

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.1 DESCRIPTION:

A. Section Includes:

- A. Demolition shall include, unless otherwise noted on Drawings, removal of existing objects or improvements, whether indicated on drawings or not, that would, in the opinion of the owner, prevent or interfere with progress or completion of proposed work.
- B. Permits, fees and licenses shall be secured and paid for by Contractor, including disposal charges as required to ensure progress of work will proceed.
- C. Work shall comply with requirements of governing authorities in demolition of existing pavement, curbs and gutters, drainage structures and utilities as may be required.
- D. Demolition requires removal and disposal charges as required to ensure progress of work will proceed. Protect items designated to remain.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
- B. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.
- C. Section 02 32 10 Subsurface Explorations (Geotechnical report prepared by SW Cole Engineering, dated September 30, 2014.)
- D. Construction Management Plan

1.3 SUBMITTALS:

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on product characteristics, performance criteria and limitations.
- C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- E. Shop Drawings and Schedule: Describe demolition, removal procedures, sequence and schedule.

Design Data: Submit calculations for bracing, shoring, and underpinning to protect structures indicated to remain signed and sealed by professional engineer.

F. Closeout Submittals - Project Record Documents: Record actual locations of capped utilities.

1.4 JOB CONDITIONS

- A. Conditions existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable.
- B. Explosives shall not be brought to site or used without written consent of authorities having jurisdiction. Such written consent will not relieve Contractor of total responsibility for injury to persons or for damage to property due to blasting operations. The performance of any required blasting shall comply with governing regulations. **(Rock Removal is not anticipated)**

1.5 PROTECTIONS

- A. Summary:
 - 1. Ensure safe passage of persons around all areas of demolition.
 - 2. Conduct operations to prevent damage to adjacent buildings, structures, trees and vegetation on abutting property, other facilities, or injury to persons.
 - 3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structures to be demolished and of adjacent facilities to remain.
 - 4. Promptly repair damages caused to adjacent facilities by demolition operations at no cost to Owner.
 - 5. Maintain existing utilities indicated to remain, keep in service and protect against damage during demolition operations.
 - 6. Prevent interruption of existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction.
 - 7. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities.
 - 8. Make arrangements, before initiating demolition, for relocating, disconnection, rerouting, abandoning, or similar action as may be required relative to utilities and other underground piping, to permit work to proceed without delay. Arrangements shall be made in accordance with regulations of authorities of utilities concerned, including by not restricting any other services not mentioned, such as overhead and underground power and telephone lines and equipment, gas piping, storm sewers, sanitary sewers, or water piping. Contractor shall not use water when it may create hazardous or objectionable conditions, such as ice, flooding and/or pollution.
 - 9. Use water sprinkling and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level.

10. Comply with governing regulations pertaining to environmental protection.
11. Clean adjacent structures, streets and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.
12. Notify abutting property owners of demolition schedule in advance of demolition. Notify adjacent owners of work which may affect their property, potential noise, utility outage, or disruption prior to the start of Work. Coordinate with Owner's Representative.

PART 2 PRODUCTS

2.1 MATERIAL:

- A. Fill Material: Refer to Specifications Division 31 – Site Earthwork.

PART 3 EXECUTION

3.1 IMPLEMENTATION

- A. Permits - Perform all work in accordance with the demolition requirements of the applicable building code as adopted and, if applicable, amended by the authority having jurisdiction. Apply for, pay for and obtain required demolition permits.
- B. Examination
 1. Document condition of adjacent structures indicated to remain.
 2. Monitor buildings for movement during demolition operations. Notify Owner's Representative of measured movement.
- C. Preparation
 1. Call Local Utility Line Information service "Dig Safe" as per their notification requirements. Request underground utilities to be located and marked within and surrounding construction areas.
 2. Provide, erect, and maintain temporary barriers and security devices. Protect trees and vegetation on abutting properties.
- D. Standards
 1. Conduct operations with minimum interference to public or private accessways.
 2. Maintain egress and access at all times. Do not close or obstruct roadways, sidewalks without permits.
 3. Cease operations immediately when adjacent structures appear to be in danger. Notify authority having jurisdiction and Owner's Representative.
 4. Disconnect, remove and cap designated utilities to a location acceptable to the City of Portland and utility company. Identify utilities at termination of demolition. Record termination or capped location on Record Documents.

3.2 SUBSURFACE REMOVAL

A. Proposed Building Area

1. Remove all existing utilities as shown, piping and associated structures completely.
2. Remove all foundations and floor slabs shall be removed below all proposed foundations until native soils are encountered. (Refer to geotechnical report for additional conditions)
3. Remove all uncontrolled fill below proposed foundation in accordance with geotechnical recommendations.

B. Proposed Paved Area

1. Remove all pavement and deleterious material below proposed paved areas. Existing utilities should be removed and all foundations shall be removed to a minimum of 4.5 feet below finish grade and backfilled with compacted Granular Borrow. (Refer to geotechnical report for additional conditions)

3.3 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from the site all debris, rubbish and other materials resulting from demolition.
- B. Demolition debris removed from the site shall be disposed of at an approved licensed recycling or disposal facility in accordance with state regulations.
- C. No burning of any materials, debris or trash on-site will be allowed.
- D. Leave areas of work in clean condition.

END OF SECTION

SECTION 31 05 12

SITE EARTHWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
- B. Section 00 31 00 Available Project Information (Item 1.3.K)
- C. Section 31 50 00 – Temporary Support of Excavation
- D. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.
- E. Section 31 23 15 Building Pad Earthwork
- F. Section 02 32 10 Subsurface Explorations

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on product characteristics, performance criteria and limitations.
- C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- E. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Tests for soil density and/or gradations as herein designated shall be taken at the option of the Architect, Engineer and /or Landscape Architect. Costs of testing shall be paid by the Owner.
 - 2. Soil samples representative of the borrow source and suitable laboratory testing shall be furnished by the Contractor for each material listed in Part 2. Test results shall be submitted at least two (2) weeks prior to their proposed use or placement on the site. In the event a proposed material does not meet the specified gradation requirements, the material type shall not be placed on-site until an alternative borrow source is selected and the laboratory test results indicate the material meets the specified gradation requirements.

Note: Contractor shall provide testing for loam in accordance with Section 32 90 00.
 - 3. Compaction tests shall be determined on the basis of laboratory Proctor tests (ASTM D.1557, Modified Proctor).

4. Field density tests not specified on a comparative basis shall be to the percent density specified in this Section for both earth excavation and earth and granular type fills. Tests shall be in accordance with ASTM D.1556, ASTM D.2167, ASTM D.2922 OR ASTM D.3017

1.3 DESCRIPTION:

- A. Bidding requirements, conditions of the contract and pertinent portions of sections in Division One of these specifications, apply to the section as fully as though repeated herein.
- B. Work under this section includes
 1. Removals - The Contractor shall perform all work necessary for clearing and grubbing and/or removal, backfill and disposal of all existing materials noted on the Drawings, as well as temporary structures installed for construction. . Refer to Geotechnical Report referenced in Section 02 32 10
 2. Limit of Work - Take special care to keep all operations within the Limit of Work as shown on the Drawings. The Contractor shall take all necessary precautions to protect existing site elements to remain.
 3. Grade and Elevation
 - a. The Drawings indicate, in general, the alignment and finished grade elevations. The Owner's Authorized Representative, Engineer or Landscape Architect, however, may make such adjustments in grades and alignment as are found necessary in order to avoid interference or to adapt piping to other special conditions encountered.
 - b. The Contractor shall establish the lines and grades in conformity with the Drawings and maintain by means of suitable stakes placed in the field.
 4. Protection of Existing Structures and Utilities
 - a. Barricade open excavations occurring as part of this work and post with warning signs. Backfilling or secured covering of excavations shall be required.
 - b. Provide necessary supports, bracing and covering to protect existing and new structures and utilities during all phases of excavation and backfill, as outlined in Section 31 50 00 Temporary Support of Excavation
 - c. Notify appropriate owners before excavating adjacent to poles, cables, pipes, and other utilities.
 - d. Note that location of existing underground utilities on plans is approximate and may be incomplete. Responsibility for exact locations and protection of all utilities rest with the Contractor.
 - e. Conflicts between existing and new utilities and/or structures to be built under this contract shall be reported to the Owner's Authorized Representative, Engineer or Landscape Architect
- C. Related work:
 1. Erosion Control: Section 31 25 13

