixtures Using Ten-pound (10 Lb.) Hammer and Eighteen-inch (18") Drop. |
| ASTM | D2922 | Test Methods for Density of Soil and Soil-aggregate in Place by Nuclear Methods (Shallow Depth). |

Massachusetts Department of Transportation

(MassDOT) Standard Specifications for Highways and Bridges.

Code of Massachusetts Regulations

(CMR) 310.40.0032 Contaminated Media and Contaminated Debris

(CMR) 520 CMR 14.00 Excavation & Trench Safety Regulation

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Samples of all materials proposed for the project shall be submitted to the Engineer for review. Size of the samples shall be as approved by the Engineer.

1.05 PROTECTION OF EXISTING PROPERTY:

A. The work shall be executed in such manner as to prevent any damage to facilities at the site and adjacent property and existing improvements, such as but not limited to streets, curbs, paving, service utility lines, structures, monuments, bench marks, observation wells, and other public or private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout and other hazards created by earthwork operations.

B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at its own expense, make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to at least the condition that existed at the start of operations. The Contractor shall replace, at his own cost, existing benchmarks, observation wells, monuments, and other reference points, which are disturbed or destroyed.

C. Buried drainage structures and pipes, observation wells and piezometers, including those which project less than eighteen inches (18") above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment, ands hall be maintained at allt imes untilc ompletion of project.

1.06 DRAINAGE:

A. The Contractor shall provide, at its own expense, adequate drainage facilities to complete all work items in an acceptable manner. Drainage shall be done in a manner so that runoff will not adversely affect construction procedures or cause excessive disturbance of underlying natural ground or abutting properties.

1.07 FROST PROTECTION AND SNOW REMOVAL:

A. The Contractor shall, at its own expense, keep earthwork operations clear and free of accumulations of snow as required to carry out the work.

B. The Contractor shall protect the subgrade beneath new structures and pipes from frost penetration when freezing temperatures are expected.

PART 2- PRODUCTS

2.01 MATERIALS:

A. GRAVEL BORROW:

Gravel Borrow shall satisfy the requirements listed in MassDOT Specification Section Ml.03.0, Type b.

B. CRUSHED STONE:

Crushed stone shall satisfy the requirements listed in MassDOT Specification SectionM2.01.

C. SAND BORROW:

Sand Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.04.0.

D. PEASTONE:

Peastone shall be smooth, hard, naturally occurring, rounded stone meeting the following gradation requirements:

| | | |
|---|---|---|
| Passing 5/8 inch square sieve opening | - | 100% |
| Passing No. 8 sieve opening | - | 0% |

E. BACKFILL MATERIALS:

1. Class B Backfill:

Class B backfill shall be granular, well graded friable soil; free of rubbish, ice, snow, tree stumps, roots, clay and organic matter; with 30 percent or less passingthe No. 200 sieve; no stone greater than two-third (2/3) loose lift thickness, ors ix inches, whichever is smaller.

2. Select Backfill:

Select backfill shall be granular, well graded friable soil, free of rubbish, ice, snow, tree stumps, roots, clay and organic matter, and other deleterious or organic material; graded within the following limits:

| Sieve Size | Percent Finer by Weight |
|---|---|
| 3-inch | 100 |
| No. 10 | 30-95 |
| No. 40 | 10-70 |
| No. 200 | 0-10 |

F. Lightweight Fillshall be rotary kiln expanded shale meeting all the requirements of ASTM C330. Particles shall be tough, durable, non-corrosive and have thefollowing properties:

Delivered Gradation:

| Sieve Size | Percent Finer by Weight |
|---|---|
| 1-inch | 0 |
| 3/4-inch | 0 to 20 |
| #4 | 85 to 100 |

a. The dry loose unit weight shall be less than 55 PCF.

b. The Contractor shall submit verification of a compacted density of less than 70 PCF. Density shall be verified by testing in accordance with Standard AASHTO Test Designation T99.

c. The maximum soundness loss when tested with five cycles of magnesium sulphate shall be ten percent in accordance with ASTM C131.

d. Moisture content shall be determined by the Engineer.

e. Provide manufacturer's certificate stating materials provided comply with the standards specified.

G. SPECIAL PIPE BEDDING MATERIAL

1. The special pipe bedding material shall consist of a filter fabric installed on the trench bottom before back filling with crushed stone as specified and as shown on the contract drawings. Filter fabric shall be as specified in Section 02071, GEOTEXTILE FABRICS.

H. PROCESSED GRAVEL:

1. Processed gravel shall consist of inert material that is hard,durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The coarse aggregate shall have a percentage of wear,by the Los Angeles Abrasion Test,of not more than 50.

2. The gradation shall meet the following requirements:

| Sieve Designation | Percent Passing |
|---|---|
| 3-inch | 100 |
| 1 1/2-inch | 70-100 |
| ¾-inch | 50-85 |
| No. 4 | 30-60 |
| No. 200 | 0-10 |

3. The approved source of bank-run gravel material shall be processed by mechanical means. The equipment for producing crushed gravel shall be of adequate size with sufficient adjustments to produce the desired materials. The processed material shall be stockpiled in such a manner to minimize segregation of particle sizes. All processed gravel shall come from approved stockpiles.

I. STONE FILL FOR GABIONS:

1. The stone for gabions shall be hard, angular to round, durable and of such quality that they will not disintegrate on exposure to water or weathering during the life of the structure. Gabion rocks shall range between 4-inches and 8-inches. The range in sizes may allow for a variation of 5 percent oversize and/or 5 percent undersize rock, provided it is not placed on the gabion-exposed surface. The size shall be such that a minimum of two layers of rock must be achieved then filling the gabion.

PART 3- EXECUTION

3.01 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING CONSTRUCTION:

A. Contractor shall take the necessary steps to avoid disturbance of subgrade during excavation and filling operations, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering and other acceptable control measures.

B. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be removed and replaced with a minimum 12-inch layer of compacted crushed stone wrapped all around in non-woven filter fabric. Costs of removal and replacement shall be borne by the Contractor.

C. The Contractor shall place a minimum of 12-inch layer of special bedding materials and crushed stone wrapped in filter fabric over the natural underlying soil to stabilize areas which may become disturbed as a result of rain, surface water runoff or groundwater seepage pressures, all at no additional cost to the Owner. The Contractor also has the option of drying materials in-place and compacting to specified densities.

3.02 EXCAVATION:

A. GENERAL:

1. The Contractor shall perform all work of any nature and description required to accomplish the work as shown on the Drawings and as specified.

2. Excavations, unless otherwise required by the Engineer, shall be carried only to the depths and limits shown on the Drawings. If unauthorized excavation is carried out below required subgrade and/or beyond minimum lateral limits shown on Drawings, it shall be backfilled with gravel borrow and compacted at the Contractor's expense as specified below, except as otherwise indicated. Excavations shall be kept in dry and good conditions at all times, and all voids shall be filled to the satisfaction of the Engineer.

3. In all excavation areas, the Contractor shall strip the surficial topsoil layer and underlying subsoil layer separate from underlying soils. In paved areas, the Contractor shall first cut pavement as specified in paragraph 3.02 B.1 of this specification, strip pavement and pavement subbase separately from underlying soils. All excavated materials shall be stockpiled separately from each other within the limits of work.

4. The Contractor shall follow a construction procedure, which permits visual identification of stable natural ground. Where groundwater is encountered, the size of the open excavation shall be limited to that which can be handled by the Contractor's chosen method of dewatering and which will allow visual observation of the bottom and backfill in the dry.

5. The Contractor shall excavate unsuitable materials to stable natural ground where encountered at proposed excavation subgrade, as required by the Engineer. Unsuitable material includes topsoil, loam, peat, other organic materials, snow, ice, and trash. Unless specified elsewhere or otherwise required by the Engineer, areas where unsuitable materials have been excavated to stable ground shall be backfilled with compacted special bedding materials or crushed stone wrapped all around in non-woven filter fabric.

B. TRENCHES:

1. Prior to excavation, trenches in pavement shall have the traveled way surface cut in a straight line by a concrete saw or equivalent method, to the full depth of pavement. Excavation shall only be between these cuts. Excavation support shall be provided as required to avoid undermining of pavement. Cutting operations shall not be done by ripping equipment.

2. The Contractor shall satisfy all dewatering requirements specified in Section 312319 DEWATERING, before performing trench excavations.

3. Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes, and depths of cover indicated on the Drawings. Trench widths shall be as shown on the Drawings or as specified.

4. Where pipe is to be laid in bedding material, the trench may be excavated by machinery to, or just below, the designated subgrade provided that the material remaining in the bottom of the trench is not disturbed.

5. If pipe is to be laid in embankments or other recently filled areas, the fill material shall first be placed to a height of atl east 12-inches above the top of the pipe before excavation.

6. Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until back filling has been completed.

7. If, in the opinion of the Engineer, the subgrade, during trench excavation, has been disturbed as a result of rain, surface water runoff or groundwater seepage pressures, the Contractor shall remove such disturbed subgrade to a minimum of l2-inches and replace with crushed stone wrapped in filter fabric. Cost of removal and replacement shall be borne by the Contractor.

8. The Contractor shall obtain a trench permit from the municipality where the trench is located prior to making any excavations of trenches (any subsurface excavation greater than three (3) feet in depth and fifteen (15) feet or less between soil walls as measured from the bottom).

9. All trenches required to be permitted must be attended, covered, barricaded, or backfilled. Covers must be road plates at least ¾-inch thick or equivalent, barricades must be fences at least 6-feet high with no openings greater than 4-inches between vertical supports and all horizontal supports required to be located on the trench-side of the fencing.

C. BUILDING AND FOUNDATION EXCAVATION:

1. Excavations shall not be wider than required to set, brace, and remove forms for concrete, or perform other necessary work.

2. After the excavation has been made, and before forms are set for footings, mats, slabs, or other structures, and before reinforcing is placed, all loose or disturbed material shall be removed from the subgrade. The bearing surface shall then be compacted to meet the requirements of this specification.

3. If, in the opinion of the Engineer, the existing material at subgrade elevation is unsuitable for structural support, the Contractor shall excavate and dispose of the unsuitable material to the required width and depth as required by the Engineer. If, in the opinion of the Engineer, filter fabric is required; the Contractor shall place filter fabric, approved by the Engineer, as per manufacturer's recommendations. Crushed stone shall then be placed in lifts and compacted to required densities. Backfill shall be placed to the bottom of the proposed excavation.

D. EXCAVATION NEAR EXISTING STRUCTURES:

1. Attention is directed to the fact that there are pipes, manholes, drains, and other utilities in certain locations. An attempt has been made to locate all utilities on the drawings, but the completeness or accuracy of the given information is not guaranteed.

2. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and excavation shall be done by means of hand tools, as required. Such manual excavation, when incidental to normal excavation, shall be included in the work to be done under items involving normal excavation.

3. Where determination of the exact location of a pipe or other underground structure is necessary for properly performing the work, the Contractor shall excavate test pits to determine the locations.

3.03 BACKFILL PLACEMENT AND COMPACTION:

A. GENERAL:

1. Prior to backfilling, the Contractor shall compact the exposed natural subgrade to the densities as specified herein.

2. After approval of subgrade by the Engineer, the Contractor shall backfill areas to required contours and elevations with specified materials.

3. The Contractor shall place and compact materials to the specified density in continuous horizontal layers, not to exceed nine (9) inches in uncompacted lifts. The degree of compaction shall be based on maximum dry density as determined by ASTM Test D1557, Method C. The minimum degree of compaction for fill placed shall be as follows:

| Location | Percent of Maximum Density |
|---|---|
| Below pipe centerline | 95 |
| Above pipe centeline | 92 |
| Below pavement (upper 3 ft.) | 95 |
| Embankments | 95 |
| Below pipe in embankments | 95 |
| Below structures | 95 |

4. The Engineer reserves the right to test backfill for conformance to the specifications and Contractor shall assist as required to obtain the information. Compaction testing will be performed by the Engineer or by an inspection laboratory designated by the Engineer, engaged and paid for by the Owner. If test results indicate work does not conform to specification requirements, the Contractor shall remove or correct the defective Work by recompacting where appropriate or replacing as necessary and approved by the Engineer, to bring the work into compliance, at no additional cost to the Owner. All backfilled materials under structures and buildings shall be field tested for compliance with the requirements of this specification.

5. Where horizontal layers meet a rising slope, the Contractor shall key each layer by benching into the slope.

6. If the material removed from the excavation is suitable for backfill with the exception that it contains stones larger than permitted, the Contractor has the option to remove the oversized stones and use the material for backfill or to provide replacement backfill at no additional cost to the Owner.

7. The Contractor shall remove loam and topsoil, loose vegetation, stumps, large roots, etc., from areas upon which embankments will be built or areas where material will be placed for grading. The subgrade shall be shaped as indicated on the Drawings and shall be prepared by forking, furrowing, or plowing so that the first layer of the fill material placed on the subgrade will be well bonded to the subgrade.

8. Where called for on the Drawings, Lightweight Fill shall be placed and compacted as recommended by the manufacturer. The exact number of passes shall be approved by the Engineer to insure stability of the layer. As soon as the compaction of each layer has been completed, the next layer shall then be placed. The Contractor shall take all necessary precautionsduringconstructionactivitiesinoperationsonoradjacentto the Lightweight Fill to insure that the material is not over-compacted. Construction equipment, other than for compaction, shall not operate on the exposed Lightweight Fill. The top surface of the Lightweight Fill lying directly below the gravel course shall be chinked by additional rolling of the Lightweight Fill to prevent infiltration of fines.

B. TRENCHES:

1. Bedding as detailed and specified shall be furnished and installed beneath the pipeline prior to placement of the pipeline. A minimum bedding thickness shall be maintained betweenthepipeandundisturbedmaterial, as shown onthe Drawings.

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

3. Unless otherwise indicated on the Drawings, select backfill shall be placed by hand shovel in 6-inch thick lifts up to aminimum levelofl2-inches above thetop of pipe. This areaofbackfill isconsidered thezonearoundthepipeandshallbethoroughly compacted beforetheremainder ofthetrenchisbackfilled. Compaction ofeachlift in the zone around the pipe shall be done by use of power-driven tampers weighing at least20 pounds or by vibratorycompactors. Careshallbetakenthatmaterialcloseto the bank, as well as in all other portions of the trench, is thoroughly compacted to densities required.

4. Class B backfill shall be placed from the top of the select backfill to the specified material at grade (loam, pavement subbase, etc.). Fill compaction shall meet the density requirements of this specification.

5. Water Jetting:

   a. Water jetting may be used when the backfill material contains less than 10 percent passing the number 200 sieve, butshall be used only if approved by the Engineer.

   b. Contractor shall submit adetailed plan describing theprocedures he intends to use for water jetting to the Engineer for approval prior to any water jetting taking place.

   c. Compaction of backfill placed by water jetting shall conform to the requirements of this specification.

6. If the materials above the trench bottom are unsuitable for backfill, the Contractor shall furnish and place backfill materials meeting the requirements for trench backfill, as shown on the drawings or specified herein.

7. Should the Engineer order crushed stone for utility supports or for other purposes, the Contractor shall furnish and install the crushed stone as directed.

8. In shoulders of streets and road, the top 12-inch layer of trench backfill shall consist of processed gravel for sub-base, satisfying the requirements listed in MassDOT standard specification M1.03.1.

C. BACKFILLING UNDER BUILDINGS AND FOUNDATIONS:

Material to be used as structural fill under structures shall bespecial bedding material or gravel borrow, as shown on the Drawings or as required by the Engineer. Where gravel borrow fil1 is required to support proposed footings, walls, slabs, and other structures, the material shall be placed in a manner accepted by the Engineer. Compaction of each lift shall meet the density requirements of this specification.

D. BACKFILLING ADJACENT TO STRUCTURES:

1. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads to which they will be subjected. Excavated material approved by the Engineer may be used in backfilling around structures. Backfill material shall be thoroughly compacted to meet the requirements of this specification.

2. Contractor shall use extra care when compacting adjacent to pipes and drainage structures. Backfill and compaction shall proceed along sides of drainage structures so that the difference in top of fill level on any side of the structure shall not exceed two feet (2') at any stage of construction.

3. Where backfill is to be placed on only one side of a structural wall, only hand-operatedrollerorplatecompactorsshallbeusedwithinalateraldistanceoffivefeet (5') of the wall for walls less than fifteen feet (15') high and within ten feet (10') of the wall for walls more than fifteen feet (15') high.

3.04 DISPOSAL OF SURPLUS MATERIALS:

A. Surplus excavated materials, which are acceptable to the Engineer, shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill. Upon written approval of the Engineer, surplus excavated materials shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes as indicated by the Owner, within its jurisdictional limits; all at no additional cost to the Owner.

B. Surplus excavated material not needed as specified above shall be hauled away and disposed of by the Contractor at no additional cost to the Owner, at appropriate locations, and in accordance with arrangements made by him. Disposal of all rubble shall be in accordance with all applicable local, state and federal regulations.

C. No excavated material shall be removed from the site of the work or disposed of by the Contractor unless approved by the Engineer.

D. The Contractor shall comply with Massachusetts regulations (310 CMR 40.0032) that govern the removal and disposal of surplus excavated materials. Materials, including contaminated soils, having concentrations of oil or hazardous materials less than an otherwise Reportable Concentration and that are not a hazardous waste, may not be disposed of at locations where concentrations of oil and/or hazardous material at the receiving site are significantly lower than the levels of those oil and/or hazardous materials present in the soil being disposed or reused.

END OF SECTION

SECTION 02324

ROCK EXCAVATION AND DISPOSAL

PART 1- GENERAL

1.01 WORK INCLUDED:

The Contractor shall excavate rock, if encountered, to the lines and grades indicated on the drawings or as required, shall dispose of the excavated material, and shall furnish the required material as specified in Section 02300 EARTHWORK for backfill in place of the excavated rock.

1.02 RELATED WORK:

A. Section 02252, SUPPORT OF EXCAVATION

B. Section 02300, EARTHWORK

C. Section 03302, FIELD CONCRETE

1.03 DEFINITIONS:

A. The word "rock," wherever used as the name of the excavated material or material to be excavated, shall mean only boulders and pieces of concrete or masonry exceeding three cubic yards in volume, or solid ledge rock which, in the opinion of the Engineer, requires for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. No soft or disintegrated rock which can be removed by normal earth excavation methods, no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere, and no rock exterior to the maximum limits of measurement allowed, which may fall into the excavation, will be measured or allowed as "rock."

B. The word "earth," wherever used as the name of an excavated material, or material to be excavated shall mean all kinds of material other than rock as above defined.

1.04 QUALITY ASSURANCE:

A. The Contractor shall conform to all municipal ordinances and state and federal laws relating to the transportation, storage, handling, and use of explosives. In the event that any of the above mentioned laws, ordinances, or regulations require a licensed blaster to perform or supervise the work of blasting, said licensed blaster shall, at all times, have his license on the work site and shall permit examination thereof by the Engineer or other officials having jurisdiction.

B. The Contractor shall procure all permits required for blasting.

1.05 SUBMITTALS:

A. At least two weeks before beginning blasting operations, the Contractor shall submit to the Engineer for record the following data:

1. Name of Contractor or Subcontractor responsible for blasting and monitoring operations and license number.

2. Name, affiliation, and license number of the person or persons who will be directly responsible for designing each blast, supervising the loading of the shot, and firing it.

B. Copies of all permits required for blasting.

C. Results of pre-blast survey.

D. When blasting is in progress, daily reports on blasting operations and blast monitoring results.

1.06 DELIVERY/STORAGE AND HANDLING:

Delivery, storage and handling of explosives shall conform to all federal, state and local regulations and permits.

PART 2- PRODUCTS

NOT APPLICABLE

PART 3- EXECUTION

3.01 PREPARATION/PRE-BLAST SURVEY

If required, the pre-blast survey shall be conducted in accordance with state regulations and/or local permit requirements.

3.02 EXCAVATION:

A. The Contractor shall excavate rock to the lines and grades indicated on the drawings or as required by the Engineer. The excavated rock shall be removed and disposed of by the Contractor as specified for surplus excavated materials under Section 02300, EARTHWORK.

B. Work damaged by blasting shall be repaired or replaced at the Contractor's expense.

C. If rock is excavated beyond the limits of payment indicated on the drawings, specified, or authorized in writing by the Engineer, the excavation, whether resulting from over breakage or other causes, shall be backfilled, by and at the expense of the Contractor, as specified below:

1. In pipe trenches, excess excavation shall be filled with the required material and compacted in the same manner as specified for the material in the zone around the pipe under Section 02300 EARTHWORK.

2. In excavations for structures, excess excavation in the rock beneath foundations shall be filled with concrete which shall have a minimum 28-day compressive strength of 3000 psi. Other excess excavation shall be filled with Class B backfill compacted to a minimum of 92 percent density (ASTM D1557 Method C) as specified under Section 02300, EARTHWORK.

3. If the rock below normal depth is shattered due to drilling or blasting operations of the Contractor, and the Engineer considers such shattered rock to be unfit for foundations, the shattered rock shall be removed and the excavation shall be backfilled with concrete as required, except that in pipe trenches crushed stone may be used for backfill, if approved. All such removal and backfilling shall be done by and at the expense of the Contractor.

D. When required by the Engineer, the Contractor shall remove all dirt and loose rock from designated areas and shall clean the surface of the rock thoroughly to determine whether seams or other defects exist.

E. When concrete is to be placed on rock, the rock shall be free of all vegetation, dirt, sand, clay, boulders, scale, excessively cracked rock, loose fragments, water, ice, snow, and other objectionable substances.