- 2. Water Utility: Section 33 10 00
- 3. Storm Drainage: Section 33 40 00
- 4. Sanitary Sewer: Section 33 30 00

1.4 QUALITY ASSURANCE:

- A. Conform to all applicable City of Portland and state codes for excavation, earthwork and disposal of debris.
- B. Conform to all applicable standards of the various utility companies.
- C. References - Where M.D.O.T. appears it shall be taken to mean The State of Maine Department of Transportation Specifications, Highways and Bridges - (Latest Revision).
- D. Reference Standards

The following most current publications form part of this specification to the extent indicated by references thereto and shall be followed for all construction testing:

American Society for Testing and Materials (ASTM):

- D 422 Method for Particle Size Analysis of Soils
- D 698 Test for Moisture-Density Relations of Soils Using 5.5 lb. (2.5 kg) hammer and 12-inch (304.8mm) Drop (Standard Proctor)
- D 1556 Test for Density of Soil in Place by the Sand Cone Method
- D 1557 Test for Moisture-Density Relations of Soils Using 10-lb (4.5 Kg) hammer and 18-inch (457 mm) Drop (Modified Proctor)
- D 1559 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
- D 2167 Test for Density of Soil in Place by the Rubber Balloon Method
- D 2216 Laboratory Determination of Moisture Content of Soil
- D 2487 Classification of Soils for Engineering Purposes
- D 2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- D 4318 Test for Plastic Limit, Liquid Limit, & Plasticity Index of Soils
- C 25 Chemical Analysis of Limestone, Quicklime and Hydrated Lime
- C 110 Physical Testing for Quicklime and Hydrated Lime, Wet Sieve Method
- C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

E. Definitions

- 1. Contractor: Person or organization identified in the Agreement as being responsible for the Work of this Section. The term Contractor shall also refer to an authorized representative of the Contractor.
- 2. Owner: Home for the Aged-The Park Danforth
- 3. Landscape Architect: Authorized representatives of the Owner. For the Work covered under this Section, this term will include Mitchell & Associates of Portland, Maine.

4. Engineer: Authorized representatives of the Owner. For the Work covered under this Section, this term will include Mitchell Associates and Haley & Aldrich, Inc. of Portland, Maine.
 5. Zone of Influence (ZOI): The ZOI is defined as the area below footings and below imaginary lines that extend 2 ft laterally beyond the footing outer bottom edges and down on a one horizontal to one vertical (1H:1V) slope to the top of natural, inorganic bearing soils
- F. Drawings do not purport to show above ground objects existing on site. Contractor shall visit site and acquaint himself with all observable conditions as they exist before submitting Bid.

PART 2 PRODUCTS

2.1 MATERIAL:

A. Fill Materials: Backfill and ordinary fill materials shall be as follows:

1. Materials from excavation: Excavated material which can be readily spread and compacted, and consists of mineral soil, substantially free of organic materials, loam, wood, rubbish or other perishable substance may be reused as common fill. Material larger than six (6) inches shall be removed from excavated material before using for fill. Reuse of in-situ soils shall be undertaken at the sole risk of the Contractor at no additional cost to the Owner. It is possible that some of the excavated in-situ fill material may not be acceptable for reuse as common fill as defined in the Geotechnical Report. Excavated soils will not be acceptable for reuse as structural fill.
2. Granular Borrow: sandy or silty sand meeting gradation requirements of MDOT Standard Specifications 703.19 for backfill over drainage pipes shall be free of stones over one (1) inch diameter for first one (1) foot over pipes.
3. Aggregate Base, Crushed - M.D.O.T. 703.06, (a), Type A. (No stones larger than two inches). - Compacted at 95% ASTM D-1557
4. Aggregate Subbase Gravel - M.D.O.T. 703.06, (a), Type C, Size of stone no larger than six (6) inches. - Compacted at 95% ASTM D-1557.
5. Aggregate Subbase Gravel, M.D.O.T. 703.06 (b) Type D (no stone larger than 4 inches – compacted at 95% ASTM D – 1557.

6. Structural Fill -

<u>Screen or Sieve Size</u>	<u>% Passing</u>	<u>Compaction</u>
4 inches	100	
3 inches	90-100	95 % ASTM D 1557
¼ inch	25-90	Maximum 12-inch lifts
No. 40	0-30	
No. 200	0-5	

7. Gravel Borrow - M.D.O.T. 703.20. Size of stone no larger than six (6) inches. Compacted at 95% ASTM D-1557.
8. Drainage Stone - M.D.O.T. 703.22, Type C. - Vibrated with hand vibrating plate.

9. Common Fill: Common Fill shall consist of well-graded, mineral sandy or gravelly soil, predominantly free from organic matter, plastic, metal, wood, cinders, asphalt, brick, concrete, trash, ice, snow, debris, other deleterious materials, and weak, compressible materials, and shall have the characteristic that it can be readily placed and compacted. Common Fill shall not contain particles larger than 6 in. in maximum dimension and shall have a maximum of 80 percent passing the No. 40 sieve and a maximum of 30 percent passing the No. 200 sieve. On-site soils meeting the above criteria can generally be used as Common Fill at locations agreed upon by the Engineer. The Contractor shall mechanically screen or process on-site soils as needed to remove over-sized and deleterious materials prior to reuse as required or directed by the Engineer.

B. Pipe Bedding Material:

1. Granular Pipe Bedding Material: Shall be clean and free of organic matter, silt, or clay lumps, and deleterious materials. The material shall meet the following gradation requirements:

<u>Sieve Designation</u>	<u>% by Weight Passing Square Mesh Sieve</u>
1/2"	100
#4	95-100
#40	20-45
#200	0-5

2. Stone Pipe Bedding Material: Shall be screened or crushed stone free of organic matter, silt, or clay lumps, and deleterious material. The material shall meet the following gradation requirements.

100% passing a 1-inch square mesh sieve and not more than 5% passing a ¼-inch square mesh sieve.

C. Suitable Backfill Material

1. Structural fill or natural material excavated during the course of construction, excluding debris, pieces of pavement, organic matter, topsoil, all wet or soft muck, peat, or clay, all excavated ledge material, and all rocks over six (6) inches in largest dimension, or any material which will not provide sufficient support or maintain the completed construction in a stable condition, all approved by the Owner's Authorized Representative, Engineer or Landscape Architect.