3.03 VIBRATION AND AIR BLAST MONITORING:

A. The Contractor shall measure air blast and vibration levels of blasting operations to assure compliance with all applicable regulations and local permits.

B. Records of each day's air blast and vibration measurements shall be submitted to the Engineer in writing no later than the start of the next day's work. Records shall include, as a minimum:

1. Identification of instrument

2. Name of observer

3. Name of interpreter

4. Distance and direction of recording station from the area of detonation

5. Date and exact time of reading

6. Type of ground at recording station

7. Peak particle velocity for all components as well as resultant for all frequencies of vibrations

8. Duration of motion with a velocity in excess of one thousandth of an inch per second

9. A copy of the photographic record of seismograph readings

10. Peak air blast level.

3.04 BLASTING RECORDS:

The Contractor shall prepare and submit to the Engineer daily blast reports, including logs of each blast. Reports shall be submitted to the Engineer no later than the start of the next day's work. However, during each day of blasting, the Contractor shall review and shall provide access for the Engineer to review the data from that day's blasting. Reports after each blast shall include at least the following information for each blast:

1. Date, time, and location of blast

2. Permit number and expiration date

3. Amount and type of explosives used by weight and number of cartridges

4. Total number of delays used and number of holes used for each delay

5. On a diagram of the blast pattern, indicate total number and depth of holes, maximum charge per delay, maximum charge per hole, and corresponding delay number

6. An evaluation of the blast indicating areas of significant overbreak, unusual results, and any recommended adjustments for the next blast.

3.05 POST BLASTING INSPECTIONS:

The Contractor shall examine any properties, structures, and conditions where complaints of damage have been received or damage claims have been filed. Advance notice shall be given to all interested parties so that the parties may be present during the final examination. Records of the final examination shall be signed and distributed to the owner of the property, the head of the local fire department, and the Engineer.

END OF SECTION

SECTION 02513

INSULATION FOR PIPELINES

PART 1- GENERAL

1.01 WORK INCLUDED:

This Section covers the furnishing of all material, accessories, labor, and equipment necessary to insulate the pipelines where shown on the drawings and where so required by the Engineer.

1.02 RELATED WORK:

A. Section 02080, DUCTILE IRON PIPE AND FITTINGS

B. Section 02300, EARTHWORK

1.03 REFERENCES:

A. The following standards form a part of this specification as referenced:

American Society for Testing and Materials (ASTM)

ASTM C552 Specification for Cellular Glass Block and Pipe Thermal Insulation

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Six sets of manufacturer's literature of the materials of this section and installation instructions for the products being provided for the project shall be submitted to the Engineer for review.

B. A sample of the insulation shall be submitted to the Engineer.

PART 2- PRODUCTS

2.01 DIRECT BURIED PIPE

A. Insulation shall be cellular glass type. The insulation shall be a cellular glass product that is made specifically for thermal insulation of piping and is compatible with the piping material. Insulation shall be a minimum of 2 inches thick, unless otherwise shown on the drawings.

B. Insulation shall be composed of all glass sealed cells having no binders or fillers. The completed product shall be rigid and impermeable, with an ultimate compressive strength of at least 90 psi.

C. Cellular glass insulation shall comply with all requirements of ASTM C552. The cellular glass shall be fabricated in half sections whenever possible.

D. Insulation to the pipe shall be 0.5 inches wide by 0.020 inches thick made of stainless steel.

E. e jacketing for the insulation shall be one of the following methods:

1. A 125 mil (3mm) thick, heat sealed high polymer asphaltic membrane with an integral glass scrim and integral 1 mil (.02mm) aluminum foil and a thin Mylar film on the surface, equal to Pittwrap Jacketing as manufactured by Pittsburgh Corning or equal.

2. Mastic - asphalt cutback mastic, equal to Pittcote 300 Finish, as manufactured by Pittsburgh Corning or equal.

3. Reinforcing fabric - an open mesh polyester fabric with a 6 x 5.5 mesh/inch configuration, equal to PC Fabric 79, as manufactured by Pittsburgh Corning or equal.

F. e insulation shall be "Foam glass" with jacketing as manufactured by Pittsburgh Corning Corporation, Pittsburgh, PA, or an approved equal. A minimum of 6" layer of fine sand shall surround the insulated pipe before rock free backfill is used in the trench.

G. e Foam glass and jacketing shall be installed per the manufacturer instructions included in the approved shop drawings.

H. es, valves, and bends shall be covered with form fitting factory made sections.

PART 3-EXECUTION

3.01 INSTALLATION:

A. Cellular glass shall not be applied to the piping until the piping has been wiped clean and supported so that there is adequate space to apply the full thickness of insulation and the covering completely around the pipe. The Contractor must obtain the

B. Cellular glass insulation and jacketing shall be applied in accordance with the manufacturers installation procedures included in the approved shop drawings.

C. There shall be at least three 0.50-inch wide stainless steel bands secured around each joint and these bands shall be placed not over 9 inches on center on straight sections of pipe.

D. Tees, valves, and bends shall be covered with form fitting factory made sections.

E. All testing of the piping system, such as hydrostatic, x-ray or other such testing, shall be accomplished prior to application of insulation.

END OF SECTION

SECTION 02518

TRACER TAPE

PART 1- GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing, handling and installation of tracer tape, as called for on the drawings.

1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Six sets of manufacturer's literature on the materials, colors and printing specified herein, shall be submitted to the Engineer for review.

B. Tape samples shall also be submitted to the Engineer for review.

PART 2- PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

Tracer tape shall be by Reef Industries, Houston, TX; Empire Level, Mukwonago, WI; Pro-Line Safety Products Co., W. Chicago, IL; or approved equal.

2.02 TRACER TAPE:

A. Tracer tape shall be at least 3-inches wide.

B. Tracer tape for non-ferrous pipe or conduit shall be constructed of a metallic core bonded to plastic layers. The metallic tracer tape shall be a minimum 5-mil thick and must be locatable at a depth of 18 inches with ordinary pipe locaters.

C. Tracer tape for ferrous pipe or conduit shall consist of multiple bonded plastic layers. The non-metallic tracer tape shall elongate at least 500% before breaking.

D. The tape shall bear the wording: "BURIED DRAIN LINE BELOW" (with "DRAIN" replaced by "WATER, "SEWER", "ELECTRICAL", "GAS", "TELEPHONE", or "CHEMICAL" as appropriate), continuously repeated every 30 inches to identify the pipe.

E. Tape colors shall be as follows, as recommended by the American Public Works Association (APWA):

| | |
|---|---|
| Electric | Red |
| Gas & Oil | Yellow |
| Communications | Orange |
| Water | Blue |
| Sewer & Drain | Green |
| Chemical | Red (not AWPA) |

PART 3-EXECUTION

3.01 INSTALLATION:

A. Tracer tape shall be installed directly above the pipe or conduit it is to identify, approximately 12 inches below the proposed ground surface.

B. The Contractor shall follow the manufacturer's recommendations for installation of the tape, as approved by the Engineer.

END OF SECTION

SECTION 02920

LOAMING ANDSEEDING

PART 1- GENERAL

1.01 WORK INCLUDED:

This section covers all labor, materials, and equipment necessary to do all loaming, seeding and related work as indicated on the drawings and as herein specified. All lawns disturbed by the Contractor's operations shall be repaired as here in specified.

1.02 RELATED WORK:

A. Section 02931, LANDSCAPING

1.03 QUALITY ASSURANCE:

A. For a particular source of loam, the Engineer may require the Contractor to send approximately 10 pounds of loam to an approved testing laboratory and have the following tests conducted:

1. Organic concentration
2. pH
3. Nitrogen concentration
4. Phosphorous concentration
5. Potash concentration

A. These tests shall be at the Contractor's expense. Test results, with soil conditioning and fertilizing recommendations, shall be forwarded to the Engineer.

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Six sets of information detailing the seed mixes, fertilizers, mulch material, slope protection material (if required) and origin of loam shall be submitted to the Engineer for review.

A. Three sets of test results shall be submitted to the Engineer for review.

PART 2- PRODUCTS

2.01 MATERIALS:

A. LOAM:

1. Loam shall be a natural, fertile, friable soil, typical of productive soils in the vicinity, obtained from naturally well-drained areas, neither excessively acid nor alkaline, and containing no substances harmful to grass growth. Loam shall not be delivered to the site in frozen or muddy condition and shall be reasonably free of stumps, roots, heavy or stiff clay, stones larger than l-inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other litter.

2. The loam shall contain not less than 4 percent nor more than 20 percent organic matter as determined by the loss of weight by ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F.

A. LIME:

Lime shall be standard commercial ground limestone containing at least 50 percent total oxides (calcium oxide and magnesium oxide), and 50 percent of the material must pass through a No. 100 mesh sieve with 98 percent passing a No. 2 mesh sieve.

B. FERTILIZER:

Fertilizer shall be commercial fertilizer, 10-10-10 fertilizer mixture containing at least 40 percent of organic nitrogen. It shall be delivered to the site in the original sealed containers, each showing the manufacturer's guaranteed analysis. Fertilizer shall be stored so that when used it will be dry and free flowing. No fertilizer shall be used which has not been marketed in accordance with State and Federal Laws, relating to fertilizers.

C. MULCH:

1. Materials to be used in mulching shall conform to the following requirements:

2. Straw Mulch - Straw Mulch shall consist of stalks or stems of grain after threshing.

3. Wood FibreMulch-Wood FibreMulch shall consist of wood fibre produced from clean, whole uncooked wood, formed into resilient bundles having a high degree of internal friction and shall be dry when delivered to the project.

D. SEED:

1. Seed shall be of an approved mixture, the previous year's crop, clean, high in germinating value,a perennial variety,and low in weed seed. Seed shall be obtained from a reliable seed company and shall be accompanied by certificates relative to mixture purity and germinating value.

2. Grass seed for lawn areas shall conform to the following requirements:

| | Proportion by Weight | Germination Purity | Purity Minimum |
|---|---|---|---|
| Chewing’s Fescue | 30% | 70% | 97% |
| Kentucky 31 Fescue | 30% | 90% | 98% |
| Kentucky Blue Grass | 20% | 80% | 85% |
| Domestic Rye Grass | 20% | 90% | 98% |

Grass seed for cross-country areas, slopes and other areas not normally mowed shall conform to the following requirements:

| | Proportion by Weight | Germination Minimum | Purity Minimum |
|---|---|---|---|
| Creeping Red Fescue | 50% | 85% | 95% |
| Kentucky 31 | 30% | 85% | 95% |
| Domestic Rye | 10% | 90% | 98% |
| Red Top | 5% | 85% | 92% |
| Ladino Clover | 5% | 85% | 96% |

E. TEMPORARY COVER CROP:

1. Temporary cover crop shall conform to the following requirements:

| | % Weight | Germination Minimum |
|---|---|---|
| Winter Rye | 80 min. | 85% |
| Red Fescue (creeping) | 4 min. | 80% |
| Perennial Rye Grass | 3 min. | 90% |
| Red Clover | 3 min. | 90% |
| Other Crop Grass | 0.5 max. | |
| Noxious Weed Seed | 0.5 max. | |
| Inert Matter | 1.0 max. | |

F. SLOPE EROSION PROTECTION:

1. Erosion control blanket shall be 100% degradable plastic mesh with 100% degradable straw or straw/coconut fill. Fill shall be held together by degradable fastening. Weight shall be 0.50 lb/sq. yd. Erosion control blankets shall be applied parallel to direction of water flow. The erosion control blankets shall be by North American Green, Evansville, IN orapproved equal. Forslopes 2:1 or greater, Model SC150 shall be used. For slopes less than 2:1, Model S150 shall be used.

2. Six inch wire staples shall be placed according to manufacturer’s recommend anchor the mesh material. Staples shall be designed to decompose.

PART 3- EXECUTION

2.02 SURFACE PREPARATION:

A. After approval of rough grading, loam shall be placed on areas affected by the Contractor's operations. Loam shall be at least 6-inches compacted thickness.

B. Lime shall be applied to bring the pH to 6.5 or, without a soil test, at the rate of2-3 tons of lime per acre.

C. Fertilizer shall be applied according to the soil test, or without a soil test, at the rate of 1000 pounds per acre.

D. Loam shall be worked a minimum of3-inches deep, thoroughly incorporating the lime and fertilizer into the soil. The loam shall then be raked until the surface is finely pulverized and smooth and compacted with rollers, weighing not over 100 pounds per linear foot of tread, to an even surface conforming to the prescribed lines and grades. Minimum depth shall be 6-inches after completion.

2.03 SEEDING:

A. Seeding shall be done when weather conditions are approved as suitable, in the periods between April 1 and May 30 or August 15 to October 1, unless otherwise approved.

A. If there is a delay inseeding, during which weeds grow or soil is washed out, the Contractor shall remove the weeds or replace the soil before sowing the seed, without additional compensation. Immediately before seeding is begun, the soil shall be lightly raked.

B. Seed shall be sown at the approved rate, on a calm day by machine.

C. One half the seed shall be sown in one direction and the other half at right angles. Seed shall be raked lightly into the soil to a depth of1/4-inch and rolled with a roller weighing not more than 100 pounds per linear foot of tread.

D. The surface shall be kept moist by a fine spray until the grass shows uniform germination over the entire area. Wherever poor germination occurs in areas larger than 3 sq. ft., the Contractor shall reseed, roll, and water as necessary to obtain proper germination.

E. The Contractor shall water, weed, cut and otherwise maintain and protect seeded areas as necessary to produce a dense, healthy growth of perennial lawn grass.

F. If there is insufficient time in the planting season to complete the fertilizing and seeding, permanent seeding may be left until the following planting season, at the option of the Contractor or as required by the Engineer. In that event, a temporary cover crop shall be sown. This cover crop shall be cut and watered as necessary until the beginning of the following planting season, at which time it shall be plowed or harrowed into the soil, the area shall be fertilized and the permanent seed crop shall be sown as specified.

2.04 PLACING MULCH:

A. Straw Mulch shall be loosely spread to a uniform depth over all areas designated on the plans, at the rate of 4-1/2 tons per acre, or as otherwise required.

A. Straw Mulch may be applied by mechanical apparatus, if in the judgment of the Engineer the apparatus spreads the mulch uniformly and forms a suitable mat to control slope erosion. The apparatus shall be capable of spreading at least 80 percent of the hay or straw in lengths of 6-inches or more, otherwise it shall be spread by hand without additional compensation.

B. Wood Fibre Mulch shall be uniformly spread over certain selected seeded areas at the minimum rate of 1,400 pounds per acre unless otherwise required. It shall be placed by spraying from an approved spraying machine having pressure sufficient to cover the entire area in one operation.

2.05 SEEDING AND MULCHING BY SPRAY MACHINE:

A. The application of lime, fertilizer, grass seed and mulch may be accomplished in one operation by the use of an approved spraying machine. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The spraying equipment shall be so designed that when the solution is sprayed over an area, the resulting deposits of lime, fertilizer, grass seed and mulch shall be equal to the specified quantities.

A. A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of limestone, fertilizer, grass seed and mulch per 100 gallons of water.

B. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above. If the results of the spray operation are unsatisfactory, the Contractor will be required to abandon this method and to apply the lime, fertilizer, grass seed and mulch by other methods.

2.06 INSPECTION AND ACCEPTANCE:

At the beginning of the planting season following that in which the permanent grass crop is sown, the seeded areas will be inspected. Any section not showing dense, vigorous growth at that time shall be promptly reseeded by the Contractor at his own expense. The seeded areas shall be watered, weeded, cut and otherwise maintained by the Contractor until the end of that planting season, when they will be accepted if the sections show dense, vigorous growth.

END OF SECTION

SECTION 02921

SURFACE RESTORATION OF CROSS COUNTRY AREAS

## PART 1- GENERAL

### 1.01 WORK INCLUDED:

This section covers labor, materials, and equipment necessary to restore cross country areas affected by the Contractor's operations.

### 1.02 RELATED WORK:

A. Work in cross country areas shall also be in accordance with Section 01570, ENVIRONMENTAL PROTECTION.

A. Restoring lawn areas is specified in Section 02920, LOAMING AND SEEDING.

### 1.03 SYSTEM DESCRIPTION:

A. Cross country areas shall be restored as much as possible to their original condition. A vegetative cover shall be established as soon as possible to prevent erosion.

A. In areas within or adjacent to wetlands, the provisions of the Conservation Commission Order of Conditions shall be adhered to unless otherwise required by the Engineer.

## PART 2- PRODUCTS

### 2.01 MATERIALS:

A. Seed Mix shall consist of a certified mixture of the following seeds:

1. Conservation/Wildlife mix — Big Bluestem, Switchgrass, Little Bluestem, Canada Wild Rye, Fox Sedge, Partridge Pea, Fringed Bromegrass, Pennsylvania Smartweed, Common Milkweed, Nodding Bur-marigold, Showy Tick-Trefoil, Silky Smooth Aster, Flat-top Aster.

2. New England Wildflower Mix -Creeping Red Fescue, Little Bluestem, Indian Grass, Partridge Pea, Wild Blue Lupine, Smooth Aster, Canada Wild Rye, Common Milkweed, Wild Senna, Heath Aster, Butterfly Milkweed, Early Goldenrod, Grey Goldenrod, New England Aster.

A. Weed seed shall be less than 1 percent.

B. Lime and fertilizer shall be as specified in Section 02920, LOAMING AND SEEDING, except as noted below:

1. New England Wildflower Mix - fertilization is not required unless the soils are particularly infertile.

C. Mulch shall consist of weed-free straw.

PART 3- EXECUTION

3.01 SEPARATION OF SURFACE MATERIALS:

A. Topsoil shall be carefully removed and separately stored to be used again as required.

3.02 SURFACE PREPARATION:

A. After approval of rough grading, the stockpiled topsoil shall be replaced in the areas affected by the Contractor's operations.

A. Seedbed shall be worked up a minimum of 3-inches deep. The topsoil shall then be raked until the surface is finely pulverized and smooth and shall be compacted with rollers weighing not over 100 pounds per linear foot of tread, to an even surface to the prescribed lines and grades.

3.03 SEEDING:

A. Seeding shall be done when weather conditions are approved as suitable, in the periods between April 1 and May 30 or August 15 to October 1, unless otherwise approved.

Straw mulch shall be used for summer and fall seeding for the following seed mixes: New England Wildflower Mix

Straw mulch shall be used at all times that the Erosion Control/Restoration Mix for Dry Sites is applied.

A. Seed shall be sown at a rate applicable to the type of seed mix being applied. Application rates shall be as follows:

1. Conservation/Wildlife Mix — 25 lb/acre

2. New England Wildflower Mix — 15 lb/acre

Mix may be applied by hydro seeding, mechanical spreader, or by hand on small sites.

B. One half the seed shall be sown in one direction and the other half at right angles. Seed shall be raked lightly into the soil to a depth of'Z4-inch and rolled with a roller weighing not more than 100 pounds per linear foot of tread.

C. Wherever poor germination occurs in areas larger than 3 square feet, the Contractor shall reseed, roll, and water as necessary to obtain proper germination.

3.04 INSPECTION AND ACCEPTANCE:

A. At the beginning of the planting season following that in which the seed mix is sown, the seeded areas shall be inspected. Any section not showing dense, vigorous growth at that time shall be promptly reseeded by the Contractor at his own expense. If necessary, the Contractor shall furnish and apply soil conditioners and fertilizer to achieve acceptable growth.

A. The seeded areas shall be watered, cut and otherwise maintained by the Contractor until the end of that planting season, when they will be accepted if the sections show dense, vigorous growth.

END OF SECTION

## PART 1- GENERAL

2.02 WORK INCLUDED:

A. This Section includes furnishing all labor, materials, equipment, plants, and incidental materials necessary to perform all operations related to the planting of all trees, shrubs, vines, herbaceous plants, ground covers, and for all appurtenant work, complete in place, maintained, and accepted, in accordance with the Contract Drawings and Specifications.

A. The Contractor shall bear the responsibility and cost of furnishing and applying water or any other substances, as necessary to ensure the sustainability of plant materials, as part of the work of this contract.

1.02 RELATED WORK:

A. Section 02920, LOAMING AND SEEDING

1.03 SUBMITTALS:

In accordance with requirements of the general specifications, the Contractor shall submit the following:

A. Prior to planting, State nursery inspection certificates for all plant materials shall be submitted to the Engineer for review.

A. Samples and six copies of the manufacturer's product data, as applicable, shall be submitted to the Engineer for review and approval for the following materials:

1. Limestone.
2. Fertilizer.
3. Sphagnum Peat Moss.
4. Humus.
5. Organic Compost.
6. Manure.
7. Mulch.
8. Guying and Staking Apparatus.
9. Crepe Wrapping for tree trunks.

10. Anti-transpirant/Anti-desiccant.

11. Insecticides.

12. Herbicides.

13. Fungicides.

PART 2- PRODUCTS

1.01 PLANT MATERIALS:

A. The Contractor shall furnish and plant all plant materials as shown on the plans and in the quantities and sizes listed thereon. No substitutions shall be permitted without the written approval of the Engineer.

A. Plants larger than those specified in the Plant List may be used if approved by the Engineer. However, use of such oversized plants shall not be considered grounds for any increase in the contract price. If the use of larger plants is approved, the required spread of roots or ball of earth shall be increased in proportion to the size of the plant and plant pits shall be increased as necessary.

B. All plants shall be certified to have passed all required Federal and State inspection laws requiring ensuring freedom from plant diseases and insect infestations. The Contractor shall obtain clearance from applicable governing agencies, as required by law, before planting any plants delivered from outside the state in which they are to be planted.

C. All plants shall be nursery-grown under climatic conditions and environmental stresses similar to those in the locality of the project. All plants shall originate from nurseries that are no more than one Hardiness Zone higher (as established by the Arnold Arboretum, Jamaica Plain, MA) than where the plant is to be installed. Plants also shall conform to the botanical names and standards of size, culture, and quality for the highest grades and standards as adopted by the American Association of Nurserymen, Inc. in the American Standard for Nursery Stock, ANSI-Z60.1, latest edition. All plants shall be legibly tagged with their proper botanical name.

D. No heeled-in plants or plants from cold storage shall be used. All plants shall be typical of their species or variety and shall have a normal habit of growth. Plants shall be sound, healthy, and vigorous, well branched and densely foliated when in leaf; shall be free of disease, insects, eggs or larvae; and shall have healthy, well-developed root systems. All parts of the plant shall be moist and shall show active green cambium when cut.

E. All nursery plants shall be balled and burlapped or container-grown and shall have been acclimatized for at least one growing season. Container-grown stock shall have been grown in a container long enough for the root system to have developed sufficiently to hold its soil together, firm and whole, after removal from the container. No plants shall be loose in the container. Container-grown plants shall have no girdling roots and shall not be in a root-bound condition. Plants shall remain in their container until planted.

F. Care shall be exercised in digging and preparing field-grown plants for shipment and planting. Balled and burlapped materials shall have solid unbroken balls of earth of sufficient size to encompass all fibrous feeding roots necessary to ensure successful recovery and development of the plants. Balls shall be firmly wrapped in untreated biodegradable burlap and tied securely with wire cages and/or jute twine. Roots or balls of plants shall be adequately protected at all times from sun and drying winds. No plant shall be accepted when the ball of earth surrounding its roots has been badly cracked or broken preparatory to or during planting, or after the burlap, staves, wire cage, rope, or platform in connection with its transplanting have been removed. Soil characteristics (i.e., composition, texture, pH, etc.) of all field-grown plants shall closely match those of the soil where plant materials are to be planted.

G. The height of the trees, measured from the crown of the roots to the top of the top branch, shall not be less than the minimum size designated in the Plant List in the Drawings. The branching height for deciduous trees installed adjacent to or within walks shall be 7 feet minimum, having been pruned to this height at least 1 year prior to transplanting. Except when a clump is designated, the trunk of each tree shall be a single trunk growing from a single, unmutilated crown of roots. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety. The trunk shall be free from sunscald, frost cracks, or wounds resulting from abrasions, fire, or other causes. All pruning cuts shall comply with acceptable horticultural practices. No pruning wounds having a diameter of more than l'Z2-inches shall be present. Any such wounds must show vigorous bark growth on all edges. Evergreen trees shall be branched to within 1 foot of the ground. No tree that has had its leader cut or die shall be accepted.

H. Caliper measurements for tree trunks shall be taken 6-inches above ground for trees up to and including 4-inch caliper size and at 12-inches above ground for larger sizes.

I. Shrubs shall meet the requirements for spread and/or height stated in the Plant List on the Drawings. The measures for height are to be taken from the crown or root flare to the average height of the top of the shrub mass (not the longest branch). The fullness of each shrub shall correspond to the trade classification "No. 1". Single stemmed or thin plants will not be accepted. The side branches must be generous, well-twigged and the plant as a whole must be well-bushed to the ground. The plants must be in a moist, vigorous condition, free from dead wood, bruises or other root or branch injuries.

J. Herbaceous plants, vines and groundcovers shall be of the size, age and/or condition designated in the Plant List on the Drawings.

K. Plants shall be delivered only after preparations for planting have been completed. Plants shall be handled and packed in a horticulturally approved manner and all necessary precautions shall be taken to ensure that plants arrive on-site in a healthy vigorous condition. Trucks used for transporting plants shall be equipped with covers to protect plants from windburn, desiccation, and overheating during transport. Plants that have not been thoroughly watered shall not be accepted at the planting site. Any plants delivered to the site in a dry or wilted condition shall be rejected and replaced at no expense to the Owner. All plant materials shall be protected, watered and otherwise maintained prior to, during, and upon delivery to the site.

L. Plants shall be subject to inspection and approval by the Engineer at the place of growth, or upon delivery, for conformity to specification requirements as to quality, size, variety, and condition. Inspection and selection of plants before digging shall be at the option of the Engineer. The Contractor, or his representative, shall be present, if requested by the Engineer, for inspection of plants at the Nursery. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of work, for size and condition of balls and roots, disease, insects and latent defects or injuries. Rejected plants shall be removed immediately from the site. Certificates of inspection of plant materials shall be furnished as may be required by Federal, State and other authorities to accompany shipments.

1.02 LOAM BORROW:

Loam Borrow shall be as specified in Section 02920, LOAMING AND SEEDING.

1.03 SOIL ADDITIVES AND AMENDMENTS:

A. LIMESTONE:

Lime shall be an approved agricultural limestone containing at least 50 percent total oxides (calcium oxide and magnesium oxide). The material will be ground such that 50 percent of the material will pass through a No. 100 mesh sieve and 98 percent will pass a No. 2 mesh sieve. Lime shall be uniform in composition, dry and free-flowing and shall be delivered to the site in the original sealed containers, each bearing the manufacturer's guaranteed analysis.

A. FERTILIZER:

1. Fertilizer shall be a complete, standard commercial fertilizer, homogeneous and uniform in composition, dry and free-flowing, and shall be delivered to the site in the manufacturer's original sealed containers, each bearing the manufacturer's guaranteed analysis and marketed in compliance with State and Federal Laws.

   All fertilizer shall be used in accordance with the manufacturer's recommendations.

2. Fertilizer for tree, shrub and groundcover plantings shall contain all major plant nutrients and minor trace elements essential to sustain plant growth and shall have the following analysis:

| Nitrogen (N) | Phosphorous (P) | Potassium (K) |
|---|---|---|
| 10% | 10% | 10% |

3. As approved by the Engineer, a slow release root contact fertilizer installed at the time of planting, may be used in place of the above, at the discretion of the Contractor.

B. Organic Compost shall be a standard commercial product comprised of fully decomposed, 100 percent plant-derived, natural organic matter. Its composition shall furnish ample water holding capacity and cation exchange capacity for the retention of plant nutrients. Compost shall be free of sticks, stones, weed seeds, roots, mineral or other foreign matter and delivered air dry. It shall be free from excessive soluble salts, heavy metals, phytotoxic compounds, and/or substances harmful to plant growth and viability. Organic compost shall have an acidity range of 4.5 to 7.0 pH.

C. Sphagnum Peat Moss shall be a standard commercial product. Its composition shall furnish ample water holding capacity and cation exchange capacity for the retention of plant nutrients. Peat moss shall be free of sticks, stones, weeds or weed seeds, roots, mineral or other foreign matter. It shall be free from toxic substances and/or compounds harmful to plant growth and viability. It shall be delivered air dry in standard bales and shall have an acidity range of 3.5 to 5.5 pH.

D. Humus shall be natural humus, reed peat, or sedge peat. Its composition shall furnish ample water holding capacity and cation exchange capacity for the retention of plant nutrients. Humus shall be free of sticks, stones, weeds, roots, mineral or other foreign matter and/or toxic substances harmful to plant growth and viability. It shall be low in wood content, free from hard lumps and excessive amounts of zinc and delivered air dry in a shredded or granular form. The acidity range for humus shall be 5.5 to 7.5 pH, and the organic matter content shall be not less than 85 percent, as determined by loss on ignition. The minimum water holding capacity shall be 200 percent by weight on an oven-dry basis.

E. Manure shall be well-rotted, leached, cow manure not less than 8 months or more than 2 years old. It shall be free of sawdust, shavings, or refuse of any kind and shall not contain more than 25 percent straw. It shall contain no substances harmful to plant growth. The Contractor shall furnish information regarding chemical disinfectants, if any, that may have been used in storage of the manure.

1.04 PLANTING MIXTURE:

Planting mix shall consist of 7 parts loam borrow and 1 part organic compost, humus, sphagnum peat moss, or manure, thoroughly blended.

1.05 WATER:

Water shall be furnished by the Contractor, unless otherwise specified, and shall be suitable for irrigation and free from ingredients harmful to plant growth and viability. The delivery and distribution equipment required for the application of water shall be furnished by the Contractor, at no additional cost to the Owner.

1.06 MULCH:

Mulch shall be fibrous pliable shredded softbark mulch, not exceeding U2-inch in width. It shall be 98 percent organic matter with a pH range between 3.5 and 4.5 and a moisture content not to exceed 35 percent. It shall be free of weeds, weed seeds, debris, and other materials harmful to plant growth and viability. Organic mulch shall be aged no longer than 2 years.

1.07 MATERIALS FOR STAKING, GUYING, AND WRAPPING:

A. Tree stakes shall be sound, untreated 2 x 3 (nominal) x 8-foot length Douglas Fir reasonably free of knots. No paint or stain shall be used in conjunction with tree stakes. Tying material shall be flexible braided nylon webbing, °Z4-inch wide and have a tensile strength of 900 pounds. Webbing shall be 'Arbor Tie', or approved equal.

B. Drive anchors and guy wire assemblies shall be suitable for protecting trees and shall be sized in accordance with the manufacturer's recommendations. No materials shall be used for guying that will girdle, chafe, or otherwise injure trees.

C. Tree wrap shall be duplex, waterproof kraft paper crinkled to 33-1/3 percent stretch, 4- to 6-inch wide strips. Tying materials shall be jute twine, 2-ply for shrubs and trees less than 3-inch caliper; 3-ply for larger plants.

1.08 TREE PAINT:

Tree paint shall not be used.

1.09 ANTI-TRANSPIRANT/ANTI-DESICCANT:

Anti-transpirant or anti-desiccant shall be 'Wilt-Prufi, as manufactured by Nursery Specialty Products, Inc., Groton Falls, NY, or approved equal. It shall be delivered in original sealed manufacturer's containers and used in accordance with the manufacturer's instructions.

2.10 INSECTICIDES:

A. No insecticides shall be used on-site without the Contractor notifying and obtaining the prior approval of the Engineer.

A. Insecticides shall be EPA registered and approved for use in public open spaces. All insecticides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.

B. Insecticide use shall be limited and selective, only to control specific insect infestations, as identified by the Contractor or the Owner's Representative, that may result in the disfigurement, decline, or death of plant materials.

2.11 HERBICIDES:

A. No herbicides shall be used on-site without the Contractor notifying and obtaining prior approval of the Engineer.

A. Herbicides shall be EPA registered and approved for use in public open spaces. All herbicide shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.

B. Herbicide for post-emergent application shall be glyphosate contact, 'Roundup', as manufactured by Monsanto, Inc., or approved equal.

C. Herbicide use shall be limited and selective, only to control specific weed infestations that have been identified by the Contractor or the Owner's Representative.

2.12 FUNGICIDES:

A. No fungicides shall be used on-site without the Contractor notifying and obtaining prior approval of the Engineer.

A. Fungicides shall be EPA registered and approved for use in public open spaces. All fungicides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.

B. Fungicide use shall be limited and selective, only to control specific fungal pathogenic disease infestations, as identified by the Contractor or the Owner's Representative, that may result in the disfigurement, decline, or death of plant materials.

PART 3- EXECUTION

2.03 INSTALLATION:

A. All plants shall be subject to inspection and approval by the Engineer upon delivery to the site. No materials shall be planted until approval is received.

A. All work shall be performed by skilled workers with a minimum of 2 years planting experience, in accordance with accepted horticultural/nursery practices, under the full-time supervision of a Certified Nurseryman or Arborist.

B. All balled and burlapped plants that cannot be planted immediately upon delivery shall be set on the ground and the root balls shall be well protected with soil, wet moss, or other acceptable material. All foliage shall be protected and covered with perforated shade materials.

C. The planting season for evergreen trees and shrubs shall extend from the time the soil becomes workable in the spring until new growth appears, and from September 15 until November 30 in the fall. Deciduous trees and shrubs shall be planted only when dormant, either prior to bud break and/or before leaves appear in the spring, or subsequent to their leaf drop in the fall. Ground covers shall be planted only after the last frost in the spring through mid-May. Planting season periods may be extended if weather and soil conditions permit only with the written approval of the Engineer. Extended or out-of-season planting requirements shall include application of antitranspirant and extra water as needed. Plant guarantee periods shall remain as stated below. Planting shall not be permitted in frozen ground.

D. All plant locations and outlines for planting beds shall be staked out for review and potential adjustment by the Engineer before any excavation is begun. In the event that rock, underground construction work or obstructions are encountered in any proposed planting pit or bed, the Engineer may select alternate locations. Where locations cannot be changed, the obstruction shall be removed, subject to the Engineer's approval, to a depth of not less than 3 feet below grade and not less than 6-inches below the bottom of the root ball when plant is properly set at the required grade. Removal of boulders or obstructions greater than 1 cubic yard in size shall be subject to approval and will be paid for by the Owner. No ledge will be removed to create planting pits or beds

E. All planting pits shall be excavated with sloped walls, wider at the top than at the bottom, and scarified to eliminate glazing. Tree pits shall be at least 2 feet greater in diameter than the root ball of earth or root system. Shrub pits shall be at least 1 foot greater than the diameter of the root ball. Planting pits shall not be deeper than the height of the root ball.

F. When excavation occurs in areas of heavily compacted earth, stones, concrete chunks or other foreign matter, pits shall be dug at least 3 times the width of the rootball. Excavated material from plant pits shall be disposed of as required.

G. Container plants shall be removed from their growing container before planting. If roots are densely matted, the outer root mass shall be scored, sliced vertically, with a sharp knife to separate roots. All herbaceous plants and groundcovers shall be evenly spaced to produce a uniform effect and staggered in rows at intervals designated on the contract drawings.

H. Shrubs and trees shall be set in the center of planting pits, plumb and straight, and at such a level that after settlement the crown of the roots will be l-inch above the surrounding finished grade. Root ball masses shall not be loosened, broken or damaged. When balled and burlapped plants are set, planting mixture shall be compacted around bases of balls to fi11 all voids. All tying materials, twine and rope shall be cut and removed. Biodegradable burlap shall be laidback or cut away from the top half of the ball. If a wire basket is present, the upper 2/3 of the basket shall be cut away and removed. Do not remove the entire basket. Roots or bare root plants shall be properly spread out and planting mixture carefully worked in among them. Broken or frayed roots shall be cleanly cut.

I. Backfill plant pits with planting mixture in layers of not more than 9-inches and firmly tamp each layer and water to sufficiently settle the backfilled soil before the next layer is put in place. When the planting pit is 2/3 backfilled, the hole shall be flooded and watered thoroughly so that the water level reaches the top of the planting pit. Allow water to soakin, then complete the backfilling operation. Immediately after planting pit is backfilled, a shallow basin 3-inches deep and slightly larger than the pit shall be formed with a ridge of soil for water retention. Form a common basin for plant materials throughout mass planting beds. After planting, lightly till the soil in planting beds between planting pits and rake smooth to eliminate compaction of soils.

J. All planting hole basins shall be flooded with water twice within the first 24 hours of planting, and watered not less than twice per week until final acceptance of the work.

K. All thin barked deciduous trees shall be wrapped after they are planted and before they are staked. Prior to wrapping, inspect trees for injury to trunks or improper pruning. Take corrective measures as necessary. Wrap trunks of all trees spirally from bottom to top with tree wrap and secure top and bottom at 2-foot intervals with jute twine. The wrapping shall overlap and entirely cover the trunk from the ground to the height of the second branches and shall be neat and snug. Overlap shall be approximately 2-inches.

L. Stake trees immediately after planting as detailed. All staking apparatus shall be adequate to hold the tree in a vertical position under severe weather conditions. All staking apparatus and tree trunk wrapping shall be removed and disposed of off-site by the Contractor at the end of one growing season.

M. Immediately after planting and staking operations are complete, all plant pit basins and plant beds shall be covered with approved mulch to the depths designated on the plans. Mulch shall not contact tree bark, cover tree root flares, or shrub crowns. No mulch shall be applied prior to the first watering.

N. The pruning of trees and shrubs shall only be permitted to remove dead or dying branch limbs and tips, sucker growth, water sprouts, crossing or rubbing branches, broken or damaged branches, diseased or insect infested limbs, and to preserve the natural character of the plant. Plant materials shall be pruned in accordance with American Nurserymen Association Standards and as required by the Engineer. Questionable weak limbs and branch removals that may disfigure the plant shall be left to the discretion of the Engineer. The tree leader shall never be permitted to be cut. Pruning shall be done with clean, sharp tools. All large pruning cuts that are U2-inch in diameter or larger shall be made along the bark branch ridge. Pruning cuts shall not breach or otherwise interfere with the branch collar. All pruning cuts less than 'Z4-inch diameter shall be made with hand pruners as close to the main stem as possible without damaging the cambium or bud. Tree paint shall not be used to cover pruning cuts.

O. P. As the work proceeds, the Contractor shall remove all debris from the site, including but not limited to branches, rock, paper, and rubbish. All areas shall be kept clean, neat and in an orderly condition at all times. Prior to final acceptance, the Contractor shall cleanup the entire area to the satisfaction of the Engineer.

3.02 MAINTENANCE:

A. Maintenance shall begin immediately after each plant is planted and shall continue until completion of the guarantee period and final acceptance of the project. Plants shall be watered, pruned, sprayed, fertilized, cultivated and otherwise maintained and protected. Tree guys and stakes shall be tightened and repaired. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit.

A. Settled plants shall be reset to proper grade and position, planting pits and common basins restored, and dead materials removed and replaced. Planting beds and individual basins shall be neat inappearance, maintained to their original layout lines and kept free of weeds. Mulch shall be replaced as required to maintain proper depths.

B. Contractor shall make arrangements to provide sufficient water to maintain all trees, shrubs and plant materials until final acceptance. Plants shall be sprayed with anti-transpirant or anti-desiccant if required by seasonal conditions or as required by the Engineer.

C. Planting areas shall be protected against trespass and damage of any kind during the maintenance period. This shall include the furnishing and installation of approved temporary fencing if necessary. If any plants become damaged during the maintenance period, they shall be treated or replaced as required by the Engineer at no additional cost to the Owner.

3.03 INSPECTION AND PRELIMINARY ACCEPTANCE:

A. Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of inspection for preliminary acceptance. The Engineer shall recommend preliminary acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals or replacements.

A. Inspection and acceptance of plantings may be requested and granted in part, provided the areas for which acceptance is requested are relatively substantial in size, and with clearly definable boundaries. Acceptance and use of these areas by the Owner shall not waive any other provisions of this Contract.

3.04 GUARANTEE:

A. All plant materials shall be guaranteed for a period of one year after the date of completion of the specified maintenance period and preliminary acceptance of the project by the Owner.

A. When the work is accepted in part, the guarantee period shall extend from each partial acceptance to the terminal date of the last guarantee period. All guarantee periods terminate at one time.

B. Plants shall be healthy, free of pests and disease. Plants shall exhibit vigorous growth, shall bear foliage of normal density, size and color and shall have no less than seventy-five percent (75%) of their branches alive at the end of the guarantee period. If the leader of any single-leader species is dead, the entire plant shall be considered dead.

C. Any plant required under this Contract that is dead or unsatisfactory, as determined by the Engineer, shall be removed from the site. These shall be replaced as soon as weather permits during the specified planting season, at no additional cost to the Owner, until the plants live through one year.

D. All replacements shall be plants of the same kind and size as specified on the Plant List. They shall be furnished and planted as specified above.

E. The guarantee of all replacement plants shall extend for an additional one-year period from the date of their acceptance as replacement.

F. Guarantee shall not apply to the replacement of unacceptable plants resulting from the removal, loss, or damage due to occupancy of the project in any part; vandalism or acts of neglect on the part of others; physical damage by animals, vehicles, etc.; and Acts of God, including but not limited to, catastrophic fire, hurricanes, riots, war, etc.

G. In the instance of curtailment of water by local water authorities (when supply was to be furnished by the Owner), the Contractor shall furnish all necessary water by water tanker, the cost of which will be approved and paid for by the Owner.

3.05 FINAL INSPECTION AND FINAL ACCEPTANCE:

A. At the end of the guarantee period, the Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of final inspection for final acceptance.

A. The Engineer shall recommend final acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals or replacements.

END OF SECTION

SECTION 036000

GROUTING

PART 1-GENERAL

1.01 WORK INCLUDED

A. Portland cement grout.

B. Rapid curing epoxy grout.

C. Non-shrink cementitious grout.

1.02 RELATED SECTIONS:

A. Section 03 30 00 - Cast-In-Place Concrete.

1.03 REFERENCES

American Concrete Institute:

ACI 301 - Specifications for Structural Concrete.

ACI 318 - Building Code Requirements for Structural Concrete.

American Society of Testing and Materials:

| | | |
|---|---|---|
| ASTM | C33 | Standard Specification for Concrete Aggregates. |
| ASTM | C40 | Test Method for Organic Impurities in Fine Aggregates for Concrete. |
| ASTM | C150 | Standard Specification for Portland Cement. |
| ASTM | C191 | Test Method for Time of Setting of Hydraulic Cement by Vicat Needle. |
| ASTM | C307 | Test Method for Tensile Strength of Chemical Resistant Mortar, Grouts, and Monolithic Surfacings. |
| ASTM | C531 | Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes. |
| ASTM | C579 | Test Method for Compressive Strength of Chemical Resistant Mortars, Grouts, monolithic Surfacings and Polymer Concretes. |
| ASTM | C827 | Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures. |

U. S. Army Corps of Engineers Concrete Research Division (CRD):

CRD C621 - Non-Shrink Grout.