D. Geotextile Materials

1. Acceptable Geotextiles and Geogrids:
 - a. Mirafi 600x
 - b. Phillips 66 Supac 6WS
 - c. Dupont Typar 3401 and 3601
 - d. Trevira S1114 and S1120
 - e. AMOCO 2006
 - f. Tensar SS-1 and SS-2
 - g. Exxon GTF-200 or 350
 - h. Conwed Stratagrid GB-5033

- i. Miragrid 3xT
2. Filter/Drainage Geotextiles:
 - a. Mirafi 160N or equal

PART 3 EXECUTION

3.1 EXECUTION:

- A. Earth Excavation - Removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, any material indicated in the data on subsurface conditions, and other materials encountered that are not classified as rock excavation or unauthorized excavation.
- B. Unauthorized Excavation
 1. Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Architect, Engineer and/or Owner's Representative.
 2. Under footings or foundation bases, fill unauthorized excavation by filling with Structural Fill and compacting to 95 percent of ASTM D-1557 without altering top elevation.
- C. General Excavation
 1. Grades, Dimensions - excavate where indicated and as necessary to obtain subgrades as shown on the Drawings and hereinafter specified. All excavation shall include the satisfactory removal of all materials of whatever substance encountered within the indicated limits. Only suitable materials shall be used or stockpiled for later use in backfill preparation. Disturbed subgrade material shall be removed prior to pouring of footings and replaced with either compacted structural fill or thickened footing concrete. All footing subgrades shall be approved by the Engineer or Owner Representative prior to pouring concrete for footings.
 2. The Contractor shall provide temporary drains, ditches, well points and the necessary equipment, as required, to maintain the site of work and adjacent areas in a well drained condition. Keep all excavations free of both ground and surface water at all times. All water pumped or drained from the work shall be disposed of so as not to endanger public health, property or any portion of the work under construction or completed.
 3. The Contractor shall provide shoring, sheeting and bracing as may be required to maintain excavations and trenches secure and safe from collapse and to protect adjacent structures. As outlined in Section 31 50 00 Temporary Support of Excavation.
 4. Excavation shall not be made below specified subgrades except where rock unsuitable or unstable material is encountered. If suitable bearing is not found at levels shown on the Drawings, the Architect, Engineer and the Owner shall be notified in writing immediately so that adjustments or changes may be made. Material removed below specified subgrade without the approval of the Engineer and Owner shall be replaced and compacted with a structural fill or other material approved by the Engineer at the Contractor's expense.
 5. All work shall be carried out in a manner consistent with the regulations of such Federal, State and Local authorities as may have jurisdiction over such activities.
- D. Summary of Utility Installation

1. Set all lines, elevations and grades for utility and drainage system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments or other reference points.
2. Perform all excavation for underground piping and utility systems to the depths indicated on the Drawings or as otherwise specified. Trenches shall be excavated by open cut in accordance with OSHA requirements.
3. Maintain in operating condition existing utilities, active utilities and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.
4. Verify location, size, elevation and other pertinent data required to make connections to existing utilities and drainage systems as indicated on Drawings. Contractor shall comply with local codes and regulations.
5. Inspection of stormwater system excavation, utility excavation and backfilling subject to review by utility company, city engineer, if necessary, by Engineer and Owner Representative.

E. Excavation, Trenching and Backfilling

1. Perform excavation as indicated for specified depths. During excavation, stockpile materials suitable for backfilling in an orderly manner far enough from bank of trench to avoid overloading, slides or cave-ins.
2. Remove excavated materials not required or not suitable for backfill or embankments and waste as specified. Any structures discovered during excavation(s) shall be disposed of as specified.
3. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods.
4. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill. Dispose of unsuitable material and provide other suitable material at no additional cost to Owner.
5. Excavations for all foundation work shall be backfilled with structural fill meeting specifications set forth herein.

F. Trench Excavation

1. The Contractor shall contact the local utility companies, if necessary, before excavation begins. Dig trench at proper width and depth for laying pipe, conduit or cable. Cut trench banks to slopes no steeper than OSHA requirements and remove stones as necessary to avoid point-bearing. Over-excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding.
2. All trench excavation side walls greater than five (5) feet in depth shall be sloped, shored, sheeted, braced or otherwise supported by means of the sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to an exit ladder or steps shall not be greater than 25 feet in trenches four (4) feet or deeper.

3. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer or wider than needed to make joint connection properly.
4. Trench width requirements below the top of the pipe shall not be less than 12 inches nor more than 18 inches wider than outside surface of any pipe or conduit that is to be installed to designated elevations and grades. All other trench width requirements for pipe, conduit or cable shall be least practical width that will allow for proper compaction of trench backfill.
5. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances:
 - a. Water Mains: 66 inches to top of pipe barrel.
 - b. Sanitary Sewer: Elevations and grades as indicated on Drawings. Note: Pipe with less than five (5) feet of cover in pavement areas or four (4) feet in landscaped areas, provide two (2) inches of rigid insulation as shown on detail.
 - c. Electrical Conduits: 40 inches minimum to top of conduit for primary and 30 inches to top of conduit for secondary or as required by NEC 300-5, NE 710-36 codes, or the local utility company requirements, whichever is deeper.
- G. Sheeting and Bracing - Provide sheeting and bracing, when necessary, in trenches and other excavations where protection of workmen is required. Sheeting may be removed after sufficient backfilling to protect against damaging or injurious caving. Refer to Section 31 50 00 for temporary support system requirements.
- H. Pipe Bedding - Accurately cut trenches for pipe or conduit that is to be installed to designated elevations and grades to line and grade as specified below bottom of pipe and to width as specified. Place specified depth of bedding material, compact in bottom of trench, and accurately shape to conform to low portion of pipe barrel. After pipe installation, place select bedding material in accordance with details and compact as required.
- I. Trench Backfilling
 1. Criteria: Trenches shall not be backfilled until required tests are performed and the utility systems comply with and are accepted by applicable governing authorities. Backfill trenches as specified. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact as specified, to properly correct condition in an acceptable manner.
 2. Backfilling: After pipe or conduit has been installed, bedded, and tested as specified, backfill trench or structure excavation with specified material placed in eight (8) inch maximum loose lifts.
 3. Fill shall not be placed on a surface of frozen material, nor shall snow, ice, frozen earth or debris be incorporated in the fill. Compact to minimum density of 95% of maximum dry density in accordance with ASTM D 698 (or 92% of maximum dry density in accordance with ASTM D1557). For utility trenches located in pavement and sidewalk areas, place backfill in eight (8) inch maximum loose lifts and compaction to 95% of ASTM D.1557 maximum dry density.

J. Structural Excavation

1. Earth shall be excavated to the depth and sections required for installation of all footings, floor slabs or other appurtenant facilities to the extent indicated on the Plans. Care shall be taken that the foundation areas of structures are not excavated below subgrade or are disturbed so as to lessen their bearing capacity.
2. Excavations for structures shall be sheeted, braced, sloped, or otherwise protected in the same manner and meeting the safety requirements and conditions specified in Section 31 50 00 as necessary. Any excess excavated material shall be removed from the site.
3. If man-placed fill soils are present at design bearing subgrade level for footings, the material shall be over-excavated within the zone of influence of the footings and replaced with structural fill, flowable concrete or other material approved by the Engineer. Based on the soil conditions encountered in the test explorations, it may be necessary for the Contractor to locally over-excavate within the ZOI of some of the footings located near the corner of Cumberland Avenue and Forest Avenue, and along the wall foundation adjacent to Forest Avenue. Other areas of over-excavation may be needed. Based on subsurface conditions encountered in the explorations (test borings and test pits), we anticipate that up to approximately 2 ft of over-excavation will be required in the southwestern portion of the proposed building footprint and possibly along the western perimeter wall footing. Other areas of over-excavation may be needed and may not become apparent until after construction begins.

K. Drainage

1. The Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to intercept and/or remove promptly and dispose of properly all water entering excavations. Such excavations shall be kept dry until the structures and appurtenances to be built therein, have been completed to such extent that they will not be damaged.
2. Dewatering shall be accomplished in a manner that will preserve the undisturbed state of the foundation soils. All water pumped or drained from the work shall be disposed of in a suitable manner without undue interference with other work, other surfaces, or property. Suitable temporary pipes, flumes or channels shall be provided for water that may flow along or across the site of the work. All earthwork and foundation construction shall be constructed in-the-dry.
3. Temporary underdrains, if used, shall be laid in trenches beneath the grade of the structure. Trenches shall be of suitable dimensions to provide room for the chosen size of underdrain and its surrounding screened gravel.
4. Temporary underdrains, if used, shall be laid at an approved distance below the bottom of the normal excavation and entirely surrounded by screened gravel. The distance between the bottom of the pipe or structure and the top of the bell of the underdrain pipe shall be at least three (3) inches, unless otherwise permitted. The space between the underdrain and the pipe or structure shall be filled with sand meeting the requirements of ASTM Designation C-33 which shall be rammed if necessary and left with a surface suitable for laying the pipe or building structure. Following their use, underdrains shall be plugged as directed by the Engineer and or Owner's Representative.