1.04 SUBMITTALS

A. Product Data: Submit product data on grout.

B. Manufacturer's Installation Instructions: Submit manufacturer’s instructions for mixing, handling, surface preparation and placing epoxy type and non-shrink type grouts.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver grout in manufacturer's unopened containers with proper labels intact.

B. Store grout in a dry shelter, protect from moisture.

PART 2-PRODUCTS

2.01 PORTLAND CEMENT GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I and II.

B. Water:

1. Potable; containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:

a. Corrosion of steel.

b. Volume change increasing shrinkage cracking.

c. Efflorescence.

d. Excess air entraining.

C. Fine Aggregate

1. Washed natural sand.

2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.

3. Free from injurious amounts of organic impurities as determined by ASTM C40.

D. Mix:

1. Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.02 NON-SHRINK CEMENTITIOUS GROUT

A. Non-shrink Cementitious Grout: Pre-mixed ready for use formulation requiring only addition of water; non-shrink, non-corrosive, non-metallic, non-gas forming, no chlorides.

B. Properties: Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with CRD-C621, for Type D nonshrink grout:

| Property | Test | Time | Result |
|---|---|---|---|
| Setting Time | ASTM C191 | Initial | 2 hours (Approx) |

| | | | |
|---|---|---|---|
| | | Final | 3 hours (Approx) |
| Expansion | | | 0.10% -0.4% Maximum |
| Compressive Strength | CRD-C621 | 1 day | 4,000 psi |
| | | 7 days | 7,000 psi |
| | | 28 days | 10,000 psi to 10,800 psi |

2.03 FORMWORK

A. As required.

2.04 CURING

A. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or with use of wet burlap method.

PART 3-EXECUTION

3.01 EXAMINATION

A. Verify areas to receive grout.

3.02 PREPARATION

A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until sound, clean concrete surface is achieved.

B. Rough concrete lightly, but not enough to interfere with placement of grout.

C. Remove foreign materials from metal surfaces in contact with grout.

D. Align, level and maintain final positioning of components to be grouted.

E. Saturate concrete surfaces with clean water; remove excess water, leave none standing.

3.03 INSTALLATION – FORMWORK

A. Construct leakproof forms anchored and shored to withstand grout pressures.

B. Install formwork with clearances to permit proper placement of grout.

3.04 MIXING

A. Portland Cement Grout:

1. Use proportions of 2 parts sand and 1 part cement, measured by volume.

2. Prepare grout with water to obtain consistency to permit placing and packing.

3. Mix water and grout in two steps; pre-mix using approximately 2/3 of water; after partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing 2 to 3 minutes.

4. Mix only quantities of grout capable of being placed within 30 minutes after mixing.

5. Do not add additional water after grout has been mixed.

6. Capable of developing minimum compressive strength of 2400 psi in 48 hours and 7000 psi in 28 days.

B. Mix grout components in proximity to work area and transport mixture quickly and in manner not permitting segregation of materials

3.05 PLACING GROUT

A. Place grout material quickly and continuously.

B. Do not use pneumatic-pressure or dry-packing methods.

C. Apply grout from one side only to avoid entrapping air.

D. Do not vibrate placed grout mixture, or permit placement when area is being vibrated by nearby equipment.

E. Thoroughly compact final installation and eliminate air pockets.

F. Do not remove leveling shims for at least 48 hours after grout has been placed.

3.06 CURING

A. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. After grout has attained its initial set, keep damp for minimum of 3 days.

3.07 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with ACI 301 or 318.

B. Tests of grout components may be performed to ensure conformance with specified requirements.

END OF SECTION

SECTION 311100

SITE CLEARING

PART 1-GENERAL

1.01 WORK INCLUDED

A. Removing surface debris.

B. Removing designated paving, curbs, and other site features.

C. Removing designated trees, shrubs, and other plant life within the Limit of Work area, as indicated on Drawings.

D. Tree protection.

E. Pedestrian protection.

F. Removing abandoned above and below grade utilities.

G. Excavating and stockpiling topsoil.

1.02 RELATED SECTIONS

A. Section 312000 – Earth Moving.

B. Section 312500 – Erosion and Sediment Controls.

1.03 QUALITY ASSURANCE

A. Conform to applicable code for environmental requirements and disposal of debris.

B. Perform Work in accordance with State, Local and Federal requirements.

C. Prior to the commencement of work, obtain approval of staked and/or flagged site clearing.

PART 2-PRODUCTS

2.01 WORK ZONE AND TREE PROTECTION CONSTRUCTION FENCE

A. Temporary security fence:

1. Chainlink with suitable base.

2. 6-foot minimum in height.

3. See Drawings for additional detail.

B. Temporary construction fence and tree protection:

1. Stakes to be rolled “T” rail steel, 6-ft long and painted green or wooden, pointed 6-ft long 2x2’s.

2. Construction Fencing: Snow fence to be orange Resinet OSF60 Barrier Fence, Cortina Barrier Fence, Tenax Guardian Safety Fence, approved equal.

3. Tree trunk protection to be 2 x 4 lumber, 6-ft in length secured with 9 gauge galvanized steel wire banding staples to the wood lumber.

PART 3-EXECUTION

3.01 EXAMINATION

A. Verify existing plant life designated to remain is tagged or identified.

B. Identify stockpile, waste or salvage areas for placing removed or temporarily stored materials.

3.02 PREPARATION

A. Call Dig Safe at 1-888-DIG-SAFE (1-888-344-7233) not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Prior to altering any utilities, obtain consent of utility service provider.

1. Arrange with the utility service providers to shut off utilities to be disturbed as indicated on the Drawings and inform Owner and Engineer of anticipated interruption.

3.03 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping. Tree protection to be in accordance with Massachusetts Department of Transportation’s Project Development and Design Guide latest edition, Chapter 13 Landscape and Aesthetics.

C. Protect bench marks, survey control points, and existing structures from damage or displacement.

D. During demolition and earthwork the work zone will be surrounded with temporary chainlink fencing. Tree protection and open excavation to be surrounded by construction fence (snow fence).

3.04 REMOVAL

A. Remove and properly dispose of cleared material.

B. Remove all surplus soil and unsuitable soil.

C. Remove debris, rock, and extracted plant life from site.

D. Remove paving, curbs, and other site features.

E. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.

F. Continuously clean-up and remove trash, construction debris and waste materials from site. Do not allow materials to accumulate on site.

G. Remove all temporary facilities at the end of the project.

H. Separate recyclable materials removed during site clearing and store/stockpile without intermixing with other materials and reuse as indicated or transport them to a recycling facility.

I. Do not burn or bury materials on site. Leave site in clean condition.

3.05 TOPSOIL EXCAVATION

A. Remove sod/grass before excavation of topsoil.

B. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, to the depths encountered without mixing with underlying soils and foreign materials for use in finish grading.

1. Remove trash, debris, weeds, roots and other waste materials from stockpiled topsoil.

C. Do not excavate wet topsoil.

D. Transport topsoil and place in small stockpiles in locations requiring placement of topsoil.

E. Stockpile in area designated on site to a height not exceeding 8 feet and protect from erosion.

1. Stockpile material on a level area until disposal.

2. Do not stockpile within the tree protection zones indicated on Drawings.

3. Stockpile topsoil away from the edge of excavations, do not intermix with subsoil.

4. Grade and shape stockpiles to drain surface water.

5. Cover to prevent windblown dust contamination by air borne weed seed.

6. Install temporary erosion control devices for all stockpiled soil, as indicated on Drawings and/or as directed by the Engineer to protect adjacent properties and/or resource areas.

F. Remove excess topsoil not intended for reuse on the Project site.

END OF SECTION

SECTION 312500

EROSION AND SEDIMENTATION CONTROLS

PART 1-GENERAL

1.01 WORK INCLUDED:

A. Labor, materials and equipment necessary to install proper control measures to prevent erosion, siltation and sedimentation of the Project site and adjacent and off-site areas.

1.02 Related Sections:

A. Section 31 10 00 - Site Clearing.

B. Section 31 20 00 - Earthmoving.

C. Section 31 37 00 – Riprap and Rock Lining.

D. Section 32 91 19 - Landscape Grading.

E. Section 32 92 19 - Seeding.

F. Section 33 41 13 – Storm Utility Drainage Piping.

1.03 SUBMITTALS

A. Product Data: Product Data: Submit data on each type of proprietary erosion control devices, and geotextile.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with the requirements set forth in the Order of Conditions issued by the Conservation Commission.

PART 2-PRODUCTS

2.01 MATERIAL

A. Stakes: Stakes for bales as indicated on Drawings.

B. Tubular Sediment Barrier: Tubular netting filled with water permeable compost material meeting the following requirements:

1. Compost:

a. Derived from a well-decomposed source of organic matter.

b. Free of weeds, refuse, contaminants or other materials toxic to plant growth. Non composted products will not be accepted.

2. Tubular Netting:

a. One continuous barrier.

b. Diameter per Drawings.

c. Equal to the following:

d. Silt Soxx by Filtrexx

e. Silt Sock

f. FilterMitt by Phase II Stormwater Products, Inc.

C. Erosion Control Blanket: machined produced 100% biodegradable blanket. Equal to:

1. East Coast Erosion Blankets EC-7Y Coir Mat

2. GEOCOIR/DeKoWe 700

3. RoLanka International, Inc. BioD-Mat 70

4. Nedia Enterprises, Inc. KoirMat 700

D. Catch basin Inserts: permeable geotextile fabric that mounts under the grate of catch basins. Equal to:

1. ACF Environmental Silt Sack

2. UltraTech International, Inc. Ultra-Drain Guard

3. Enpac 1341 Catch Basin Insert

E. Temporary Stabilization Practices:

1. Straw temporary mulch, 100 pounds per 1,000 square feet.

2. Wood fiber cellulose temporary mulch, 35 pounds per 1,000 square feet.

3. Tackafier for anchoring mulch or straw: a non-petroleum based liquid bonding agent specifically made for anchoring straw.

4. Provide natural (jute, wood excelsior) or man-made (glass fiber) covering with suitable staples or anchors to secure to ground surface. Do not use wire staples and nonbiodegradable coverings for any area that will be mown turf.

5. Temporary vegetative cover for graded areas must be undamaged, air dry threshed straw free of undesirable weed seed.

6. Spray-applied bonded fiber matrix.

F. Seeding Materials

1. Seeding and Soil Supplements as specified in Section 32 92 19. G. Mulch: Where specified in Drawings.

G. Bonded Fiber Matrix: A hydraulically applied slurry consisting of long strand wood fibers, organic tackifiers and bonding agents, when dry forms a continuous erosion control blanket bonded to the soil surface. Equal to:

1. Geoperm Bonded Fiber Matrix

2. Mat, Inc. Soil Guard

3. Profile Products Flexterra

PART 3-EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade, granular base, and/or stabilized soil is acceptable and ready to support devices and imposed loads.

B. Verify gradients and elevations of base or foundation for other work are correct.

3.02 PREPARATION

A. Install control measures prior to construction to prevent erosion, siltation and sedimentation of construction areas, adjacent areas and off-site areas in the following work areas:

1. Soil stockpiles, storage and staging areas;

2. Cut and fill slopes and other stripped and graded areas;

3. Constructed and existing swales and ditches;

4. Bioretention areas, detention ponds, infiltration basins and other stormwater controls.

5. As indicated on Drawings

B. Provide additional means of erosion and sediment control as required for continued or unforeseen erosion problems.

3.03 GENERAL

A. Install and maintain site erosion and sediment controls as indicated on Drawings.

3.04 TUBULAR SEDIMENT BARRIER

A. See Drawings and manufacturer's recommendations for installation.

B. Remove sediment collected along the tubular barrier when it reaches half way up the barrier and dispose of properly.

C. At the end of construction remove all sediment from along the barrier and dispose of properly. Cut open the outer netting layer of the barrier and spread the mulch or straw over the ground surface. Remove and dispose of the outer containment netting.

3.05 SITE STABILIZATION

A. Incorporate erosion control devices indicated on Drawings into the Project at the earliest practicable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Do not exceed 35 feet height for stockpile(s) and waste pile(s). Slope stockpile(s) sides at 2:1 or flatter.

D. Provide appropriate temporary stabilization of any disturbed area on which activity has ceased and which will remain exposed for more than 14 days.

1. Provide temporary seed mix with application rates according to the State of Massachusetts DOT Standard Specifications.

a. Water the seeded areas as required until satisfactory establishment.

b. During non-germinating periods, apply mulch at recommended rates.

E. Provide permanent stabilization of disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with permanent seeding specifications or as indicated on Drawings with one of the following:.

1. Application of Bonded Fiber Matrix hydroseed seed mix as specified.

2. Placement of erosion control blanket as indicated on Drawings.

F. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.06 SLOPE STABILIZATION (SLOPES OF 4:1 OR GREATER)

A. Do not leave disturbed areas and slopes unattended or exposed for excessive periods of time such as the inactive winter season. Provide appropriate stabilization practices as indicated on Drawings on disturbed area as soon as possible, but not more than 14 days after the construction activity in that area has temporarily or permanently ceased.

B. Reinforce temporary areas having a slope greater than 4:1 with erosion control blankets or approved equivalent until the site can be properly stabilized.

C. Provide permanent slope stabilization immediately after the placement of topsoil. Provide permanent stabilization as indicated on Drawings with one of the following:

1. Apply of hydroseed seed mix as specified.

2. Application of Bonded Fiber Matrix hydroseed seed mix as specified.

3. Placement of erosion control blanket as indicated on Drawings.

D. Apply of hydroseed seed mix as specified.

3.07 EROSION CONTROL BLANKET

A. As indicated on Drawings and or manufacturer's recommendations for installation.

3.08 TURF REINFORCEMENT MATTING

A. As indicated on Drawings and/or manufacturer's recommendations for installation.

3.09 BONDED FIBER MATRIX

A. As indicated on Drawings and/or manufacturer's recommendations for installation.

3.10 CATCH BASIN INSERTS

A. Place between the frame and grate of all catch basins within the limits or impacted by the work.

B. As indicated on Drawings and/or manufacturer's recommendations for installation.

3.11 FIELD QUALITY CONTROL

A. Inspect erosion and sediment control devices and stabilized slopes on a weekly basis and after each rainfall event of .25 inch or greater. Make necessary repairs of identified problems within 24 hours to ensure erosion and sediment controls are in good working order. Reset or replace materials as required.

B. When field visits indicate Work does not meet specified requirements, repair and/or replace Work.

C. Any deviation from the requirements must be approved by the Engineer.

3.12 CLEANING

A. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment barrier or device, remove and dispose of sediment.

B. Do not damage structure or device during cleaning operations.

C. Do not permit sediment to erode into construction or site areas or natural waterways.

D. Clean channels when depth of sediment reaches approximately one half channel depth.

3.13 PROTECTION

A. Do not permit construction traffic over stabilized areas.

B. Protect Project site stabilization from elements, flowing water, or other disturbance until vegetation established.

END OF SECTION

SECTION 312000

EARTH MOVING

PART 1-GENERAL

1.01 WORK INCLUDED

A. Provide labor, materials and equipment necessary to complete the work of this Section, including:

1. Removal of subsoil, excavating and trenching

2. Backfilling

3. Cutting, grading, filling, rough contouring, compacting, and finish grading site for site structures, building pads, utility, road, parking, sidewalks, walkways and landscape installation and other site features.

B. Related Sections:

1. Section 03 30 00 - Cast-In-Place Concrete.

2. Section 31 25 00 – Erosion and Sedimentation Controls.

3. Section 31 37 00 – Riprap and Rock Lining.

4. Section 32 11 23 – Aggregate Base Course.

5. Section 32 12 16 – Asphalt Paving.

6. Section 32 91 19 – Landscape Grading.

7. Section 32 92 19 - Seeding and Soil Supplements.

8. Section 32 93 00 - Plants.

9. Section 33 02 14 – Public Manholes and Structures.

10. Section 33 41 00 - Storm Utility Drainage Piping.

1.02 REFERENCES

A. Local utility standards when working within 24 inches of utility lines.

B. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

C. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.

3. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).

8. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

9. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

10. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.03 DEFINITIONS

A. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions on Drawings or without approval by Engineer.

B. Landscaped Areas: Areas not covered by structures, walks, roads, paving, or parking.

C. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

D. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials. E. Utility: Any buried pipe, duct, conduit, or cable.

1.04 SUBMITTALS

A. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

B. Shop Drawings: Indicate soil densification grid for each size and configuration footing requiring soils densification.

C. Product Data: For the following:

1. Each type of plastic warning tape

2. Geotextile

D. Material Test Reports for Each Type of Offsite Earth Material: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill. On-site material not designated for re-use will not be allowed to be used as backfill unless tested.

2. Laboratory compaction curve according to ASTM D 1557 for each onsite and borrow soil material proposed for fill and backfill.

E. Materials Source: Submit name of imported materials source.

F. Manufacturer's Certificate: Certify materials meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.06 QUALITY ASSURANCE

A. Furnish subsoil and topsoil material from single source throughout the Work unless written approval is provided by the Owner.

B. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

C. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698, ASTM D1557 or AASHTO T180 where applicable.

D. When tests indicate materials do not meet specified requirements, change material and retest.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements:

1. Excavation: When temperatures below 32 degrees F are anticipated, do not excavate to final required elevations for concrete work unless concrete can be placed immediately.

2. Backfilling: When backfilling below 32 degrees F, the following procedures must be followed:

   a. Remove frozen ground in its entirety from beneath and five feet beyond the area of fill placement.

   b. Fill material to consist of selected fill free of all frozen chunks that exceed four inches in size. Material transported to the project site must only consist of material excavated from below the frost depth.

   c. End of the work day: Cover the area of fill placement with insulated blankets. Other means of protection (straw, wood chips, etc.) may also be used for protection provided it is approved by the Engineer.

   d. Following work day: Remove the insulated blankets and/or strip the area of all frozen material as specified previously.

   e. Upon establishing the subgrade elevations, protect the grades with insulated blankets or place additional material that will adequately insulate the exposed earth surface from frost. Strip additional or protective material just prior to pouring concrete.

PART 2-PRODUCTS

2.01 SOIL MATERIALS

A. Satisfactory Soils for General Backfill (imported or excavated):

   1. ASTM D2487 Unified Soil Classification Groups GW, GP, GM, SW, SP, and SM or a combination of these groups.

   2. Free of rock or gravel larger than 3 inches in any dimension, debris, oil and or/ hazardous waste, frozen materials, vegetation, invasive species and other deleterious matter.

   3. Immediately notify the Engineer if satisfactory soils are not maintained within 2 percent of optimum moisture content at the time of compaction.

B. Unsatisfactory Soils for General Backfill (imported or excavated):

   1. Includes unsatisfactory imported borrow or excavated and re-used material.

   2. ASTM D2487 Unified Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

   3. Contains rock or gravel larger than 3 inches in any dimension, debris, oil and or/ hazardous waste, frozen materials, vegetation, invasive species and other deleterious matter.

C. Subsoil: Imported or excavated material, graded free of lumps larger than 6 inches, rocks larger than 3 inches, organic material, and debris.

D. Type A - Select Granular Material: Coarse stone (gravel): washed natural stone; free of shale, clay, friable material, sand, debris.

1. Grading: AASHTO M147; Grade 57.

E. Type B - Pea Gravel (stone): Natural stone; washed, free of clay, shale, organic matter.

1. Minimum Size: 1/4 inch.

2. Average Size: 3/8 inch.

3. Maximum Size: 1/2 inch.

F. Type C - Sand: ASTM C 33; washed; fine aggregate material free of silt, clay, loam, friable or soluble materials, and organic matter.

G. Type D - Subsoil: Reused or Imported, free of rock larger than 3 inch size, and debris.

H. Type E - Blended Material: Per Drawings.

I. Type F - Soil Cement.

J. Type G - Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

K. Type H - Berm/Embankment fill:

1. Free of roots, stumps, wood, rubbish, stones greater than 6 inches, frozen or other objectionable materials.

2. Conforming to ASTM D2487 Unified Soil Classification GC, SC, CH, or CL with at least 30 percent passing the No.200 sieve.

L. Type I - River Substrate: Native material either excavated from an onsite source or an imported mix of native cobble, gravel, sand and fine material. During excavation Contractor to provide a 5 gallon sample and sieve of the river substrate material to the Engineer for review if additional material is needed.

2.02 ACCESSORIES

A. Geotextile Fabric: Non woven drainage geotextile made from polyolefins, polyesters, or polyamides with the following minimum properties according to ASTM D 4659 and referenced standard test methods:

1. Grab Tensile Strength: 120 lbf (533 N); ASTM D 4632.

2. Tear Strength: 50 lbf (222 N); ASTM D 4533.

3. Puncture Resistance: 70 lbf (311 N); ASTM D 4833.

4. Water Flow Rate: 120 gpm per sq. ft. (4885 L/min per sq. m); ASTM D 4491.

5. Apparent Opening Size: No. 70 (0.212 mm); ASTM D 4751.

B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities

1. A minimum of 6 inches wide and 4 mils thick

2. Continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection

3. Detectable by metal detector when tape is buried up to 30 inches deep; colored as follows: a. Red: Electric.

a. Yellow: Gas, oil, steam, and dangerous materials.

b. Orange: Telephone and other communications.

c. Blue: Water systems.