L. Compaction

1. Compaction densities specified herein shall be the percentage of the maximum dry density obtainable at optimum moisture content as determined and controlled in accordance with ASTM D.1557. Field density tests shall be made in accordance with ASTM D.1556, D.2167 or D.2922. Each layer of backfill shall be moistened or dried as required, and shall be compacted to the required densities unless otherwise specified in the project specifications.
2. Fills placed within the ZOI of footings and beneath floor slabs, roads, parking areas and walks shall be compacted to not less than 95 percent of the ASTM D - 1557 maximum dry density. Material used as backfill beneath the upper slab on grade adjacent to Cumberland Avenue shall consist of structural fill placed and compacted to the requirements outlined herein.
3. The subbase material placed under the road gravel base in fill areas shall be compacted to not less than 95 percent of the ASTM D1557 maximum density.
4. Fills adjacent to building walls from the exterior face of the building and/or retaining walls to a point not less than 10'-0" from the exterior face of the wall shall be compacted to not less than 92 percent of the ASTM D. 698 maximum compaction dry densities as herein before specified.
5. Bedding material and trench sand under pavement: 95%
6. Bedding material and trench sand non-pavement areas: 92%
7. Loam areas: 90%
8. All other areas: 85%
9. Methods and equipment proposed for compaction shall be subject to the prior acceptance by the Engineer. Compaction generally shall be done with vibrating equipment. Displacement of, or injury to the pipe and structure shall be avoided. Movement of in-place pipe or structures shall be at the Contractor's risk. Any pipe or structure damaged thereby shall be replaced or repaired as directed by the Engineer at the expense of the Contractor.

M. Filling and Subgrade Preparation

1. Exposed subgrades for footings and slabs shall inspected in the field by the Engineer to verify strength and bearing capacity (per IBC Code requirements). If instructed by the Engineer, the Contractor may be required to remove localized areas of weak, disturbed or otherwise unacceptable soils.
2. The Contractor may elect to place a thin layer of crushed stone over the subgrade once it has been approved by the Engineer to provide a stable working surface for workers and light equipment. This will help stabilize the subgrade in preparation for the placement of footing concrete and minimize subgrade disturbance. This will be done as needed at no additional cost to the Owner.
3. All materials shall be placed and compacted to conform to the lines, elevations and cross-sections indicated on the Drawings. Do not start fill placement until the subgrade area has been inspected and approved by the Engineer

4. Fill shall not be placed on a surface of frozen material, nor shall snow, ice, frozen earth or debris be incorporated in the fill. All materials shall be approved by the Engineer before being placed.
5. Unless specifically stated otherwise on the Drawings, areas exposed by excavation, removal of structural foundations or stripping and on which subgrade preparations are to be performed, shall be compacted to a minimum of 95% of maximum dry density, in accordance with ASTM D 1557. Subgrades consisting of granular soils shall be compacted with a 15 ton highway roller. These areas shall then be proof-rolled to detect any areas of insufficient compaction. Proof-rolling shall be accomplished by making a minimum of two (2) complete passes with a fully-loaded tandem-axle dump truck, or approved equivalent, in each of the two perpendicular directions. Areas of failure shall be excavated and re-compacted as stated above.
6. The Contractor shall make final footing excavations to the bearing subgrade either by hand or by using smooth-bladed equipment to minimize disturbance to soil subgrades. Where marine clay soils are present at footing subgrade level, the Contractor shall not proof roll or compact the subgrade.
7. If sufficient suitable fill material is not available from excavations under this Contract, additional fill, suitable for use, shall be brought to the site from other sources. Subgrade fill in pavement areas shall consist of Gravel Borrow (M.D.O.T. 703.20) or Structural Fill (MeDOT 703.06 (a) Type C. Place in maximum 12 inch layers and compact to 92 percent of maximum density in accordance with ASTM D 1557. Each layer shall be free from ruts and shall meet compaction requirements before next layer is placed. Maintain layers with crown or other practical means of drainage.
8. Stones in fills shall be well distributed. Do not have stones over six (6) inches in diameter within twelve (12) inches of subgrade.

N. Finish Grading

1. Grade all areas where finish grade elevations or contours are indicated on Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10 feet above or below established finished subgrade elevation, and all ground surfaces shall vary uniformly between indicated elevations. Ditches and swales shall be graded to allow for proper drainage without ponding and in a manner that will minimize erosion potential. For topsoil application, refer to Section 32 90 00, Plantings.
2. Correct all settlement and eroded areas within one year after date of completion at no additional expense to Owner. Bring grades to proper elevation. Replant or replace any grass, shrubs, trees or other vegetation disturbed by construction using corrective measures.

3.2 INSPECTION:

- A. If Owner elects to test, an independent testing laboratory selected and paid by the Owner shall be retained to perform construction testing on site.
- B. If compaction requirements are not complied with at any time during the construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner.

- C. The independent testing laboratory shall prepare test reports that indicate test location, elevation data and test results. The Owner, Engineer and Contractor shall be provided with copies of reports within 72 hours of time test was performed. In the event that any test performed fails to meet these Specifications, the Engineer and Contractor shall be notified immediately by the independent testing laboratory.
- D. All costs related to retesting due to failures shall be paid for by the Contractor at no additional expense to the Owner. The Owner reserves the right to employ an independent testing laboratory and to direct any testing that is deemed necessary. Contractor shall provide free access to site for testing activities.

3.3 CLEAN-UP:

- A. The Contractor shall remove all debris, construction equipment, and material from the areas to be loamed and seeded.

END OF SECTION

SECTION 31 25 13

EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 DESCRIPTION:

- A. This Plan has been developed as a strategy to control soil erosion and sedimentation during and after construction of the 58 unit apartment addition to The Park Danforth, Stevens Avenue in Portland, Maine. This plan is based on the Maine Erosion and Sedimentation Control Handbook for Construction, Best Management Practices, March 2003 or Latest Revision.
- B. Proposed development consists of the construction of a proposed one (1) story connector and one four (4) and five (5) story residential apartment building with below grade parking structure and associated site improvements. The building and parking with their associated grading define the limits of proposed earth movement for the development. The horizontal and vertical placement of the proposed building and parking lot have been designed to maximize the topographic opportunities available.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
- B. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on product characteristics, performance criteria and limitations.
- C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

PART 2 METHODS AND PRODUCTS

2.1 EROSION CONTROL PRACTICES / TEMPORARY MEASURES:

The following temporary measures to control erosion and sedimentation shall be utilized:

- A. Each ground area, opened or exposed, whether directly or indirectly due to the development, shall be minimized and shall be stabilized within 15 days of initial disturbance of soil and shall be permanently stabilized within seven days of final grading. This statement applies to disturbed areas beyond the limits of the proposed road. Exposed areas shall be stabilized prior to a rain event.