PART 3-EXECUTION

3.01 EXCAVATION EXAMINATION

A. Verify site conditions prior to starting work.

B. Verify survey bench mark and intended elevations for the Work as indicated on Drawings

C. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

3.02 EXCAVATION PREPARATION

A. Call Digsafe not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company as necessary.

D. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.03 PROTECTION

A. Maintain and protect above and below grade utilities indicated to remain.

B. Protect plant life, lawns, rock outcroppings and other features remaining as portion of final landscaping.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

E. Grade excavation top perimeter to prevent surface water run-off into excavation or to adjacent properties.

F. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

G. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

H. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

I. Protect newly graded areas from traffic, freezing, erosion and over compaction.

3.04 UNDERGROUND UTILITIES

A. Do not interrupt existing utilities that are in service until temporary or new utilities are installed and operational.

B. Abandoned utilities:

1. Remove abandoned utilities beneath, and five feet laterally beyond, the structure's proposed footprint. Backfill and compact excavations required for their removal.

2. Utilities extending outside the five feet limit specified above may be abandoned in place provided their ends are adequately plugged as described below.

3. Permanently close open ends of abandoned underground utilities, exposed by excavations, which extend outside the limits of the area to be excavated.

4. Close open ends of metallic conduit and pipe with threaded galvanized metal caps or plastic plugs or other approved method for the type of material and size of pipe. Do not use wood plugs.

5. Close open ends of concrete and masonry utilities with concrete or flowable fill.

6. 6Provide support systems for existing utilities as necessary during earth work operations. Supports to include plates, beams, cables, and other fasteners to suit application and site conditions.

3.05 GENERAL EXCAVATION

A. Excavate subsoil to accommodate utilities, roads, parking, sidewalks, walkways, landscape installation, building foundations, slabs-on-grade paving and site structures, construction operations, and other features as necessary.

B. Excavate to working elevation for piling work.

C. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with this Section.

D. Slope banks with machine to angle of repose or less until shored.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Trim excavation. Remove loose matter.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.

1. Remove rock to lines and grades required to permit installation of permanent construction as indicated on Drawings without exceeding the following dimensions:

a. 24 inches outside of concrete forms other than at footings;

b. 12 inches outside of concrete forms at footings;

c. 6 inches outside of minimum required dimensions of concrete cast against grade;

d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments;

e. 6 inches beneath bottom of concrete slabs on grade;

f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide;

g. As indicated on the Drawings.

H. Notify Engineer of unexpected subsurface conditions.

I. Correct areas over excavated with approved fill material.

J. Remove excess and unsuitable material from site.

K. Repair or replace items indicated to remain damaged by excavation.

3.06 SUBSOIL EXCAVATING

A. Excavate subsoil and topsoil from areas designated.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

C. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

D. Remove groundwater by pumping to keep excavations dry.

E. Excavate subsoil from marked areas required for building foundations, piling, construction operations, and other Work.

F. Proof roll bearing surfaces. Fill soft spots with fill and compact uniformly to 95 percent of maximum density.

G. Correct unauthorized excavation at no cost to Owner.

H. Backfill over-excavated areas under in accordance with specifications and as directed by the Engineer.

I. Remove excess subsoil not being reused from site.

J. Excavate subsoil from areas to be further excavated, relandscaped, or regraded.

K. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

L. When excavating through roots, perform Work by hand and cut roots with sharp axe.

M. Remove excess excavated materials subsoil and topsoil not intended for reuse, from site.

N. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.

O. Benching Slopes: Horizontally bench existing slopes greater than 1: 4 to key placed fill material to slope to provide firm bearing.

P. Stability: Replace damaged or displaced subsoil as specified for fill.

## 3.07 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within accepted tolerance.

B. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations:

a. Do not disturb bottom of excavation.

b. Excavate by hand to final grade just before placing concrete reinforcement.

c. Trim bottoms to required lines and grades.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures:

a. Do not disturb bottom of excavations intended as bearing surfaces.

3. Slabs and Floors: Excavate to the following depths below bottom of concrete for addition of select granular material:

a. Interior Floors: 6 inches unless otherwise indicated on Drawings.

b. Exterior Slabs and Steps: 12 inches unless otherwise indicated on Drawings.

3.08 TRENCHING

A. Excavate for storm drains, sanitary sewer, ducts, water, gas, other utilities and piping per Drawings.

B. Excavate trenches to indicated gradients, lines, depths, and elevations. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.

C. Hand trim excavation and leave free of loose matter. Hand trim for bell and spigot pipe joints.

D. Support pipe bells, joints, and conduit, during placement and compaction of bedding fill.

E. Remove projecting stones and sharp objects along trench subgrade.

F. Coordinate backfilling with utilities testing and testing agency.

G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

H. Backfill trenches to required contours and elevations.

I. Place and compact fill materials as for backfilling.

3.09 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be left in place as part of the completed Work, cut off minimum 18 inches below finished grade.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.10 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.

1. Engineer and Owner reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.11 UNAUTHORIZED EXCAVATION

A. Immediately notify the Engineer prior to the commencement of any unauthorized excavation or backfilling work.

B. Backfill unauthorized excavation under footings, foundation bases, or retaining walls with compacted select granular material without altering the required footing elevation. Elsewhere, backfill and compact unauthorized excavation as specified for authorized excavation of the same classification.

3.12 BACKFILL EXAMINATION

A. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

B. Verify foundation or basement walls are braced to support surcharge forces imposed by backfilling operations.

3.13 BACKFILL PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with granular fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 3 inches.

D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

E. Replace unsatisfactory soil with compacted backfill or fill material.

F. Survey locations of underground utilities for As-built Drawings and Record Documents.

G. Test and inspect underground utilities as specified.

H. Remove concrete formwork.

I. Remove trash and debris.

J. Install permanent or temporary horizontal bracing on horizontally supported walls

K. Reconstruct subgrade damaged by freezing temperatures, frost, rain, accumulated water, or construction activities without additional compensation.

L. If unsatisfactory soil is encountered immediately notify Engineer before any work commences.

3.14 BACKFILLING

A. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

B. Place and compact backfill in excavations promptly.

C. Place backfill and fill soil materials in layers to specified depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

D. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

E. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

F. Backfill areas to contours and elevations indicated on Drawings.

G. Use unfrozen and unsaturated materials.

H. Place geotextile fabric over unstable subsoil.

I. Place material in continuous layers as follows:

1. Soil Materials: Maximum 8 inches compacted depth.

2. Structural Fill Materials: Maximum 8 inches compacted depth.

3. Granular Fill: Maximum 8 inches compacted depth.

4. Trench Fill: Maximum 6 inches compacted depth when in paved area, 8 inches compacted depth when outside paved area.

J. Employ placement method that does not disturb or damage other work.

K. Employ placement method so not to disturb or damage foundations, foundation perimeter drainage, foundation damp-proofing, foundation waterproofing and protective cover, or utilities in trenches.

L. Maintain optimum moisture content of backfill materials to attain required compaction density.

M. Backfill against supported foundation walls. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

N. Slope grade away from building minimum 1 percent slope for minimum distance of 10 ft, unless noted otherwise.

O. Do not leave more than 50 feet of trench open at end of working day.

P. Protect open trench to prevent danger to Owner and/or the public.

Q. Make gradual grade changes. Blend slope into level areas.

R. Remove surplus backfill materials from site.

S. Leave fill material stockpile areas free of excess fill materials.

3.15 FILLING (GRADING)

A. Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations as indicated on Drawings.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Fill areas to contours and elevations with unfrozen materials.

C. Place material in continuous layers as follows:

1. Subsoil Fill: Maximum 8 inches compacted depth.

2. Structural Fill: Maximum 6 inches compacted depth.

3. Granular Fill: Maximum 8 inches compacted depth.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 1 percent slope for minimum distance of 10 ft, unless noted otherwise.

F. Make grade changes gradual. Blend slope into level areas.

G. Trim and rough grade area within the grading limits to a depth sufficient below the finish grades to accommodate topsoil, pavement, concrete and other finished surfaces.

H. Repair or replace items indicated to remain damaged by excavation or filling.

I. Install Work in accordance with State, Local or Federal standards.

3.16 EMBANKMENT/BERM FILL

A. Fill materials for berms and key trenches:

1. Furnish from approved designated borrow areas.

2. Free from roots, stumps, wood, stones greater than 6 inches, and frozen or other objectionable material.

B. Remove all unsuitable soil and scarify subgrade prior to placement of fill.

C. Provide a key trench beneath all the berm as indicated on Drawings. Extend the trench a minimum of 2 feet below existing grade.

1. Key Trench Bottom Width: minimum of 3 feet

2. Key trench side slopes: minimum of 1:1 (h:v)

D. Place the most permeable borrow material along the downstream portions of the embankment.

E. Install principal spillway concurrently with fill placement. Do not excavate into the embankment.

F. Place fill in 8 inch maximum layers continuous for the entire length of embankment.

G. Compaction: As indicated on Drawings.

H. Compact fill using a sheepsfoot type compactor. To prevent damage to the drainage pipe(s), do not cross any pipe with compaction equipment until minimum cover is established along the pipe(s).

I. Use topsoil on the outer shell of the berm. The topsoil must meet specification requirements and have the capability to support vegetation of the quality required to prevent erosion of the berm.

3.17 STOCKPILING

A. Stockpile materials on site at locations approved by the Owner and Engineer.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Stockpile topsoil 8 feet high maximum.

E. Prevent intermixing of soil types or contamination.

F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

G. Cover to prevent windblown dust.

H. Stockpile soil materials away from edge of excavations.

I. Do not store within drip line of remaining trees.

J. For soil stockpiles left overnight, provide silt sock, strawbales, silt fence, or a combination of silt fence with strawbales around the stockpile perimeter.

K. Stockpile unsuitable or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.18 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

3.19 TOLERANCES

A. Top Surface of Backfilling within Building Areas and Underground Tanks: Plus or minus 1/2 inch from required elevations.

B. Top Surface of Backfilling under paved Areas or surface stormwater features: Plus or minus 1/2 inch required elevations.

C. Top Surface of Backfilling under lawn, or landscape: Plus or minus 1 inch from required elevations.

3.20 FIELD QUALITY CONTROL

A. Repair and reestablish grades to specified tolerances where graded surfaces have been disturbed or altered due to construction activities, weather conditions or other means.

B. Perform inspection of excavation and controlled fill operations in accordance with applicable code.

C. Request visual inspection of bearing surfaces by before installing subsequent work.

D. Perform inspection of foundations in accordance with applicable code.

E. Perform laboratory material tests

F. Perform in place compaction tests in accordance with the following:

1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.

2. Moisture Tests: ASTM D3017.

G. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

H. Frequency of Tests: Initial Testing by Owner. Contractor to accommodate testing agency. Additional testing due to inadequate work by Contractor.

I. Proof roll compacted fill surfaces under slabs-on-grade, pavers, paving, and other site features as required.

3.21 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.22 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 312319

DEWATERING

PART 1- GENERAL

1.01 WORK INCLUDED:

This section specifies designing, furnishing, installing, maintaining, operating and removing temporary dewatering systems as required to lower and control water levels and hydrostatic pressures during construction; disposing of pumped water; constructing, maintaining, observing and, except where indicated or required to remain in place, removing of equipment and instrumentation for control of the system.

1.02 RELATED WORK:

A. Section 00890, PERMITS

B. Section 01570, ENVIRONMENTAL PROTECTION

C. Section 02252, SUPPORT OF EXCAVATION

D. Section 02300, EARTHWORK

1.03 SYSTEM DESCRIPTION:

A. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from the slopes or bottom of the excavation; increasing the stability of excavated slopes; preventing loss of material from beneath the slopes or bottom of the excavation; reducing lateral loads on sheeting and bracing; improving the excavation and hauling characteristics of sandy soil; preventing rupture or heaving of the bottom of any excavation; and disposing of pumped water.

1.04 QUALITY ASSURANCE:

A. The Contractor is responsible for the adequacy of the dewatering systems.

B. The dewatering systems shall be capable of effectively reducing the hydrostatic pressure and lowering the groundwater levels to a minimum of 2 feet below excavation bottom, unless otherwise required by the Engineer, so that all excavation bottoms are firm and dry.

C. The dewatering system shall be capable of maintaining a dry and stable subgrade until the structures, pipes and appurtenances to be built therein have been completed to the extent that they will not be floated or otherwise damaged.

D. The dewatering system and excavation support (see Section 02252, SUPPORT OF EXCAVATION) shall be designed so that lowering of the groundwater level outside the excavation does not adversely affect adjacent structures, utilities or wells.

1.05 SUBMITTALS

A. Contractor shall submit six copies of a plan indicating how they intend to control the discharge from any dewatering operations on the project, whether it is discharge of groundwater from excavations or stormwater runoff during the life of the project.

PART 2- PRODUCTS:

NOT APPLICABLE

PART 3- EXECUTION

3.01 DEWATERING OPERATIONS:

A. All water pumped or drained from the work shall be disposed of in a manner that will not result in undue interference with other work or damage to adjacent properties, pavements and other surfaces, buildings, structures and utilities. Suitable temporary pipes, flumes or channels shall be provided for water that may flow along or across the site of the work. All disposal of pumped water shall conform to the provisions of Section 01570 ENVIRONMENTAL PROTECTION and Section 00890 PERMITS.

B. Dewatering facilities shall be located where they will not interfere with utilities and construction work to be done by others.

C. Dewatering procedures to be used shall be as described below:

1. Crushed stone shall encapsulate the suction end of the pump to aid in minimizing the amount of silt discharged.

2. For dewatering operations with relatively minor flows, pump discharges shall be directed into hay bale sedimentation traps lined with filter fabric. Water is to be filtered through the hay bales and filter fabric prior to being allowed to seep out into its natural watercourse.

3. For dewatering operations with larger flows, pump discharges shall be into a steel dewatering basin. Steel baffle plates shall be used to slow water velocities to increase the contact time and allow adequate settlement of sediment prior to discharge into waterways.

4. Where indicated on the contract drawings or in conditions of excess silt suspended in the discharge water, silt control bags shall be utilized in catch basins.

D. The Contractor shall be responsible for repair of any damage caused by his dewatering operations, at no cost to the Owner.

END OF SECTION

SECTION 321123

AGGREGATE BASE COURSES

PART 1-GENERAL

1.01 WORK INCLUDED:

A. Aggregate subbase.

B. Aggregate base course.

1.02 Related Sections:

A. Section 31 20 00 - Earthmoving.

B. Section 31 37 00 – Riprap and Rock Lining.

C. Section 32 12 16 - Asphalt Paving.

D. Section 32 91 19 - Landscape Grading.

E. Section 33 05 13 - Manholes and Structures.

F. Section 33 41 13 - Storm Utility Drainage Piping.

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.

2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

3. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

2. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction

3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

4. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

6. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

7. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

9. ASTM D2940 - Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.

10. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

11. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.04 SUBMITTALS

A. Materials Source: Submit name of aggregate materials suppliers.

B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements with a sieve of each material.

1.05 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

PART 2-PRODUCTS

2.01 AGGREGATE MATERIALS

A. Subbase Aggregate: ASTM D2940; graded type.

| Sieve Size | Percent Passing |
|---|---|
| 2 inches | 100 |
| No. 4 | 30 to 60 |
| No. 200 | 0 to 12 |

B. Base Aggregate: ASTM D2940; graded type.

| Sieve Size | Percent Passing |
|---|---|
| 2 inches | 100 |
| 1-1/2 inches | 95 to 100 |
| 3/4 inches | 70 to 92 |
| 3/8 inches | 50 to 70 |

| | |
|---|---|
| No. 4 | 35 to 55 |
| No. 30 | 12 to 25 |
| No. 200 | 0 to 8 |

C. Crushed Stone: durable crushed rock consisting of angular fragments, free from a detrimental quantity of thin, flat, elongated pieces or durable crushed gravel stone obtained by artificial crushing of boulders or fieldstone. The crushed stone must be free from clay, loam, or deleterious material.

Crushed Stone to conform to the following gradations:

| | Percent Passing By Weight | |
|---|---|---|
| Sieve Size | 1/2-Inch Stone | 3/4-Inch Stone |
| | | |
| 1 inch | --- | 100 |
| 3/4 inch | --- | 90-100 |
| 5/8 inch | 100 | --- |
| 1/2 inch | 85-100 | 10-50 |
| 3/8 inch | 15-45 | 0-20 |
| No. 4 | --- | 0-5 |
| No. 8 | 0-5 | --- |
| | | |
| | Percent Passing By Weight | |
| Sieve Size | 1-1/2-Inch Stone | 2-Inch Stone |
| | | |
| 2 inch | 100 | 90-100 |
| 1-1/2 inch | 95-100 | --- |
| 1-1/4 inch | --- | 25-50 |
| 1 inch | 35-70 | --- |
| 3/4 inch | 0-25 | 0-15 |
| 1/2 inch | --- | --- |

2.02 FINE AGGREGATE MATERIALS

A. Fine Aggregate Type: Conforming to State of Local Public Work's standard.

B. Fine Aggregate Type (Sand): Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136, ASTM D2487 Group Symbol SW SP SM SC.

2.03 SOURCE QUALITY CONTROL

A. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D1557, AASHTO T180, ASTM D4318, or ASTM C136.

B. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3-EXECUTION

3.01 EXAMINATION

A. Verify compacted substrate is dry and ready to support paving and imposed loads.

1. Proof roll substrate with vibratory roller in minimum two perpendicular passes to identify soft spots.

2. Remove soft substrate and replace with compacted fill.

B. Verify substrate has been inspected, gradients and elevations are correct.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting.

B. If fill is required, compact subgrade soil in accordance with 31 20 00.

C. Excavate sandy loam and loamy sand topsoil from areas to be paved prior to subbase installation.

D. Do not place fill on soft, muddy, or frozen surfaces.

3.03 AGGREGATE PLACEMENT

A. Spread aggregate over prepared substrate to total compacted thickness indicated on Drawings.

B. Roller compact aggregate to 95 percent maximum density unless otherwise indicated on Drawings.

C. Level and contour surfaces to elevations, profiles, and gradients indicated on Drawings.

D. Roadway Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to 95 percent of maximum density.

E. Add small quantities of fine aggregate to coarse aggregate when required to assist compaction.

F. Maintain optimum moisture content of fill materials to attain specified compaction density.

G. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

A. Maximum Variation From Flat Surface: 1/2 inch measured with 10 foot straight edge.

B. Maximum Variation From Thickness: 1/4 inch.

C. Maximum Variation From Elevation: 1/2 inch.

3.05 FIELD QUALITY CONTROL

A. Contractor to accommodate the Owner's third party testing agency to perform compaction testing during the work.

B. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.06 COMPACTION

A. Compact materials to 98 percent of maximum density as determined from test strip, in accordance with ASTM D2940.

END OF SECTION

SECTION 321216

ASPHALT PAVING

PART 1-GENERAL

1.1 WORK INCLUDED:

A. Asphalt materials.

B. Aggregate materials.

C. Asphalt paving base course, binder course, and wearing course.

D. Asphalt paving overlay for existing paving.

E. Surface slurry.

F. Asphalt berm (Cape Cod berm).

1.02 RELATED SECTIONS:

A. Section 32 11 23 - Aggregate Base Courses.

B. Section 32 17 23 - Pavement Markings.

C. Section 33 05 13 - Manholes and Structures.

1.03 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO M17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.

2. AASHTO M29 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.

3. AASHTO M140 - Standard Specification for Emulsified Asphalt.

4. AASHTO M208 - Standard Specification for Cationic Emulsified Asphalt.

5. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.

6. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.

7. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

8. AASHTO MP1a - Standard Specification for Performance-Graded Asphalt Binder.

B. Asphalt Institute:

1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.

2. AI MS-2 – Asphalt Plant Manual

3. AI MS-19 - Basic Asphalt Emulsion Manual.

C. U.S. Army Corp OF Engineers

1. UN-13 (CE MP-ET) – Hot Mix Asphalt Handbook

D. ASTM International:

1. ASTM C1371-2004a - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.

2. ASTM C1549-2004 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.

3. ASTM D242 - Standard Specification for Mineral Filler For Bituminous Paving Mixtures.

4. ASTM D692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.

5. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.

6. ASTM D977 - Standard Specification for Emulsified Asphalt.

7. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.

8. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples

9. ASTM D2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type).

10. ASTM D2397 - Standard Specification for Cationic Emulsified Asphalt.

11. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of NonAbsorptive Compacted Bituminous Mixtures.

12. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.

13. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.

14. ASTM D3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

15. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.

16. ASTM D3910 - Standard Practices for Design, Testing, and Construction of Slurry Seal.

17. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

18. ASTM E408-1971(1996) e1 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.

19. ASTM E903-1996 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.

20. ASTM E1918-1997 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.

21. ASTM E1980-2001 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.04 SUBMITTALS

A. Product Data:

1. Submit product information for asphalt and aggregate materials.

2. Submit mix design with laboratory test results supporting design.

a. Design mix submittal to follow the format indicated in the Asphalt Institute Manual MS-2, Marshall Stability Method; and include the following:

b. Type/name of the mix.

c. Gradation analysis.

d. Grade of asphalt cement used

e. Marshall Stability (lbs.).

f. Flow and effective asphalt content (percent).

1.05 QUALITY ASSURANCE

A. Mixing Plant: Certified by State.

B. Obtain materials from same source throughout.

C. Perform Work in accordance with State, Municipality, and/or Public Work's standard.

D. Perform work within public rights-of-way in accordance with the rules, regulations and requirements of the Public Agency having control and ownership of such rights-of-way.