- B. Temporary soil stabilization shall be either by temporary mulching, temporary seeding, permanent base gravel, or rip-rap as follows:
1. Temporary Seeding. Seed shall be Aroostook rye applied at 2.60#/1000 SF. Lime shall be agricultural ground limestone applied at 138#/1000 SF. Fertilizer shall be 10-10-10 classification applied at 13.8#/1000 SF. Mulch shall consist of hay or straw mulch and spread evenly at a rate of 70-90#/1000 SF. Temporary seeding shall only be made between April 15 and October 1, and shall not be placed over snow.
 2. Temporary Mulching. Mulch shall consist of chopped hay or straw mulch and spread by mechanical blower evenly at a rate of 150-200#/1000 SF. Temporary mulch shall be removed prior to permanent soil stabilization. Mulch must not be placed over snow. Snow shall be removed prior to mulching.
 3. Permanent Base Gravel. Base gravel shall be suitable as temporary soil stabilization under the following conditions: Gravel shall meet the specifications for base or subbase gravel for the proposed completed surface.

2.2 EROSION CONTROL PRACTICES / PERMANENT MEASURES:

The following permanent measures to control erosion and sedimentation shall be utilized:

- A. Permanent seeding shall be performed during construction operations as each disturbed area has been brought to finish grade. Permanent seeding shall be made as dormant seeding after the first killing frost. Dormant seeding and mulch shall be used at two times the permanent seeding and mulching rate shown below. Seed, loam, lime, fertilizer and mulch are to be as follows:
1. Seed. The seed mixture shall consist of seeds proportioned by weight. All seed shall be fresh, clean, "new crop" seed. Harmless inert matter and weed seeds shall be permitted up to one percent of the gross weight of each variety of seed. All seed supplied shall be packed in approved containers bearing the manufacturer's name and analysis of contents. The following materials and application rates shall be required for permanent seeding:

Creeping red fescue:	0.69#/1000 SF
Kentucky bluegrass:	0.57#/1000 SF
Perennial ryegrass:	0.46#/1000 SF
<u>Redtop:</u>	<u>0.12#/1000 SF</u>
Total:	1.84#/1000 SF
 2. Loam. Loam shall be free of grasses, roots, large stone and inorganic debris. Place loam at four inches minimum depth over all disturbed areas. Final grading of all lawn areas to be approved by Landscape Architect prior to seeding.
 3. Lime. Lime shall be agricultural ground limestone and applied as per recommendation of a State Commercial Soil Testing Laboratory.
 4. Fertilizer. Fertilizer shall be 10-20-20 classification and applied as per recommendation of a State Commercial Soil Testing Laboratory.

5. Mulch. Mulch shall consist of hay or straw mulch. Mulch shall be spread evenly at a rate of two and one half tons per acre over all seeding. After application, the mulch shall be thoroughly wetted. In steep areas, the mulch shall be held in place by the use of jute erosion control netting or approved alternative netting material. Note: All exposed soil must be covered regardless of mulching rates specified.
 6. The contractor shall maintain the seeded and mulched areas until final acceptance of the work. Maintenance shall consist of providing proper watering, protection against traffic and repairing any areas damaged due to wind, water, erosion, fire or other causes. Such damaged areas shall be repaired to re-establish the condition and grade of the soil prior to seeding and shall then be re-fertilized, reseeded and re-mulched.
- B. Winter Construction. The winter construction period is from November 1 through April 15. Winter excavation and earthwork shall be completed such that no more than 1 acre of the site is without stabilization at any one time. Limit the exposed area to those areas in which work is expected to be undertaken during the proceeding 15 days and that can be mulched in one day prior to any snow event. Hay and straw mulch rates shall be a minimum of 150#/1000 SF (3 tons/acre) and shall be properly anchored. The contractor must install any added measures which may be necessary to control erosion/sedimentation from the site dependent upon the actual site and weather conditions. Continuation of earthwork operations on additional areas shall not begin until the exposed soil surface on the area being worked has been stabilized in order to minimize areas without erosion control protection.

PART 3 EXECUTION

3.1 CONSTRUCTION SEQUENCE:

The general sequence of work shall be as follows:

- A. Install erosion control devices (silt fence and or wood waste erosion control mix, stabilized construction entrance and or sediment barrier). Note: when frozen ground conditions exist, silt fence shall be replaced with wood waste filter berm.
- B. Demolition to include removal of existing buildings, existing bituminous and concrete pavement, existing trees and shrubs, existing stormdrain structures and pipes, existing sewerage pipes and existing water service.
- C. Temporarily stabilize disturbed areas by mulching all exposed soil within 15 days of initial disturbance.
- D. Excavation for footings and frost wall construction.
- E. Install storm water infrastructure and provide silt sack sediment trap in catch basin.
- F. Install water service, sanitary sewer service, and natural gas.
- G. Install underground utilities.
- H. Complete building construction.
- I. Complete site construction work.

- J. Install permanent vegetation on all exposed areas within 15 days of final grading.
- K. Perform continuing maintenance on all erosion and sedimentation control devices and measures including cleaning/sweeping of Stevens Avenue, Arbor Street and Forest Avenue as necessary to remove tracked sediment resulting from equipment use.

3.2 SITE INSPECTION & MAINTENANCE:

- A. Weekly inspections, as well as routine inspections following rainfalls of 0.5" over a consecutive 24-hour period, shall be conducted by the Site Contractor, of all temporary and permanent erosion control devices until final acceptance of the project. Necessary repairs shall be made to correct undermining or deterioration. Final acceptance shall include a site inspection to verify the stability of all disturbed areas and slopes. Until final inspection, all erosion and sedimentation control measures shall immediately be cleaned, and repaired by the General Contractor after storm events. Disposal of all temporary erosion control devices shall be the responsibility of the Site Contractor.
- B. Continued temporary maintenance and long-term provisions for permanent maintenance of all erosion and sedimentation control facilities after acceptance of the project shall be the responsibility of Home for the Aged – The Park Danforth or Assigns.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 GENERAL

1.1 DESCRIPTION:

- A. Bidding requirements, conditions of the contract and pertinent portions of sections in Division One of these specifications, apply to the section as fully as though repeated herein.
- B. Work under this section includes furnishing and installing asphalt paving on the project site and within the City of Portland right-of-way.
- C. Related work:
 - 1. Section 31 05 12, Site Earthwork.

1.2 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Submit materials certificate to onsite independent testing laboratory which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

1.3 QUALITY ASSURANCE:

- A. Reference: State of Maine Department of Transportation Standard Specifications Highways and Bridges, latest revision, hereafter designated as MDOT Specifications.
- B. Work shall be in conformance with the City of Portland Technical Design Standards.
- C. Pavement restoration, including areas subject to a moratorium shall be completed in conformance with the City of Portland standards.

PART 2 PRODUCTS

2.1 MATERIAL:

- A. Bituminous Concrete – An approved hot plant mix conforming to MDOT Standard Specifications (latest revision). Use Grading B mix for binder and C mix for surface or equivalent pavement designation.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. The Contractor shall be responsible that gravel is in proper condition to pave before starting work.