1.06 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum 5 years documented experience.

1.07 AMBIENT CONDITIONS

A. Do not place asphalt mixture between November 1 and March 1 without written request and approval from the Owner and Engineer.

B. Do not place asphalt mixture when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

C. Apply tack coat only when the ambient temperature is above 40°F, and when the temperature has been above 35°F for 12 hours immediately prior to application. Do not apply when base is wet, contains excess moisture, or during rain.

D. The required temperature of the bituminous pavement mixture, within a tolerance of plus or minus 15°F, when delivered at the site, will be governed by the temperature of the base upon which the mix is placed, as follows:

| Base | Required Material Temperature in Degrees F | | | |
|---|---|---|---|---|
| Temperature | For Course Thickness in Inches | | | |
| in Degrees F | 1 | 1-1/2 | 2 | 3 and Greater |
| | | | | |
| 35-40 | - | 305 | 295 | 280 |
| 41-50 | 310 | 300 | 285 | 275 |
| 51-60 | 300 | 295 | 280 | 270 |
| 61-70 | 290 | 285 | 275 | 265 |
| 71-80 | 285 | 280 | 270 | 265 |
| 81-90 | 275 | 270 | 265 | 260 |
| 91 & over | 270 | 265 | 260 | 255 |

E. Place asphalt mixture when temperature is not more than 15 degrees F less than initial mixing temperature.

PART 2-PRODUCTS

2.01 ASPHALT PAVING

A. Performance / Design Criteria:

1. Paving: Design for parking areas and residential streets.

B. Asphalt Materials:

1. Asphalt Cement: Comply with AASHTO M-226/ASTM D 3381; Table 2 for grades AC-10, AC-20, or AC-30, AR-8000, viscosity grade, depending on local mean annual air temperature, as follows:

| Temperature Condition | Asphalt Grades |
|---|---|
| Cold, mean annual air temperature < 7 degrees C) 45 degrees F) | AC-10 85/100 pen. |
| Warm, mean annual air temperature Between 7 degrees C (45 degrees F) And degrees C (75 degrees F) | AC-20 60/70 pen. |
| Hot, mean annual air temperature > 24 degrees C (75 degrees F) | AC-30 |

2. Primer: In accordance with State and local Public Work's standards.

3. Tack Coat: diluted emulsified asphalt, one part water to one part emulsified asphalt setting type.

4. Reclaimed Asphalt Pavement (RAP): Processed material obtained by milling or full depth removal of existing asphalt paving.

5. Oil: In accordance with State and local Public Work's standards.

C. Aggregate Materials:

1. Fine Aggregate:

   a. 100% Natural sand

   b. 100% Stone sand

   c. A blend of natural sand and stone sand

   d. The fine aggregate, as delivered to the mixer, must meet the following gradation requirement:

| | Percent Passing | |
|---|---|---|
| Sieve | Minimum | Maximum |
| 3/8 inch | 95 | 100 |
| No. 8 | 70 | 95 |
| No. 50 | 20 | 40 |
| No. 200 | 2 | 16 |

   e. In the fine aggregate sieve analysis (passing No. 8), the amount between two successive sieves (No. 16, 30, 50, and 100) not to exceed 33 percent of the fine aggregate total.

2. Mineral Filler: ASTM D242 or AASHTO M17; Rock or slag dust, Portland cement, or other inert material or finely ground mineral particles, free of foreign matter.

D. Reclaimed Asphalt Pavement (RAP): Provide material obtained from the highways or streets by crushing, milling, or planning existing hot mix asphalt pavements.

1. Proportion of RAP to virgin aggregate for base course mixtures and intermediate course mixtures maximum amounts:

a. 40% for drum mix plants

b. 20% for modified batch plants.

c. 10% for surface course mixtures.

E. Aggregate Subbase: Specified in Section 32 11 23.

2.02 MIXES

A. Use dry material to avoid foaming. Mix uniformly.

B. Asphalt-Aggregate Mixture: A minimum stability based on a 50-blow Marshall Method, complying with AASHTO T245 (ASTM D 1559), of 1200 lb. with a flow between 8 and 16.

Provide the aggregate gradation and bitumen content, as follows:

1. Air Voids: 3-5%.

2. Allowable variance of percent bitumen by weight of total mix: +0.4 percent.

3. The maximum allowable percentage of wear per Abrasion Test (AASHTO-T96): 35 percent.

4. Sieve analysis of mix percent by weight passing as follows:

| Sieve | Base Course | Binder Course | Dense Binder Mix | Standard Top Course | Dense Top Course | Modified Top Course | Sand Mix |
|---|---|---|---|---|---|---|---|
| 2 inch | 100 | | | | | 100 | |
| 1 inch | 55-80 | 100 | | | | 95-100 | |
| 3/4 inch | | 80-100 | | | | | |
| 5/8 inch | | | | 100 | | 75-90 | |
| 1/2 inch | 40-65 | 65-80 | 100 | 95-100 | 100 | 60-75 | 100 |
| 3/8 inch | | | 80-100 | 80-90 | 90-100 | 40-60 | 80-100 |
| No. 4 | 20-45 | 48-65 | 55-80 | 50-76 | 50-76 | 32-44 | 64-85 |
| No. 8 | 15-33 | 37-51 | 48-63 | 37-54 | 37-54 | 32-34 | 46-68 |
| No. 16 | | | 36-49 | 26-40 | 26-40 | 24-34 | 26-50 |
| No. 30 | 8-17 | 17-30 | 24-38 | 17-29 | 17-29 | 16-26 | 13-31 |
| No. 50 | 4-12 | 10-22 | 14-27 | 10-21 | 1-21 | 8-18 | 7-17 |
| No. 100 | | | 6-18 | 5-16 | 5-16 | 4-13 | 3-8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. 200 | 0-4 | 0-6 | 4-8 | 2-7 | 2-7 | 2-7 | 7-8 |

C. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by MASSDOT Specifications and designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types".

2.03 ACCESSORIES

A. Sealant: ASTM D6690, Type I; hot applied type.

2.04 SOURCE QUALITY CONTROL

A. Submit proposed mix design of each class of mix for review prior to beginning of Work.

B. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by MASSDOT Specifications and designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types".

PART 3-EXECUTION

3.01 EXAMINATION

A. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

B. Verify compacted subbase is dry and ready to support paving and imposed loads.

1. Proof roll subbase with heavy pneumatic-tired equipment in minimum two perpendicular passes to identify soft spots.

2. Remove soft subbase and replace with compacted fill as specified in Section 31 23 23.

C. Verify gradients and elevations of base are correct.

D. Verify gutter drainage grilles and frames manhole frames, valve covers, and other utility access covers are installed in correct position and elevation.

3.02 PREPARATION

A. Coordinate paving operations with all other work, especially underground utility construction, to prevent covering up unfinished or uninspected work and loss of time or labor by improper scheduling.

B. Apply a uniform coating of an approved tack coat material on vertical surfaces of structures and existing pavement surfaces in contact with new bituminous pavement. Prevent splattering or staining of exposed surfaces above finished grade during the application. Clean, repair or replace exposed surfaces that are stained as a result of incorrect application.

C. Thoroughly clean with a self-propelled sweeper all existing paved surfaces to be overlaid. Broom sweep until areas inaccessible by power sweeper.

3.03 DEMOLITION

A. Saw cut and notch existing paving as indicted on Drawings.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

C. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.04 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling.

B. Remove existing asphalt pavement by cold milling to grades and cross sections as indicated on Drawings.

C. Perform milling by machinery suitable for the type and size of project.

3.05 INSTALLATION

A. Install pavements in the location and to the grades as indicated on Drawings.

B. Install pavement courses at thickness as indicated on Drawings.

C. Subbase:

1. Aggregate Subbase: Install as specified in Section 32 11 23.

D. Primer:

1. Apply primer in accordance with AI MS-2.

E. Tack Coat:

1. Apply tack coat on asphalt and concrete surfaces at uniform rate.

a. New Surfaces: 1/3-1/2 gal/sq yd.

b. Existing Surfaces: 1/3-1/2 gal/sq yd.

2. Apply tack coat to contact surfaces of curbs, gutters and existing pavement.

3. Coat surfaces of manholes, catch basin frames and other covers with oil to prevent bond with asphalt paving. Do not tack coat these surfaces.

F. Single Course Asphalt Paving:

1. Place asphalt within 24 hours of applying primer or tack coat.

2. Place asphalt wearing course to thickness indicated on Drawings.

3. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.

4. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

G. Double Course Asphalt Paving:

1. Place asphalt binder course within 24 hours of applying primer or tack coat.

2. Place binder course to thickness indicated on Drawings.

3. Place wearing course within 24 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.

4. Place wearing course to thickness indicated on Drawings.

5. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.

6. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

H. Asphalt Paving Overlay

1. Apply tack coat to existing paving surface at rate recommended by geotextile fabric manufacturer.

2. Install geotextile fabric in accordance with manufacturer's instructions to permit asphalt saturation of fabric. Lap fabric edge and end joints 4 inches.

3. Place wearing course to thickness indicated on Drawings.

4. Compact overlay by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.

5. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

I. Meeting Existing Pavements

1. Sawcut the existing pavements to produce a uniform, smooth joint surface. Sawcut neat, straight, even lines with straight vertical edges free from irregularities. Do not damage the pavement to remain.

J. Surface Slurry

1. Install uniform thickness surface slurry over existing paving in accordance with ASTM D3910.

2. Allow slurry to cure.

3. Roll paving to achieve uniform surface.

K. Asphalt Berm

1. Clean surface of all loose and deleterious material.

2. Apply tack coat in accordance with the Drawings and MassDOT requirements.

3. Installed as indicated on Drawings.

4. Install asphalt berm with a self-propelled automatic berm machinery.

5. Do not place asphalt berm on wet surfaces, or when weather conditions otherwise prevent the proper handling or finishing of asphalt mixtures.

6. Backfill the back of the berm with top soil within 24 hours after placement.

L. Curbs

1. Install extruded asphalt curbs of 6 inch profile as indicated on Drawings.

3.06 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from Indicated Elevation: Within 1/2 inch.

3.07 FIELD QUALITY CONTROL

A. Asphalt Paving Mix Temperature: Measure temperature at time of placement.

B. Owner to provide and Independent Testing Laboratory to perform testing of in-place bituminous pavement courses for compliance with requirements for thickness, density and surface smoothness. Top and base courses will be randomly tested with a calibrated nuclear gauge or Engineer approved equal. If density tests are found to be not in conformance with the specifications, additional core samples are to be provided at the same interval listed above for the paved surface for further testing. Pavement samples will be tested for conformance with the mix design. If additional core samples are found to be not in conformance with the specifications, remove and replace pavement at no expense to the Owner. Fill core samples with bituminous or cement concrete.

C. Compaction: Minimum compacted density of 95% of laboratory Marshall Density in accordance with one of the following standards:

1. Bulk Specific Gravity and Density of Compacted Bituminous Mixture Using ParaffinCoated Specimens: ASTM D-1188.

2. Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens: ASTM D-2726.

D. Remove and replace areas of insufficient compaction in compliance with the specifications.

3.08 PROTECTION

A. No vehicular traffic or loads permitted on the newly completed pavement until adequate stability has been attained, the material has cooled sufficiently to prevent distortion or loss of fines, and the pavement has achieved a maximum temperature of 140 degrees F.

B. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Engineer.

3.09 FINAL CLEAN UP

A. Clean all pavement surfaces with proper sweeping machinery.

B. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an approved landfill.

3.10 SCHEDULE – MIX USES

A. Mix Uses:

1. Top Course: Residential streets.

2. Dense Top Course: Standard for non-residential commercial, steep grades, high traffic.

3. Modified Top Course - Trucking terminals, Interstate Highways, 20,000 VPD.

4. Binder Course: Standard for all pavements.

5. Base Course: Used for heavy duty pavements when specified by Engineer.

6. Dense Mix: Parking lots, sidewalks, bike paths, and driveways.

7. Sand Mix: Playgrounds, tennis courts.

END OF SECTION

1.01 WORK INCLUDED:

SECTION 321723 PAVEMENT MARKINGS

(not applicable)

END OF SECTION

SECTION 329119

LANDSCAPE GRADING

PART 1-GENERAL

1.01 WORK INCLUDED:

A. Final grade topsoil for finish landscaping.

1.02 Related Sections:

A. Section 31 20 00 – Earth Moving

B. Section 31 25 00 – Erosion and Sediment Controls

C. Section 32 92 19 - Seeding

D. Section 32 93 00 – Plants

1.03 REFERENCES AND STANDARDS

A. AOAC: Association of Official Agricultural Chemists

B. ASTM International: American Society of Testing Materials International

C. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

D. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

E. UMTC: University of Massachusetts Transportation Center, "Manufactured Loam using Compost Material - Phase 1: Feasibility", October 1966 or latest update.

1.04 SUBMITTALS

A. Topsoil tests: Prior to delivery or spreading, submit a minimum of two (2) approved sample test results of planting soil from each proposed location or source.

B. Submit reports at least one (1) month before any delivery of materials.

C. Soil Additives and amendments: Product or testing certificates signed by manufacturers certifying that their products comply with specified requirements:

1. Manufacturers' certified analysis for all products specified.

2. Analysis for other amendments, such as organic compost, by the University of

3. Massachusetts Agricultural Extension Service or other approved testing laboratory, made

4. according to methods established by the AOAC, where applicable, and as required in this Specification.

5. Sieve and salt analysis of sand proposed as a planting soil amendment or component.

D. Organic Material: A letter certifying source and composition of organic material proposed for use as a soil amendment indicating compliance with UMTC "Article 5.4 Standard Compost Specifications for Massachusetts" and meets requirements. Letter must also give description of product and recommendations for use as a planting soil component or amendment.

E. Samples:

1. Topsoil: Submit, 2 lb sample of soil material to the Landscape Architect or Engineer.

2. Organic Material (if applicable): Submit, 2 lb sample of each type of organic material to Landscape Architect or Engineer

F. Materials Source: Submit name of imported materials source.

G. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Furnish each topsoil material from single source throughout the Work.

B. Soil Samples:

1. Mix and obtain composite top soil samples for testing to ensure the topsoil conform to the specifications. Collect composite samples from the stockpiles and source or material to be delivered to the site. Submit prototype topsoil mixes to Laboratory at least 30 days before intended use on site, to allow for reformulation and retesting if test results are rejected.

2. Provide samples to both Landscape Architect and testing laboratory and have testing report sent directly to the Landscape Architect.

C. Do not order or deliver materials until required samples, certifications, manufacturers' literature and test results have been reviewed by the Landscape Architect or Engineer. Delivered materials must be from the same source as the submitted samples.

D. The Landscape Architect or Engineer may compare each soil delivery to the site with submission samples. Any deviations from the approved materials identified will require resubmission and further testing be performed. The Landscape Architect or Engineer reserves the right to reject on or after delivery any material that does not meet specifications or match approved samples. Use of unapproved topsoil will result in rejection and removal.

E. Soil tests: All Tests performed by the University of Massachusetts Cooperative Extension Service in accordance with current standards of AOAC or other testing laboratory as approved by the Landscape Architect. Deliver test samples to laboratory, and have test results sent directly to the Landscape Architect. Testing reports to include the following for the stockpiled topsoil and finished planting soil that may or may not be amended in order to meet the specifications:

1. Mechanical gradation (sieve analysis) and USDA soil classification

2. Percent organic matter

3. Chemical analysis for the following elements:

    a. Soluble salts.

    b. Carbon: nitrogen ratio

    c. Potassium

    d. Phosphorus

    e. Magnesium

    f. Calcium

    g. Acidity (pH)

    h. Toxic Elements

4. Testing for heavy metals as required by the USEPA

5. Recommendations for soil additives to correct soils deficiencies as necessary to accomplish particular planting operations of the Project.

F. When tests indicate materials do not meet specified requirements, change material and retest.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Weather Limitations: Proceed with grading only when existing and forecasted weather conditions permit.

PART 2-PRODUCTS

2.01 MATERIAL

A. Topsoil Source:

1. Reuse surface soil stockpiled on-site if adequate stockpile areas are available.

2. Supplement with imported topsoil from off-site sources when on-site reusable quantities are insufficient.

3. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least four inches deep; do not obtain from agricultural land, bogs or marshes.

B. Topsoil:

1. Reusable excavated and /or Imported borrow

a. Fertile, friable, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots;

2. USDA Textural Classification: Sandy Loam.

3. Acidity range (pH) of 5.5 to 7.0.

4. Containing the minimum of 4 percent and maximum of 10 percent inorganic matter by weight.

5. Soluble salt content (Electrical Conductivity):

a. Conductivity not to exceed 900 ppm in soil. 1) Naturally Stripped Topsoil: 10-25 ppm

b. Loam borrow manufactured from organic compost: not to exceed levels recommended for the specific plantings 10-75 ppm

c. Note: Salt content will decrease the longer the soil is spread on site, with rain and aging of the organic components. The salt content must be within approved ranges by the time the soil is spread on site and plants installed, or planting will be delayed or soil rejected and will require replacement with an approved planting soil.

6. Nutrient Ranges:

a. Magnesium: 60-200 ppm

b. Phosphorus: 10- 100 ppm

c. Potassium to exceed 120 – 300 ppm

7. Reasonably free of roots, rocks larger than 1/2 inch subsoil, debris, large weeds, and foreign matter.

8. Free of other extraneous materials harmful to plant growth.

C. Organic matter proposed as a soil amendment: Natural or manufactured mature, composted organic material

1. Comply with UMTC "Article 5.4 Standard Compost Specifications for Massachusetts" and that the compost is mature.

2. Produced by a DEP approved composting vendor of material originating from mature leaf compost, mature composted animal manure, other aged, composted vegetable materials such as brewer's waste, or chemically tested toxin-free processed sludge products (biosolids), composted with wood products, safe for plants, humans and soil organisms (Class A or Type I).

3. Organic matter manufactured from sludge and other biowaste materials or manure to be aged for at least one (1) year without exception, and have no objectionable biowaste odor.

4. Do not use raw (uncomposted or unprocessed) or incompletely composted organic matter.

5. Refer also to requirements included in Article 2.3 Soil Additives for Planting Soil.

2.02 SOURCE QUALITY CONTROL

A. Testing and Analysis of Topsoil Material.

B. All topsoil delivered to the site must match the samples approved by the Landscape Architect or Engineer. Additional testing of topsoil delivered to the site will be required if it does not appear to be consistent with previously tested samples.

C. When tests indicate materials do not meet specified requirements, change material and retest.

D. Furnish materials of each type from same source throughout the Work.

PART 3-EXECUTION

3.01 EXAMINATION

A. Section 31 20 00 – Earth Moving: Verification of rough grading, trench backfilling and subbase has been contoured and compacted before starting work.

B. Verify compliance with requirements and for conditions affecting performance of work of this Section prior to starting any work. Report any defect, such as incorrect grading, incorrect subgrade elevations, improper compaction or drainage problems, to the Landscape Architect or Engineer prior to beginning Work. Do not proceed with installation until unsatisfactory conditions have been corrected. Commencement of Work indicates acceptance of filled subgrade areas and responsibility for Work.

1. When conditions detrimental to work are encountered including, but not limited to, incorrect grading, adverse drainage conditions, poor soil conditions, or invasive species problems, immediately notify the Owner and/or Landscape Architect or Engineer before beginning any Work.

C. Verify the location of the irrigation system and protect during operations.

3.02 PREPARATION

A. Coordinate topsoil placement with other Work of this contract being performed on the Project site.

B. Protect existing landscaping and other features identified to remain as part of the final Work.

C. Protect existing structures, fences, sidewalks, utilities, paving, pavers, walls and curbs.

D. Immediately notify Landscape Architect or Engineer if adjustments in grades and alignments are necessary to avoid interference with unforeseen conditions encountered.

E. Protect subgrade areas scheduled for planting or drainage infiltration systems from traffic and erosion.

3.03 SUBGRADE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, stones, in excess of 3/4 inch in size. Remove contaminated subsoil.

C. Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.04 PLACING TOPSOIL

A. Place topsoil in seeding, sodding, and planting, areas to thickness required in the Drawings. Place topsoil during dry weather. Do not spread if either the topsoil or subgrade is frozen, muddy, compacted or excessively wet.

B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade. Fill depressions caused by settlement with additional topsoil and regrade and rake until a smooth and even finished grade is created.

C. Remove roots, weeds, rocks, and foreign material while spreading.

D. Manually spread topsoil close to plant material or structures to prevent damage.

E. Lightly compact placed topsoil.

F. Remove surplus subsoil and topsoil from site.

G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.05 COMPACTION

A. Planting areas to be drill seeded or hydroseeded: Roll and compact bed before seeding. Compact with a roller or other suitable means to achieve a maximum dry density of 88 to 90% for the placed loam in accordance with compaction standards of ASTM D1557, Method D.

B. Areas to be hand seeded: Smooth surface to meet finished grades with raking and broadcast seed according to requirements specified. Compact with rolling after seeding.

C. Loosening and re-rolling of the soils will be required in areas of over compaction.

3.06 FIELD VISIT

A. A field visit is required by Landscape Architect or Engineer of the finished grades for approval.

3.07 TOLERANCES

A. Top of Topsoil: Plus or minus 1/2 inch.

B. Evenly grade slopes with smooth lines and grades.

3.08 PROTECTION OF INSTALLED WORK

A. Prohibit construction traffic over topsoil.

END OF SECTION

SECTION 329219

SEEDING

PART 1-GENERAL

1.01 WORK INCLUDED:

A. Fertilizing.

B. Seeding.

C. Hydroseeding.

D. Mulching.

E. Maintenance.

1.02 RELATED SECTIONS:

A. Section 31 20 00 – Earth Moving.

B. Section 32 91 19 - Landscape Grading.

C. Section 32 93 00 - Plants.

1.03 REFERENCES

A. ASTM International:

1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

1.04 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.05 SUBMITTALS

A. Seed Mix: Product Data and Manufacturer's Certificate of Compliance with the specifications for each type of seed to include the No seed may be sown until the Contractor has submitted the certificates.

B. Product Data: Submit data for the following:

1. Seed mixes

2. Fertilizer

3. Mulch

4. Lawn herbicides and pesticides

5. Other accessories

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements for the following:

1. Seed mixes

a. Guaranteed percentage of purity, weed content and germination of the seed, and the net weight and date of shipment and pounds per acre sowing rate.

b. Fertilizer

c. Lawn herbicides and pesticides

D. Maintenance Schedule: Provide watering, fertilizing and mowing schedule to the Owner, Engineer and/or Landscape Architect for approval.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.07 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. If required, only use herbicides, pre-emergents, fertilizers, fungicides, and pesticides reviewed and approved by the Landscape Architect or Engineer. Application to be performed by a licensed professional according to manufacturer's recommendations.

C. Select compatible products where options are provided.

1.08 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with a minimum 5 Year documented experience and with a record of successful grass establishment.

1. Installer to provide an experienced supervisor on the project site during all times that landscape construction is in progress. Provide written qualification data for firms and persons to be responsible for Work, to demonstrate their capabilities and experience.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.10 MAINTENANCE SERVICE

A. Initial maintenance period:

1. Immediately after grass areas are seeded and continue for a minimum of a 60 day active growing period following the completion of all grass construction work.

1.11 GUARANTEE

A. Satisfactory Seeded Grass: A healthy, uniform close stand of grass free of surface irregularities with coverage exceeding 90 percent over any 10 sq. ft. scattered bare spots, none of which are larger than 72 square inches, will be allowed up to a maximum of 2% of any lawn area.

B. Upon completion of the minimum maintenance period, request, in writing, an inspection by the Landscape Architect or Engineer to determine whether satisfactory seed growth has been established. If the seeded areas and workmanship are determined to be satisfactory as defined in the specifications, written notice will be given by the Landscape Architect or Engineer to the Contractor and Owner.

C. If the grass is determined to be unsatisfactory as defined in the specifications at the time of inspection, repair and/or reseed areas determined to be unacceptable.

1.12 ENVIRONMENTAL REQUIREMENTS

A. Planting Restrictions: Plant during one of the following periods:

1. All lawn Areas:

a. Spring: April 1 - June 1

b. Fall: August 15 – October 15

B. Seeding outside of season to occur only with permission of the Landscape Architect or Engineer, and may result in reseeding the following season until satisfactory seed establishment is provided. Acceptance will not be given to seed outside of season until satisfactory grass has been established. Out-of-season seeding during hot weather will require additional watering and shade mulching with netted hay-type erosion control fabric.

PART 2-PRODUCTS

2.01 SEED MIXTURE

A. Grass Seed to be of the previous year's crop and the weed seed content is not to exceed 1% by mass.

B. Use only low maintenance seed mixes.

C. Seed Mixture:

1. Seed Mix Type 1: New England Erosion Control/Restoration Mix for Moist Sites or approved equivalent to have the following species:

Virginia Wild Rye, (Elymus virginicus), Creeping Red Fescue, (Festuca rubra), Little Bluestem,(Schizachyrium scoparium), Big Bluestem, (Andropogon gerardii), Fox Sedge, (Carex vulpinoidea), Switch Grass, (Panicum virgatum), Rough Bentgrass, (Agrostis scabra), New England Aster, (Aster novae-angliae), Boneset, (Eupatorium perfoliatum), Grass Leaved Goldenrod, (Euthamia graminifolia), Green Bulrush, (Scirpus atrovirens), Blue Vervain, (Verbena hastata), Soft Rush, (Juncus effusus), Wool Grass, (Scirpus cyperinus).

Application Rate: 35 lbs/acre

2. Seed Mix Type 2: New England Roadside Seed Mix Wet Meadow or approved equivalent to have the following species:

a. Grasses

River bank Wild Rye (Elymus riparious), Virginia Wild Rye (Elymus virginicus), Creeping Red Fescue (Festuca rubra), Switch Grass (Panicum virgatum), Blunt Broom Sedge (Carex scoparia), Fowl Bluegrass (Poa palustris) Tufted Hairgrass (Deschampsia cespitosa), Redtop (Agrostis alba), Creeping Bentgrass (Agrostis stolonifera), Soft Rush (Juncus effusus), Wool Grass (Scirpus cyperinus)

b. Wildflowers

Blue Vervain (Verbena hastata), Calico Aster (Aster lateriflorus), Nodding Bur Marigold (Bidens cernua), Common Sneezeweed (Helenium autumnale), Showy Tick Trefoil (Desmodium canadense), Boneset Eupartorium perfoliatum), New England Aster (Aster novaeangliae), Spotted Joe Pye Weed (Eupatorium maculatum), New York Ironweed (Vernonia noveboracensis), Monkey Flower (Mimulus ringens) c. Shrubs Elderberry (Sambucus canadensis), Silky Dogwood (Cornus amomum), Arrow Wood

Application Rate: 35 lbs/acre

2.02 ACCESSORIES

A. Wood-Cellulose Mulch (Hydromulch): Specially prepared green-dyed and air-dried wood cellulose fibers, containing no growth or germination inhibiting substances, in packages not exceeding 100 pounds gross, with net weight shown on the package, and meeting the following requirements:

1. Fiber processed from whole wood chips manufactured specifically for standard hydraulic mulching equipment. Not produced from recycled material such as sawdust, paper, or cardboard.

2. Moisture content of hydromulch not to exceed 10%, plus or minus 3% as defined by the pulp and paper industry standards.

3. Water holding capacity of not less than 900 grams water per 100 grams fiber.

4. Nontoxic to plant life or animal life.

5. Non petroleum based organic tackifier and a green dye to allow for easy visual metering during application and not harmful to plant growth.

6. Fiber to be dispersed into a uniform slurry when mixed with water.

B. Fertilizer: Granular commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil as indicated in analysis.

1. Consist of slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.

C. Lime: ASTM C602, Class T agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

1. Provide lime in form of dolomitic limestone, with a minimum of 95 percent passing a No. 100 sieve, as recommended in the soil analysis.

D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass. Includes hose and all other watering equipment required for the Work.

E. Erosion Fabric: Coir fiber or Jute matting, as required in the Drawings.

F. Herbicide: As necessary.

G. Stakes: Softwood lumber, chisel pointed.

H. String: Inorganic fiber.

2.03 SOURCE QUALITY CONTROL

A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

B. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

C. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3-EXECUTION

3.01 EXAMINATION

A. Verify prepared soil base is ready to receive the Work of this section.

3.02 PREPARATION

A. Refer to Section 32 91 91 – Landscape Grading.

B. Correct any grading and drainage problems. Restore areas if erosion has occurred or Project site has been disturbed.

C. Moisten prepared grass areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.03 FERTILIZING

A. Apply lime at application rate recommended by soil analysis. Work lime into topsoil.

B. Apply fertilizer at application rate recommended by soil analysis but not in excess of 20 pounds per 1,000 square feet.

C. Apply after smooth raking of topsoil.

D. Do not apply fertilizer at same time or with same machine used to apply seed.

E. Spread and thoroughly mix fertilizer thoroughly into upper 3 inches of topsoil by harrowing or as part of hydroseed slurry.

F. Use no or minimal fertilizer in native grass, wildflower areas or meadow conservation mix seeding areas and only per the soil analysis recommendations. If the soil testing determines the topsoil does not contain appropriate levels of nutrients for establishment of these native species, fertilize these areas at the rates recommended by the test results.

G. Do not apply fertilizers in water protection areas or in wetland buffer areas under any circumstances.

H. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.04 SEEDING

A. Sow seed with spreader or seeding machine.

B. Do not use wet seed or seed that is moldy or otherwise damaged.

C. Apply seed at rate of per seed mix requirements recommended by the seed manufacturer evenly in two directions at right angles to each other. Rake in lightly into top 1/8 inch of topsoil.

D. Do not use wet seed or seed that is moldy or otherwise damaged.

E. Do not seed areas in excess of that which can be mulched on same day.

F. Schedule seeding when rain is not expected for 48 hours and within seasonal dates specified. Seed only when soil is in friable condition, not muddy, dried, or frozen.

G. Do not sow immediately following rain, when ground is too dry, when winds are over 12 mphor when temperatures are expected to be less than 45 or higher than 75 degrees Fahrenheit during and for two (2) weeks after seeding. .

H. Immediately following seeding, apply mulch to thickness of 1/8 inches. Maintain clear of shrubs and trees.

I. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.05 SEEDING - WILDFLOWER MIXES

A. Apply seed mixes containing wildflowers by hand broadcast method at specified rates evenly in two directions at right angles to each other.

B. Lightly rake in to ensure 1/4” soil cover, and lightly roll.

C. Alternative seeding methods:

1. Seeding with a Brillion or Slice Seeder: Completely mix in wildflower seed mix with bulking sand and apply at manufacture specified rates.

2. Hydroseeding wildflower mix per requirements above with minimal hydromulch on prepared loam, in first application, then following with a second spraying of 30 lbs./1000 sf. hydromulch and tackifier over first hydroseed application.

D. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

E. For late spring and early summer seeding, top-dress with a light mulch of weed-free straw to conserve moisture.

3.06 SEEDING SLOPES GREATER THAN 3:1

A. Protect seeded areas with slopes exceeding 3:1 with specified erosion control blankets or bonded fiber matrix as indicated on Drawings and approved by the Landscape Architect or Engineer.

B. See Section 31 25 00 – Erosion and Sedimentation Controls.

3.07 HYDROSEEDING

A. Protect adjacent and adjoining areas from hydroseeding overspray.

B. Mix specified seed, fertilizer, and premium wood fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with tackifier.

2. Apply the hydroseeding in the form of slurry consisting of organic soil amendments, commercial fertilizer, and any other recommended additives.

3. Apply slurry uniformly to all areas to be seeded in a one-step process. Spray the area with a visible uniform coat, using the dark color of the cellulose fiber as a visual guide. Apply the slurry in a downward drilling motion via a fan stream nozzle. Ensure that all of the slurry components enter the mix with the soil.

4. Ensure the uniformity of the hydroseed application at a minimum rate of 1,500-lb/acre dry weight but not less than the rate required to obtain specified seed-sowing rate.

5. Exercise special care to prevent any of the slurry from being sprayed onto any hardscape areas including paved surface, fences, walls, buildings, etc. Remove all slurry sprayed onto these surfaces at their own expense.

6. Save all seed and fertilizer tags and fiber mulch bags for the Landscape Architect or Engineer to verify compliance with the Drawings and Specifications.

3.08 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery.

B. The following are applicable only for areas were hydroseeding is NOT applied.

1. Cover seeded slopes where grade is 3:1 or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

2. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

3. Secure outside edges and overlaps at 36 inch intervals with stakes.

4. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

5. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.09 MAINTENANCE

A. Mow lawn areas at regular intervals to maintain at maximum height of 2-1/2". Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

D. Water to prevent grass and soil from drying out.

1. Provide all labor and water required to establish all grass areas. Water as required, during maintenance period to ensure the seed bed is thoroughly and evenly watered with a fine spray to penetrate the soil to a depth of at least 4 inches.

2. Keep seeded areas evenly moist until germination and satisfactory establishment.

3. Water in a manner to provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment.

E. Roll surface to remove minor depressions or irregularities if required.

F. Control growth of weeds.

1. Apply herbicides only as necessary and as approved by the Landscape Architect or Engineer. Remedy damage resulting from improper use of herbicides. G. Immediately reseed areas showing bare spots.

G. Repair washouts or gullies.

H. Protect seeded areas with warning signs during maintenance period.

I. Take immediate action to identify potential problems and undertake corrective measures in areas where a decline in the condition of grass seed areas is observed.

3.10 CLEAN UP

A. Promptly remove soil and debris created by grass work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove erosion-control measures after satisfactory grass establishment and site stabilization is complete

END OF SECTION

SECTION 330300

POLYVINYL CHLORIDE GRAVITY PIPE AND FITTINGS (SDR-35)

PART 1- GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing and installation of Polyvinyl Chloride (PVC) pipe and fittings, as indicated on the drawings and as specified herein.

1.02 RELATED WORK:

A. Section 02252, SUPPORT OF EXCAVATION

B. Section 02300, EARTHWORK

C. Section 02532, VALVES AND APPURTENANCES FOR WASTEWATER WORK

1.03 REFERENCES:

A. The following standards form a part of these specifications as referenced:

American Society for Testing and Materials (ASTM)

| | | |
|---|---|---|
| ASTM | D2321 | Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe |
| ASTM | D3034 | Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings |
| ASTM | D3212 | Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals |
| ASTM | F679 | Specification for Polyvinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings |

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Six sets of manufacturer's literature of the materials of this section shall be submitted to the Engineer for review.

PART 2- PRODUCTS

2.01 MATERIALS:

A. PVC PIPE – GRAVITY SEWER

1. PVC nonpressure sewer pipe 4-inches through 15-inches diameter shall conform to ASTM D3034, 18-inches through 60-inches diameter to ASTM F679, all with SDR of 35 unless noted, and shall meet the specific requirements and exceptions to the aforementioned specifications that follow.

2. PVC nonpressure sewer pipe shall be furnished in standard lengths.

3. One pipe bell consisting of an integral wall section with a solid cross section rubber ring, factory assembled, shall be furnished with each standard, random and short length of pipe. Rubber rings shall be provided to the requirements of ASTM D32l2.

4. The rubber ring shall be retained within the bell of the pipe by a precision formed groove or recess designed to resist fish mouthing or creeping during assembly of joints.

5. Spigot pipe ends shall be supplied with bevels from the manufacturer to ensure proper insertion. Each spigot end shall have an "assembly stripe" imprinted thereon to which the bell end of the mated pipe will extend upon proper jointing of the two pipes.

6. PVC fittings shall be provided with bell and/or spigot configurations with rubber gasketed joints compatible with that of the pipe. Bend fittings with spigot ends shorter than the pipe recess bells will not be allowed. The shorter spigot end would not allow proper seating of the spigot in the mating bell and would permit undesired contact between the mating bell and the outside of the fitting bell.

7. All pipe delivered to the job site shall be accompanied by independent testing laboratory reports certifying that the pipe and fittings conform to the above-mentioned specifications. In addition, the pipe shall be subject to thorough inspection and tests, the right being reserved for the Engineer to apply such of the tests specified as he may from time to time deem necessary.

8. All cutting of pipe shall be done with a machine suitable for cutting PVC pipe. Cut ends shall be beveled when recommended by the pipe manufacturer.

B. SOLVENT WELD JOINTS

1. Where solvent weld joints are required they shall be made with solvent supplied by the pipe manufacturer's specifications or with ASTM Recommended Practice D2855. The dry fit of joints shall be snug; pipe and fittings which afford loose fits will be rejected by the Engineer. The use of multiple layers of filler solvent to overcome a loose fit will not be permitted. Solvent cements shall conform to ASTM D-2564.

C. PIPE MARKINGS

1. Pipe and couplings shall bear identification markings that will remain legible during normal handling, storage, installation and during the life of the pipe. Markings shall have been applied to the pipe and couplings in a manner which will not reduce strength or durability or otherwise damage the pipe.

2. Markings for pressure pipe shall be applied at intervals of not more than 5 Feet and shall include the following: nominal size and OD base, "PVC", dimension-ratio number, AWWA pressure class, AWWA designation number for AWWA C-900, manufacturer's name or trademark and production record code, and mark or seal of pipe testing agency.

PART 3- EXECUTION

3.01 HANDLING AND CUTTING PIPE

A. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring its surfaces and ends.

B. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be at least 12 inches from the visible limits of the crack.

D. All cutting of PVC pipe is to be square. The pipe to be cut shall be marked around its entire circumference prior to cutting.

E. Using a factory finished beveled end as a guide to determine the angle and length of the taper, the end of a freshly cut pipe shall be beveled similarly.

3.02 PIPE BEDDING

A. Pipe bedding and foundation design shall be as specified in related sections.

3.03 INSTALLATION OF PIPE

A. Standard laying lengths shall be 20 feet for pressure pipe with 85% of the total footage of pipe being full lengths and the remaining 15% being furnished as random lengths.

B. Random lengths shall not be less than 10 feet long. Standard laying lengths for gravity sewer shall be 13 or 20 feet.

C. Prior to assembling, the bell and plain end shall be cleaned of all foreign matter. Push-on joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special non-toxic gasket lubricant, supplied by the pipe manufacturer, uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe. The end of the plain pipe shall be chamfered to facilitate assembly. The end shall be inserted into the gasket and then forced passed it until it seats against the bottom of the socket.

D. Pipe shall be installed in such a manner that will ensure that external loads will not subsequently cause a deflection of greater than 5% in the vertical cross-section dimension.

E. For PVC pressure pipe horizontal deflection from joint to joint shall be limited to 12 inches for PVC pipe sizes 6 inches to 12 inches based on 16 foot length.

F. The bedding of the pipe shall conform to the trench detail as shown on the Contract Drawings. Installation precautions are also given in ASTM D 2774.

G. Installed pipe shall rest flat and straight on the bedding at all locations without bridging or

H. binding. Backfill shall be carefully placed to avoid damage to the pipe. The pipe shall be placed to the grades shown on Contract Drawings.

I. Only laborers competent in laying plastic pipe and suitable equipment shall be employed. Pipe and fittings shall be handled with care so as to prevent scratching or other damage to the materials. All joints shall be properly cleaned and free of foreign matter. The installation instructions of the manufacturer shall be strictly followed with the exception that the pipe bedding shall be as shown on the Contract Drawings.

J. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, hammer, or other unyielding object. When each pipe has been properly bedded, enough of the backfill material shall be placed and compacted between the pipe and the sides of the trench to hold the pipe in correct alignment.

K. Before a joint is made, the pipe shall be checked to insure that a close joint with the next adjoining pipe has been maintained and that inverts are matched and form to the required grade.

L. The Contractor shall take all necessary precautions to prevent flotation of the pipe from trench flooding. At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary water-tight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

M. Any defective pipe or fitting found in the line shall be removed and replaced without cost to the Owner. All pipes and fittings shall be kept clean of all dirt and debris before being laid, and shall be kept clean until acceptance.

3.04 PIPE ENCASEMENT

A. Concrete encasement of the PVC Pipe shall be conducted as specified herein or as shown on the Contract Drawings. Concrete requirements for such encasement shall be specified in related sections.

3.05 SEWER REPLACEMENT

A. The Contractor shall take the necessary precautions to support and protect existing sewer pipes from being damaged during construction.

B. Sewer pipes that are shown on the contract drawings or located in the field and are damaged by the Contractor shall be replaced with PVC pipe at the Contractor's expense.

C. Should the Engineer feel that PVC is insufficient for use as a replacement pipe, based on field conditions, a different pipe material such as ductile iron pipe may be specified as directed by the Engineer.

D. The size of the replacement pipe shall closely approximate the size of the existing section to be replaced, allowing a watertight joint to be made while maintaining the existing pipe slope.

E. Joints between the existing pipe and replacement pipe shall be made with suitable watertight sleeve or couplings.

F. Joints shall not be backfilled until approved for water-tightness by the Engineer.

3.06 PIPE DEFLECTION MEASUREMENT:

A. In accordance with ASTM D3034, no less than 30 days after completion of the PVC sewer pipe installation, the Contractor shall test the pipeline for deflection using a "go/no-go" deflection mandrel having a minimum of nine evenly spaced arms or prongs. The "go/no-go" gauge shall be hand pulled through all sections of the pipeline by the Contractor. The Contractor shall submit drawings of the "go/no-go" gauge to the Engineer for approval prior to testing. Complete dimensions of the gauge for each diameter of pipe to be tested shall be in accordance with ASTM D3034.

B. Any section of pipe found to exceed 7.5 percent deflection shall be deemed a failed pipe and shall be excavated and replaced by the Contractor at his own expense

END OF SECTION

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SECTION 330513

PRE-CAST CONCRETE STRUCTURES AND MANHOLES

PART 1-GENERAL:

1.01 WORK INCLUDED:

A. This section shall apply to all precast concrete work, including manholes, wetwells, vaults, pads, posts, and other items as shown in the Contract Drawings or as herein specified.

B. Manholes and structures shall be constructed at the location, to the elevations, and in accordance with notes and details shown on the Contract Drawings.

PART 2-MATERIALS

2.01 GENERAL

A. Unless otherwise specified the concrete for precast sections shall conform to the requirements for 3000 psi concrete as a minimum.

B. Reinforcing steel for precast sections shall conform to the requirements of AASHTO, M31 (Billet steel) AASHTO, M55 (Welded Steel Wire Fabric) or ASTM Standard Specification A185.

2.02 PRECAST STRUCTURES

A. Concrete for precast tank sections shall conform to ASTM C 478 except as may be otherwise shown on the Contract Drawings.

B. The design loading for the tank shall conform to AASHO-HS20.

C. The minimum concrete strength shall be 4000 psi at 28 days.

D. Steel reinforcement shall conform to ASTM-A-79, grade 60, with 1 inch minimum cover.

E. Construction joints shall be sealed with 1 inch diameter Butyl Rubber Sealant (ASTM C

F. 443) or equal. They shall be designed and manufactured so that the completed joint will

G. withstand hydrostatic pressure of 20 psi for 10 minutes without showing any leakage by the gasket or displacement of it.