- B. Proof roll prepared base material surface to check for areas requiring additional compaction and areas requiring removal and recompaction.
- C. Do not begin paving work until deficient base material areas have been corrected and are ready to receive paving.
Pavement mix for roads, parking areas and sidewalks shall be as herein specified and shall consist of the following courses after compaction:

	<u>Binder Course</u>	<u>Wearing Course</u>
Collector Street Pavement	2.5"	1.5"
Local Street Pavement:	2"	1.5"
Driveway Pavement:	2"	1.5"
Sidewalk Pavement:	1"	1"

- D. The spreading of bituminous concrete shall be done wherever practicable by an approved mechanical spreader. Place mixture while it is still hot (+250 D.F.). Rolling shall be done as soon as practicable after spreading and in no case after the mixture is cooled. The exposed finished surface shall present a true, smooth plane, free from roller marks, conspicuous joining lines, patches, voids or other imperfections. Where brown spots or other serious imperfections occur they shall be cut down to the base course and replaced by new pavement rather than by attempting to patch the surface. Feathered edge patches will not be permitted.
- E. Apply successive lifts of asphaltic concrete in transverse directions with the surface course placed in the direction of surface-water flow. Place in typical strips not less than 10' - 0" wide.
- F. Make joints between old and new pavements or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Joints at existing street paving and new paving shall be saw cut. Clean contact surfaces and apply tack coat.
- G. Mix placed by hand shall be placed on a steel dump board or wheelbarrow from the truck and then shoveled into place.
- H. Rolling and Compaction
 - 1. The mixture, after being spread, shall be thoroughly compacted by rolling as soon as it will bear the weight of the rollers without undue displacement. Mixture shall be compacted to a minimum of 92% theoretical maximum density. The number, weight and types of rollers and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in workable condition.
 - 2. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
 - 3. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.
 - 4. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

5. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.
6. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.
7. **Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.**
8. **Do not permit maneuvering of excavating equipment, lifts or other vehicles with tight turning or tracking capabilities on finished surface. Damaged areas shall be restored by Contractor at no additional expense to Owner.**

3.2 INSPECTION:

- A. Grade Control: Establish and maintain required lines and elevations.
- B. Thickness: In-place compacted thickness shall not be less than thickness specified on the Drawings. Areas of deficient paving thickness shall receive a tack coat and a minimum one (1) inch overlay; or shall be removed and replaced to the proper thickness, at the discretion of the Owner's Representative and or Owner; until specified thickness of the course is met or exceeded at no additional expense to the Owner.
- C. Surface Smoothness: Testing shall be performed on the finished surface of each asphalt concrete course for smoothness, using 10' - 0" straightedge applied parallel with, and at right angles to centerline of paved area.

The results of these tests shall be made available to the Owner upon request. Surfaces will not be acceptable if exceeding following tolerances for smoothness:

Base Course Surface: 1/4"
Wearing Course Surface: 3/16"
- D. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable paving as directed by Owner's Representative and or Owner.
- E. Compaction: Field density tests for in-place materials shall be performed by examination of field cores in accordance with one of the following standards:
 1. Bulk specific gravity of paraffin-coated specimens: ASTM D-1188.
 2. Bulk specific gravity using saturated surface-dry specimens: ASTM D-2726.
- F. Rate of testing shall be one (1) core per 20,000 square feet of pavement, with a minimum of three (3) cores from heavy-duty areas and three (3) cores from standard-duty areas. Cores shall be cut from areas representative of the project.
- G. Areas of insufficient compaction shall be delineated, removed and replaced in compliance with the specifications at no expense to the Owner. Areas damaged by construction equipment shall be repaired to satisfaction of Owner at no expense to Owner.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.1 DESCRIPTION:

- A. Bidding requirements, conditions of the contract and pertinent portions of sections in Division One of these specifications, apply to the section as fully as though repeated herein.
- B. Work under this section includes furnishing and installing cast-in-place concrete work including (but not bay way of limitation) cast-in-place concrete, reinforcing, accessories, and finishing.
- C. Related work:
 - 1. Section 03 30 00, Cast-in-Place Concrete.
 - 2. Section 31 05 12, Site Earthwork.

1.2 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Submit materials certificate to onsite independent testing laboratory which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

1.3 QUALITY ASSURANCE:

- A. Reference: Section 03 30 00, Cast-in-Place Concrete – Part 1.4 Quality Assurance.

PART 2 PRODUCTS

2.1 MATERIAL:

- A. All concrete shall meet the requirements as specified in Section 03 30 00, Cast-in-Place Concrete, of these Specifications.
- B. Deicer Protection (Exterior Concrete): Saltgard as manufactured by Pro So Co, Inc. or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. Concrete Pavement and Pads
 - 1. All concrete shall meet the requirements as specified in Section 03 30 00, Cast-in-Place Concrete, of these Specifications.

2. After placement of the gravel base, the surface shall be brought to a smooth, uniform surface by grading and rolling the crushed aggregate base and re-rolled until the surface is true and even.
3. Slabs shall be placed alternately in lengths not to exceed 30 feet, or as directed and shall be separated by an expansion joint of preformed expansion joint filler and sealant 1/3 inch in thickness. The thickness of the slab shall be as shown on the Plans. The sidewalk surface shall be scored 1-3/8 inch deep into block units as shown on the Plans. When a concrete sidewalk is constructed adjacent to a building, fixed or other structures, a 1/2 inch thick preformed joint filler and sealant shall be used between the slab and the structure. Both expansion and control joints are to occur only within score joints.
4. Broom Finish - Broom finish by drawing a stiff-bristled pushbroom with a long handle over a troweled surface. Concrete walks shall receive a medium broom finish. Direction of brooming shall be perpendicular to major direction of pedestrian movement or as directed by the Landscape Architect.
5. Concrete pavement expansion joints shall be **saw cut** (not tooled) after brooming to insure a well-defined and smooth border.
6. Finished concrete shall be properly cured using a waterproof material, such as Sisal Kraft orange label lapped 6 inch taped. The concrete shall be properly moistened before covering it, and shall be kept tight. Curing shall be a minimum of seven (7) days.
7. Apply Saltgard deicer per-manufacture instructions.

END OF SECTION

SECTION 32 16 00

CURBING

PART 1 GENERAL

1.1 DESCRIPTION:

- A. Bidding requirements, conditions of the contract and pertinent portions of sections in Division One of these specifications, apply to the section as fully as though repeated herein.
- B. Work under this section includes furnishing and installing granite, bituminous and concrete monolithic curbing.
- C. Related work:
 - 1. Section 31 05 12, Site Earthwork.
 - 2. Section 03 00 00, Concrete

1.2 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data for granite curbing.

1.3 QUALITY ASSURANCE:

- A. Where M.D.O.T. appears it shall be taken to mean The State of Maine Department of Transportation Specifications, Highways and Bridges - Latest Revision.

1.4 DELIVERY:

- A. Package, handle, deliver and store access granite curbing at the project site in a manner that will avoid damage.

PART 2 PRODUCTS

2.1 MANUFACTURER:

- A. Granite curbing to be manufactured by John Swenson Granite Co. or approved equal.

2.2 MATERIALS:

- A. Granite curbing
 - 1. Vertical and Sloped Granite Curb: Granite curb shall conform to M.D.O.T. specifications for TYPE I and TYPE V. Curb shall be acceptable granite from approved quarries.
 - 2. Tip-Down and Transition Granite Curb: Miscellaneous Granite Curb Sections shall conform to M.D.O.T. Specification 712.04 (b).

3. All granite curb shall conform to the following standards.
- a. All granite curb shall be basically light gray in color, free from seams and other structural imperfection or flaws which would impair its structural integrity, and of a smooth splitting appearance. Natural color variation characteristic of the deposit from which the curbing is obtained will be permitted.
 - b. The exposed face shall be smooth quarry split to an approximately true plane having no projections or depressions which will cause over one (1) inch to show between a two (2) foot straight-edge and the face when the straight-edge is placed as closely as possible on any part of the face.
 - c. If projections on the face are more than that specified they shall be dressed off. The top and bottom lines of the face shall be pitched off to a straight line and shall not show over one (1) inch between stone and straight-edge when straight-edge is placed along the entire length of the top and bottom lines and when viewed from a direction at right angles to the plane of the face, and for the top line only not over (1) inch when viewed from a direction in the plane of the face. The ends shall be square to the length at the face and so cut that when placed end to end as closely as possible, no space shall show in the joint at the face of over 3/8 inch, except that where the edging is to be used on a curve having a radius of ten (10) feet or less, the ends of the stones shall be so cut as to provide a finished joint at the face section of not more than 1/2 inch. The arras formed by the intersection of the plane of the face with the plane of the end joint shall not vary from the plane of the face more than 1/4 inch. Drill holes not more than 3-1/2 inches in length and 1/2 inch in depth will be permitted. The sides shall not be broken under the square more than four (4) inches and the side adjacent to the grass shall not project over one (1) inch.

d. Dimension Tolerance:

Minimum Length	2 feet
Maximum Length	8 feet
Thickness	4 inches
Width of Face	12 inches

B. Concrete Monolithic Curb:

- 1. Monolithic curb, of the shape and dimensions shown, shall be constructed parallel to the centerline of pavement. Return curbs shall use a transition section not less than three (3) feet long.
- 2. Concrete shall be fiber reinforced, 4000 PSI minimum.
- 3. Concrete shall have a slump of not more than one (1) inch and shall conform to requirements of Division 03 00 00 – Concrete and conform to MDOT Standard Specifications, latest revision.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Granite Curb

1. Contractor shall install, backfill and protect all granite curb in accordance with M.D.O.T. Subsection 609.03 and as detailed on the Drawings. Provide approved granite tip-down curbs at all curb end sections. Provide approved granite transition curb where curb type and or material changes occur.