H. Sections shall be steam cured and shall not be shipped until at least five days after having been cast.

I. The tops of precast sections shall be suitably shaped, by approved means to provide an accurate connection between sections.

J. Acceptance of the sections will be on the basis of material, tools and inspection of the completed product.

K. Tanks shall be manufactured by E.F. Shea Wilmington, MA, Rotondo & Sons, Inc. Avon, Connecticut, American Precast Co., or approved equal.

2.03 BRICK MASONRY

A. Brick masonry shall be as specified in related sections.

B. The bricks shall be regular and uniform in shape and size, sound, hard and uniformly burned, of compact texture and satisfactory to the Engineer.

C. Underburned brick will not be acceptable and only whole brick shall be used unless otherwise permitted. Bricks rejected by the Engineer shall be immediately removed from the site and satisfactory bricks substituted therefore.

PART 3-EXECUTION OF WORK

3.01 INSTALLATION

A. Manholes and structures shall be constructed to the dimensions shown on the Drawings and as specified herein. Install manholes at elevations and locations shown on the Drawings or as otherwise directed by the Engineer.

B. The manholes and structures shall be placed on a thoroughly compacted type 6 material. There shall be a base to the manholes as specified on the Contract Drawings. The excavation shall be properly dewatered while placing bedding material and setting the base.

C. Set precast concrete base and sections so that the sections are vertical and in true alignment with a 1/4-inch maximum tolerance allowed. Fill the outside and inside joint with a comparatively dry mortar (one part cement to two parts sand) and finish flush with adjoining surfaces. Backfill in a careful manner, bring the fill up evenly on all sides. Compact backfill as specified on the Contract Drawings.

D. Plug holes in the concrete sections made for handling or other purposes with a nonshrink grout in combination with concrete plugs.

E. Where holes must be cut in the precast sections to accommodate pipes, do all cutting before setting them in place to prevent any subsequent jarring which may loosen the mortar joints.

F. Waterproofing shall be applied to the exterior surfaces of the manholes and structures. The waterproofing material for precast manholes shall be Koppers Bitumastic 300M, Pittsburgh Coal-Cat, Tnemec 413 Tnemec Tar or approved equal.

G. A leakage test shall then be made as described below.

3.02 LEAKAGE TEST

A. Leakage tests shall be made and observed by the Engineer on each manhole or structure. The test shall be an exfiltration test made as described below for all manholes. All other precast vaults or pits shall meet the specified leakage requirements through similar exfiltration leakage testing or air testing.

B. After the manhole has been assembled in place, all lifting holes and those exterior joints within 6 feet of the ground surface shall be filled and pointed with an approved nonshrinking mortar. The test shall be made prior to placing the shelf and invert and before filling and pointing the horizontal joints below the 6 foot depth line. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out.

C. The manhole shall then be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test as described above is unsatisfactory as determined by the Engineer or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and the measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24 hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24 hour period. If the test fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as directed by the Engineer to bring the leakage within the allowable rate of 1 gallon per vertical foot per day. Leakage due to a defective section of joint or exceeding the 3 gallon per vertical foot per day, shall be cause for the rejection of the manhole. It shall be the Contractor's responsibility to uncover the manhole as necessary and to disassemble, reconstruct or replace it as directed by the Engineer. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.

D. The test may be conducted either before or after backfilling around the manhole.

E. However, if the Contractor elects to backfill prior to testing, for any reason, it shall be at his own risk and it shall be incumbent upon the Contractor to determine the reason for any failure of the test. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc., i.e., it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Engineer that the water table is below the bottom of the manhole throughout the test.

F. An Infiltration test may be conducted if the groundwater table is above the highest joint in the manhole, and if there is no leakage into the manhole as determined by the Engineer, such a test can be used to evaluate the water-tightness of the man- hole. However, if the Engineer is not satisfied, the Contractor shall lower the water table and carry out the test as described hereinbefore.

3.03 PIPE CONNECTIONS

A. The Contractor shall submit to the Engineer for approval, the method of connecting pipes for each manhole or structures. Acceptable connections may be one or more of the following:

1. A tapered opening into which the pipe is inserted shall have the angular space around the pipe filled with nonshrink, waterproof grout. Total thickness of concrete shall be 12 inches each side of the pipe.

2. The "Lock Joint Flexible Manhole Sleeve" shall be cast in precast manhole base. The stainless steel strap, conforming to ASTM C923 and ASTM A167 shall be protected from corrosion with a bituminous coat.

3. The "Kor-N-Seal" flexible sleeve connection shall be a rubber like gasket cast in the precast manhole base. The rubber gasket shall be cast into a formed opening in the manhole.

4. Any other connections as specified on Contract Drawings.

3.04 INSPECTION

A. The supplier of the precast products is responsible for conformance to all requirements of these specifications and ASTM C478.

B. Quality of materials and workmanship during manufacturing shall be documented. A complete set of tests and records shall be submitted to the Engineer.

C. In addition, inspection of the precast sections by the Engineer shall be made upon delivery to the site. Pieces rejected after delivery to the site will be marked and removed from the job.

D. Precast sections shall be subject to rejection on account of failure to conform to any of the specification requirements. In addition, individual sections may be rejected because of any of the following:

1. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.

2. Defects that indicate imperfect proportioning, mixing and molding.

3. Surface defects indicating honeycombed or open texture.

4. Damaged or cracked ends, where such damage would prevent making a satisfactory joint.

5. Any continuous crack having a surface width of 0.01 in. or 0.3 mm or more and extending for a length of 12 in. or 300 mm or more, regardless of position in the section wall.

END OF SECTION

SECTION 333300

GRAVITY SEWER AND FORCE MAIN PIPE – GENERAL

PART 1-GENERAL

1.01 WORK INCLUDED:

A. The Contractor shall furnish, lay, join and test all gravity sewer and force main pipe, and appurtenant materials and equipment as indicated on the drawings and as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. DIVISION 31 – EARTHWORK

PART 2-MATERIALS

2.01 PIPE AND FITTINGS

A. Specifications for types and classes of pipe and fittings required are contained in related sections.

PART 3-EXECUTION OF WORK

3.01 GENERAL

A. The specifications in this section are applicable to the installation of gravity sewer and force main pipe.

3.02 LINES AND GRADES

A. Pipes shall be laid to the lines and grades shown on the drawings or as directed by the Engineer. The grade shown on the profile is that of the invert of the pipe. The work shall conform to this grade. A variation of one-eighth (1/8) inch or more from the true invert grade on gravity sewers laid on grades above one percent will be deemed sufficient reason to cause the work to be rejected. Work so rejected shall be corrected by the Contractor at his own expense.

B. The Contractor is responsible for establishing the location of the pipe, manholes and other appurtenances, and bench marks along the route of the pipeline at convenient intervals for use during construction.

C. The grade and alignment of the pipe may be maintained, with the approval of the Engineer, by the use of laser beams if the Contractor can demonstrate that he possesses sufficient equipment and employs with sufficient experience, to utilize such method.

D. The Contractor shall furnish all labor, material, surveying equipment and tools to establish and maintain all lines and grades from basic control points furnished by the Engineer.

3.03 PIPE FOUNDATION

A. All pipes to be laid in open trench excavation shall be bedded and uniformly supported over their full length on foundations of the types specified and shown on the drawings. Flat-bottomed trenches shall be excavated and dewatered prior to preparing the specified foundation. All work shall be performed in a dry trench. Where higher type foundations than those shown on the drawings are ordered as a result of the Contractor's method of operation, the Contractor shall be due no additional compensation. Where directed by the Engineer as a result of unsuitable soil conditions, the Contractor shall be paid for special bedding under appropriate bid items.

3.04 NORMAL SOIL CONDITIONS

A. All pipe shall be supported on a normal soil condition foundation, except as otherwise indicated on the drawings, or ordered by the Engineer. The trench shall be excavated to a depth equal to ¼ of the outside diameter of the pipe to be installed (6" minimum) below the bottom of the pipe. Screened gravel bedding shall be furnished and placed in the trench for its full width to uniformly support the pipe at the required line and grade. Suitable recesses shall be provided in the bedding to permit adequate clearance for bells, couplings, or similar projections. The bedding shall extend upward around the pipe barrel. Bedding material shall be spread in 6 inch layers, and each layer shall be compacted with twenty pound hand tampers or pneumatic tampers until the required total depth of bedding has been built up.

3.05 UNSTABLE SOIL CONDITIONS

A. Where unstable soil conditions are encountered, the pipe shall be supported on a special foundation. The foundation shall be installed where a suitable supporting soil or rock stratum occurs at a depth greater than ¼ of the outside diameter or 6"minimum. The trench shall be excavated to the depth necessary to reach the suitable supporting stratum (3'-0" minimum). The trench bottom and walls shall be covered with a geotextile fabric. Screened gravel shall then be furnished as bedding and placed in the trench for its full width. The bedding shall be spread in 12 inch layers, and each layer shall be compacted with twenty pound hand or pneumatic tampers. The bedding shall carry vertically from the supporting stratum up to an elevation ¼ of the outside diameter (12" minimum) above the top of the pipe. The special foundation shall extend for a minimum of 5'-0" beyond poor subgrade conditions.

## 3.06 CONCRETE ENCASEMENT

A. Where required, the pipe shall be supported on foundation. The foundation shall be installed where (a) excavations have been carried outside the normal limits as defined under related sections or (b) as directed by the Engineer. The trench shall be excavated to ¼ of the outside diameter (6 inch minimum and a 12 inch maximum depth) below the bottom of the pipe. The excavated space shall then be completely filled with concrete, and the entire pipe encased in concrete such that the minimum concrete encasement at any point around the outside barrel of the pipe measures 4 inches thick. The depth of encasement over the pipe shall be ¼ of the outside diameter (12" minimum). The total minimum width of the concrete encasement shall equal the width of trench excavation. Unless otherwise shown on the drawings or specified herein, concrete shall be 3,000 psi. Concrete mix, formwork, curing, etc., shall be in accordance with the requirements of appropriate sections. Freshly poured concrete shall be maintained free from ground water for at least the first four hours. No backfilling of the trench shall begin until a minimum time period of 24 hours has elapsed after the encasement has been poured. Steel reinforcing, if required, shall be as shown on the drawings or as directed by the Engineer.

## 3.07 INSPECTION OF PIPE BEFORE INSTALLATION

A. All pipes and fittings shall be carefully inspected in the field before placing the trench. Cracked, broken, warped, out-of-round or otherwise defective pipe, fittings as determined by the Contractor or Engineer, shall be pulled and not installed. Such rejected pipe shall be pulled and not installed. Such rejected pipe shall then be removed from the job site by the Contractor at his own expense.

## 3.08 INSTALLATION OF PIPE AND FITTINGS

A. After the trench has been brought to the proper grade, as hereinbefore specified, the pipe shall be laid. Unless otherwise approved by the Engineer in writing, pipe laying shall be done only in the presence of the Engineer. The Contractor shall give ample notice of his schedule for pipe laying operations to the Engineer.

B. All pipe and fittings shall be carefully lowered into the trench with ropes, slings and proper equipment. Pipe craked or otherwise damaged during or following installation shall be marked by the Contractor or Engineer and removed from the site as required.

C. Pipes shall be laid true to the grades shown on the drawings. Blocking will not be permitted except wher the pipe is to be permitted except where the pipe is to be encased in concrete. Any pipe that has its grades or joints disturbed after laying shall be taken up and relayed. The interior and ends of all pipe shall be thoroughly cleaned during laying operations by means of plugs or other approved methods. Under no circumstances shall pipe be laid in water and no pipe shall be laid when trench conditions or the weather is unsuitable for such work except by permission of the Engineer.

3.09 FINAL INSPECTION

A. Each section of installed sewer lines shall be visually inspected by the Engineer prior to final testing. The pipe shall be true to both line and grade, shall contain no broken pipe, shall show no leaks, shall show neither obstructions nor the projection of connecting pipes into the main pipe, and shall contain no debris or other deposits which will in any way reduce the full cross-section area of the pipe.

B. Any section of sewer pipe which does not comply with these inspection criteria, as determined by the Engineer, shall be promptly corrected, replaced or repaired by the

C. Contractor at his own expense. Methods used for the correction shall be approved by the Engineer.

3.10 FINAL TESTING

A. The Contractor shall remove all debris from manholes and shall thoroughly flush sewers and force mains prior to testing for watertightness. All sewers and force mains, (not including manholes), service connections and sewer laterals constructed under this Contract shall be tested under this section and shall satisfactorily meet the test requirements prior to final acceptance of the work. The Contractor shall furnish all labor, testing materials and equipment (including plugs and standpipes) to perform tests.

B. For the force main, the contractor shall perform a low pressure air test under the supervision and to the entire satisfaction of the Engineer.

C. For gravity sewer, the contractor shall perform a low pressure air test as well as the mandrill test under the supervision and to the entire satisfaction of the Engineer.

D. Subject to approval of the Engineer and provided that the tests are made within a reasonable time considering the progress of the project as a whole, the Contractor may backfill the pipe section to support it while testing. Pipelines in excavation greater than eight (8) feet or embedded in concrete shall be tested prior to the backfilling or placing of the concrete.

E. The contractor shall furnish and install suitable temporary testing plugs or caps, all necessary pressure pumps, pipe connections, meters, gates, and other necessary equipment, as well as all labor required.

3.11 AIR TEST

A. The contractor shall furnish all necessary equipment and labor and carry out at his own expense an air test.

B. If low pressure air testing is performed on the gravity sewer, the pressure between two (2) consecutive manholes shall not drop more than point five (0.5) psi (from five (5.0) to four point five (4.5) psi in excess of the ground water pressure above the top of the sewer in less than seven point five (7.5) minutes. Consult with the Engineer for a determination of the ground water during construction, if applicable.

C. For the force main, the air pressure between the pump chamber and the discharge point shall not drop more than point five (0.5) psi (from fifty (50) to forty-nine point five (49.5) psi in seven point five (7.5) minutes.

D. The Owner and the Engineer shall be furnished with certified copies of the testing results. The Engineer shall be present for the tests.

E. If the section fails to pass the test, the Contractor shall do everything necessary to locate, uncover, even to the extent of uncovering the entire section, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work.

F. If, in the judgement of the Engineer, it is impracticable to follow the foregoing procedure exactly for any reason, modifications in the procedure shall be made as required or approved, but in any event the Contractor shall be responsible for the ultimate tightness of the line.

3.12 MANDRILL TEST

A. In addition to pressure testing of the lines, all gravity sewer lines shall be mandrilled to a five (5) percent tolerance of the nominal pipe diameter.

B. Failure of any portion of the pipeline shall require replacement of the pipe section and retesting.

3.13 TEMPORARY PLUGS

A. At all times when sewer and force main pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of earth or other materials entering the pipe has passed.

3.14 CONNECTION TO EXISTING STRUCTURES

A. Piping to be connected to existing manholes where no stub or other opening has been provided shall be made through an opening of minimum diameter cut in the wall of the structure at the required elevation and location. All penetrations shall be made by core boring unless otherwise approved by the Engineer. The Contractor shall furnish and install a pipe stub.

B. The annular space outside of the pipe stub shall be filled and sealed with non-shrinking grout. The outer surface of heavy bitumastic Water-proofing compound of a type approved by the Engineer.

C. The benchwalls within the existing structure shall be altered as required to form a new flow channel from the new connection to the existing flow channel as shown on the Contract Drawings or directed by the Engineer. The new channel shall be constructed with a smooth and continuous radius as indicated and approved by the Engineer.

END OF SECTION

SECTION 333700

WASTEWATER SOIL ABSORPTION FIELD

PART 1-GENERAL

1.01 WORK INCLUDED:

A. This section covers the wastewater soil absorption field.

1.02 RELATED SECTIONS:

A. Section 330300, POLYVINYL CHLORIDE GRAVITY PIPE AND FITTINGS

B. Section 02252, SUPPORT OF EXCAVATION

C. Section 02300, EARTHWORK

1.03 QUALITY ASSURANCE

A. The soil absorption field system components shall be Presby Advanced Enviro-Septic pipe as manufactured by Presby Environmental, Inc., 143 Airport Road, Whitefield, NH 03598, 1-800-473-5298, or equal as defined in the plans and specifications.

B. System sand for the wastewater soil absorption system field shall conform to the requirements of ASTM C-33 as modified by Presby Environmental, Inc.

1.04 SUBMITTALS

A. Material testing requirements to be submitted:

1. Sieve analysis of material to be used for System Sand shall be provided from supplier.

2. Samples of all materials proposed for the project shall be submitted to the Engineer for review. Size of the samples shall be as approved by the Engineer.

PART 2-PRODUCTS:

2.01 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Do not deliver the Presby Advanced Enviro-Septic pipes to job site earlier than one week prior to scheduled date of commencing installation.

B. All storage and handling of the chambers at job site shall not in any way impair or damage the product.

C. If possible, it would be preferable to store AES pipe indoors or under cover. The outer fabric of the Advanced Enviro-Septic™ pipe is ultra-violet stabilized; however, this protection breaks down after a period of time in direct sunlight. If AES pipe must be stored outdoors for an extended period of time, manufacturer recommends covering the pipe with an opaque tarp. When stored outdoors, keep pipe in a high and dry area to prevent surface water and soil from entering the pipes as this could contaminate the outer geotextile fabric. Exposure to precipitation is not a concern, but the pipes are lightweight and can be strewn about in a windstorm if not secured. Prevent animals from nesting within the pipes, as manufacturer has seen this result in damage to the fabric.

D. Avoid dragging the AES pipe since the outer geotextile fabric layer can shift if the pipes are dragged; manufacturer recommends carrying pipes by holding the seam where the geotextile fabric has been stitched together. The fabric can also be contaminated if pipes are dragged through wet or muddy areas. If the pipes do get muddy or dirty, manufacturer recommends hosing them off prior to installation. Do not pull on the white geotextile (Bio-Accelerator™) or remove the wicket tags that hold it in place. Keep mud, grease, oil, etc. away from all components.

E. If constructing a system in cold weather, the plastic couplings which connect pipe sections together are easier to work with if they are stored in a heated area before use during cold weather. Each ten foot section of AES pipe bears a label that instructs the installer "This Side Up" to ensure that the Bio-Accelerator™ is correctly aligned along the bottom of the pipe.

PART 3-EXECUTION:

3.01 INSTALLATION

A. Install Advanced Enviro-Septic pipes, pipe fittings, accessories, System Sand, and all related materials in strict accordance with plans and instructions by the manufacturer.

B. Refer to Earthwork Section 31.00.00 for soil/fill material requirements or specifications.

END OF SECTION

SECTION 339500

HANDLING OF EXISTING FLOWS

PART 1-GENERAL:

1.01 WORK INCLUDED:

A. This section covers the handling of wastewater flow from the existing facility during removal of the existing septic system components and construction of the new septic system.

1.02 RELATED SECTIONS:

A. SECTION 01.11.00 SUMMARY OF WORK

B. SECTION 01.33.00 SUBMITTALS

1.03 SUBMITTALS:

A. The contractor shall provide a written description of the means and methods to be utilized to handle existing flows within the sewer and/or septic system for approval by the engineer prior to commencing any operations.

PART 2-PRODUCTS:

2.01 PLUGGING OR BLOCKING

A. A sewer line plug shall be inserted into the line upstream of the section being worked. The plug shall be so designed that all or any portion of the sewage can be released. During inspection, testing and sealing operations, flow shall be reduced to within allowable limits. After the work has been completed, flow shall be restored to normal.

PART 3-EXECUTION:

3.01 PUMPING AND BYPASSING

A. When pumping and bypassing is required, the Contractor shall supply the pumps, conduits, and other equipment to divert the flow of sewage around the septic system section in which work is to be performed, but at no point shall raw sewage be allowed to flow to the soil absorption system until such time that the entire septic system been completed and approved by the Engineer and the permitting agency to receive flow. The bypass system shall be of sufficient capacity to handle existing flow. The Contractor will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system.

B. The Contractor shall be responsible for coordinating with a licensed septage hauler to pump the wastewater from the septic tank(s) and dispose of it at an appropriate facility at the Contractor’s expense until such time that the entire septic system been completed and approved by the Engineer and the permitting agency to receive flow.

C. The Contractor may install the proposed 1,500 gallon septic tank and connect the existing sewer pipe to the inlet end of that tank for use as a temporary holding tank while installing the 2,500 gallon septic tank and filling and abandoning of the existing septic tank.

1. The 1,500 gallon tank shall be leak tested prior to receiving any wastewater flow.

2. At no time shall wastewater be allowed to exit the tank towards the soil absorption system unless the complete system has received approval from the Engineer and permitting agency to receive wastewater flows. Pumping of the tank by a licensed septage hauler shall be required if the volume collected in the tank reaches 50% of the tanks normal flow capacity.

3. Upon installation of the 2,500 gallon septic tank, leak testing, and connecting it to the sewer line from the facility, the temporary bypass piping to the 1,500 septic tank shall be removed and the tank penetration shall be mortared.

3.02 FLOW CONTROL PRECAUTIONS

A. When flow in a sewer or septic line is plugged, blocked, or bypassed; sufficient precautions must be taken to protect the sewer, septic lines, or the facility from damage that might result from surcharging wastewater. Further, precautions must be taken to insure that flow control operations do not cause flooding or damage to the facility being served by the sewers involved.

END OF SECTION