B. Concrete Monolithic Curb:

1. Construction: Monolithic curbs shall be constructed along the edge of freshly placed pavement. Forms may be placed on top of pavement forms and staked true to line and grade. Concrete shall be tamped and spaded into pavement edge to insure bond and maximum density. A metal screed or mule, designed to ride on the forms, shall be used to give proper final shape to curb.
2. Expansion Joints: Preformed expansion joint material shall be cut to fit the curb. No reinforcement or tie bars in curb shall pass through the joint. Edges of all joints shall be finished with a 3/8 inch radius edger.
3. Finishing: Back edge shall be finished with a 3/8 inch radius edger. Face of curb shall be finished with a wood float followed by moist medium brush. Gutter flowline shall be finished to a true uniform grade without ridges or water pockets.
4. Curing and Frost Protection: All curing and frost protection methods shall conform to Division 03 00 00 – Concrete.

3.2 PROTECTION:

- A. The Contractor shall be responsible to protect and repair as necessary all vertical and sloped granite curbing disturbed during construction at no expense to Owner. Provide temporary barriers at all radius locations where truck entry would impact curbing.
- B. The Contractor shall be responsible to protect all concrete monolithic curb after installation until cured. Areas subject to impact from vehicle and or construction equipment shall be protected until completion of project. Damaged curbing shall be replaced upon direction of Owner's Representative and or Project Engineer a no cost to the Owner.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 GENERAL

1.1 DESCRIPTION:

- A. Bidding requirements, conditions of the contract and pertinent portions of sections in Division One of these specifications, apply to the section as fully as though repeated herein.
- B. Work under this section includes pavement paint markings.

1.2 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data for pavement paint.

PART 2 PRODUCTS

2.1 MATERIAL:

- A. The paint shall be a non-bleeding, quick drying, alkyd petroleum base paint suitable for traffic-bearing surfaces and shall meet FS TTP-85E and mixed in accordance with manufacturer's instructions before application.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. Immediately before applying the pavement marking paint to the pavement, the surface shall be dry and entirely free from dirt, grease, oil or other foreign matter which would reduce the bond between the paint and the pavement. The surface shall be thoroughly cleaned by sweeping and blowing, if required, to remove all dust, dirt and loose materials. Areas which cannot be satisfactorily cleaned by sweeping and blowing shall be scrubbed with water, as directed, after which the surface shall be allowed to dry prior to painting.
- B. Apply two (2) coats of paint at manufacturer's recommended rate without the addition of thinner with a maximum of 125 square feet per gallon. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use a straightedge to ensure a uniform, clean, and straight stripe.

END OF SECTION

SECTION 32 32 23

SEGMENTAL RETAINING WALLS

REDI-SCAPE DIVISION OF REDI-ROCK, INT. LLC

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete segmental retaining wall units.
- B. Geosynthetic reinforcement.
- C. Leveling pad base.
- D. Drainage aggregate.
- E. Reinforced Backfill.
- F. Drainage pipe.
- G. Pre-fabricated Drainage Composite.
- H. Geotextile Filter.
- I. Impervious Materials.
- J. Construction Adhesive.

1.2 RELATED SECTIONS

- A. Section 31 05 12 - Site Earthwork
- B. Section 02 32 10 Subsurface Explorations

1.3 REFERENCES

- A. American Association of State Highway Transportation Officials (AASHTO):
 - 1. AASHTO M288 Geotextile Specification for Highway Applications.
 - 2. AASHTO Standard Specifications for Highway Bridges.
- B. ASTM International (ASTM):
 - 1. ASTM C 140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 - 2. ASTM C 1262 - Standard Test Method for Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units.
 - 3. ASTM C 1372 - Standard Specification for Segmental Retaining Wall Units.

4. ASTM D 448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
5. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu ft) (600 kN-m/cu.m.).
6. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil In Place by the Sand Cone Method
7. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu ft) (2700 kN-m/cu.m.).
8. ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
9. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).
10. ASTM D 3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer pipe and Fittings.
11. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
12. ASTM D 4491 - Standard Test Method for Water Permeability of Geotextiles by the Permittivity Method.
13. ASTM D 4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
14. ASTM D 4873 - Standard Guide for Identification, Storage and Handling of Geosynthetics.
15. ASTM D 5084 - Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
16. ASTM D 5262 - Standard Test Method for Evaluating the Unconfined Tension Creep Behavior of Geosynthetics.
17. ASTM D 5321 - Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.
18. ASTM D 5818 - Standard Practice for Obtaining Samples of Geosynthetics from a Test Section for Assessment of Installation Damage.
19. ASTM D 6637 - Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.
20. ASTM D 6638 - Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units.
21. ASTM D 6916 - Standard Test Method for Determining the Shear Strength Between Segmental Concrete Units.
22. ASTM D 6706 - Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil.

23. ASTM F 405 - Standard Specification for Corrugated Polyethylene (PE) Tubings and Fittings.
 24. ASTM G 51 - Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing.
- C. Federal Highway Administration
1. Elias, V., Christopher, B., and Berg, R., "Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines", Federal Highway Administration Report No. FHWA-NHI-00-043, March 2001.
 2. Elias, V., Christopher, B., and Berg, R., "Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforced Soil Slopes", Federal Highway Administration Report No. FHWA-NHI-00-044, March 2001.
- D. National Concrete Masonry Association (NCMA)
1. NCMA Design Manual For Segmental Retaining Walls, Second Edition, Second Printing (1997).

1.4 DEFINITIONS

- A. Concrete Segmental Retaining Wall (SRW) Units: Dry-stacked masonry units used as the retaining wall fascia.
- B. Reinforced Backfill: Soil which is used as fill behind the SRW unit, and within the reinforced soil mass (if applicable).
- C. Drainage Aggregate: Material used (if applicable) within, between, and directly behind the concrete retaining wall units.
- D. Stabilized Aggregate: A formulated mix design of clean stone, cement, and water that creates a permeable homogeneous zone (mass). It is obtained by the elimination of fine aggregates (sand) from the normal concrete mix.
- E. Geotextile Filter: Material used for separation and filtration of dissimilar soil types.
- F. Foundation Soil: Soil mass supporting the leveling pad and reinforced soil zone of the retaining wall system.
- G. Geosynthetic Reinforcement: Polymeric material designed specifically to reinforce the soil mass.
- H. Pre-fabricated Drainage Composite: three-dimensional geosynthetic drainage medium encapsulated in a geotextile filter, used to transport water.
- I. Impervious Materials: Clay soil or low permeability geosynthetic used to prevent water percolation into the drainage zone and reinforced backfill behind the wall.
- J. Global Stability: The general mass movement of a soil reinforced segmental retaining wall structure and adjacent soil mass.
- K. Project Geotechnical Engineer: A registered engineer who provides site observations, recommendations for foundation support, and verifies soil shear strength parameters.

1.5 SUBMITTALS

- A. Submit under provisions of Submittals Section.
- B. Product Data: Material description and installation instructions for each manufactured product specified.
- C. Shop Drawings: Retaining wall system design, including wall elevation views, geosynthetic reinforcement layout, pertinent details, and drainage provisions. The shop drawings shall be signed by a registered professional engineer licensed in the state of wall installation.
- D. Design Calculations: Engineering design calculations prepared in accordance with the NCMA Design Manual For Segmental Retaining Walls, or the AASHTO Standard Specifications for Highway Bridges, Section 5.8 (whichever is applicable). Analysis of global stability must be addressed and incorporated into the shop drawings.
- E. Samples:
 - 1. Furnish one unit in the color and face pattern specified, if requested.
 - 2. Furnish 12 inch square or larger piece of the geosynthetic reinforcement specified.
- F. Test Reports: Independent laboratory reports stating moisture absorption and compressive strength properties of the concrete retaining wall units meet the Project Specifications when tested in accordance with ASTM C140, Sections 6, 8 and 9.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications
 - 1. Member in good standing with the National Concrete Masonry Association.
 - 2. Manufacturer shall provide systematic testing of retaining wall units during production by a National Concrete Masonry Association Certified Masonry Testing Technician.
 - 3. Manufacturer shall provide independent quality assurance test results for retaining wall units manufactured and tested within a calendar year.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Concrete Retaining Wall Units and Accessories: Deliver, store, and handle materials in accordance with manufacturer's recommendations, in such a manner as to prevent damage. Check the materials upon delivery to assure that proper material has been received. Store above ground on wood pallets or blocking. Remove damaged or otherwise unsuitable material, when so determined, from the site.
 - 1. Exposed faces of concrete wall units shall be free of chips, cracks, stains, and other imperfections detracting from their appearance, when viewed from a distance of 10 feet.

2. Prevent mud, wet cement, adhesives and similar materials that may harm appearance of units, from coming in contact with system components.
- C. Geosynthetics (including geosynthetic reinforcement, geotextile filter, pre-fabricated drainage composite) shall be delivered, stored, and handled in accordance with ASTM D4873.

1.8 WARRANTY

- A. At project closeout, provide to Owner or Owners Representative a copy of the Anchor Wall Systems Inc. standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

1.9 EXTRA MATERIALS

- A. Furnish Owner with 3 replacement units identical to those installed on the Project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Manufacturer: Redi-Rock of Central Maine
- B. Contact: Redi-Rock of Central Maine, PO Box 339 Sangerville, ME 04479 Tel: (207) 717-0330, www.RediScapes.com : Product of other manufacturers may be considered subject to compliance with the requirements as judged by the Landscape Architect, and or Owner's Representative.
- C. Physical Requirements: Meet ASTM C 1372, except the unit height dimension shall not vary more than plus or minus 1/16 inch.
- D. Product: Subject to compliance with requirements of the following:

2.2 REDI-SCAPES 115 SERIES BLOCK

- A. Redi-Scape:
 1. Face: Straight.
 2. Color: Borestone Slate Gray
 3. Texture: Stone Face
 4. REDISCAPE RETAINING:
 - a. Front Height: 6-1/16 inches.
 - b. Front Length: 18 inches.
 - c. Front Depth: 9 inches.
 - d. Weight: 56 lbs. per unit.
 - e. Setback: 1/2 inch.

B. STANDARD COPING:

1. Front Height: 2 inches.
2. Front Length: 19 inches.
3. Front Depth: 16.5 inches.
4. Back Length: 13.5 inches.
5. Weight: 44 lbs per unit.
6. Coverage: 26 +/- sq. in.

C. REDI-SCAPES CURVED HALF CORNER:

1. Front Height: 6 1/16
2. Front Length: 11 ¼ inches.
3. Front Depth: 14 inches.
4. Weight: 54 lbs. per unit.

D. REDI-SCAPES CURVED CORNER:

1. Front Height: 6 1/16 inches.
2. Front Length: 18 1/4 inches.
3. Front Depth: 16 1/2 inches.
4. Weight: 85 lbs. per unit.

2.3 RELATED PRODUCTS

- A. Geosynthetic Reinforcement: Polyester fiber geogrid or geotextile, HDPE or polypropylene woven geotextile, as shown on the Drawings.
1. Geotextile fabric: Manufactured by Ten Cate Nicolon, Mirafi Construction Products, Pendergrass, GA 706-693-2226. Product of other manufacturers may be considered subject to compliance with the requirements as judged by the Landscape Architect, and or Owner's Representative.
 2. Or approved equal.

- B. Leveling Pad Base:
1. Aggregate Base: Crushed stone or granular fill meeting the following gradation as determined in accordance with ASTM D448:
 - a. Sieve: 1 inch - 100 percent passage.
 - b. Sieve: No. 4 - 35 to 70 percent passage.
 - c. Sieve: No. 40 - 10 to 35 percent passage.
 - d. Sieve: No. 200 - 3 to 10 percent passage.
 - e. Base Thickness: 6 inch (152mm) minimum compacted thickness.
 2. Concrete Base: Nonreinforced lean concrete base.
 - a. Compressive Strength: 3000 psi (minimum).
 - b. Base Thickness: At least 2 inches (52mm).
- C. Drainage Aggregate: Clean crushed stone or granular fill meeting the following gradation as determined in accordance with ASTM D448:
1. Sieve: 1 inch - 100 percent passage.
 2. Sieve: 3/4 inch - 75 to 100 percent passage.
 3. Sieve: No. 4 - 0 to 60 percent passage.
 4. Sieve: No. 40 - 0 to 50 percent passage.
 5. Sieve: No. 200 - 0 to 5 percent passage.
- D. Backfill: Soil free of organics and debris and consisting of either GP, GW, SP, SW, or SM type, classified in accordance with ASTM D2487 and the USCS classification system.
1. Soils classified as SC, ML and CL are considered suitable soils for segmental retaining walls with a total height of less than 10 feet unless the Plasticity Index (PI) is 20 or more.
 2. Maximum particle size for backfill is 4 inches.
 3. Unsuitable soils are organic soils and those soils classified as CH, OH, MH, OL, or PT.
- E. Impervious Material: Clayey soil or other similar material which will prevent percolation into the drainage zone behind the wall.
- F. Drainage Pipe: Perforated or slotted PVC or corrugated HDPE pipe manufactured in accordance with D3034 and/or ASTM F405. The pipe may be covered with a geotextile filter fabric to function as a filter.

- G. Construction Adhesive: Exterior grade adhesive as recommended by the retaining wall unit manufacturer.
 - 1. Construction Adhesive Manufacturer: SRW Products, Princeton, MN, 763-389-2722. Product of other manufacturers may be considered subject to compliance with the requirements as judged by the Landscape Architect, and or Owner's Representative.
 - 2. Or approved equal.

PART 3 EXECUTION

- A. Examine the areas and conditions under which the retaining wall system is to be erected, and notify the Architect/Engineer/Owner/Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Promptly notify the wall design engineer of site conditions which may affect wall performance, soil conditions observed other than those assumed, or other conditions that may require a reevaluation of the wall design.
- C. Verify the location of existing structures and utilities prior to excavation.

3.2 PREPARATION

- A. Ensure surrounding structures are protected from the effects of wall excavation.
- B. Excavation support, if required, is the responsibility of the Contractor, including the stability of the excavation and its influence on adjacent properties and structures.

3.3 EXCAVATION

- A. Excavate to the lines and grades shown on the Drawings. Over-excavation not approved by the Architect will not be paid for by the Architect/Engineer/Owner/Contractor. Replacement of these soils with compacted fill and/or wall system components will be required at the Contractor's expense. Use care in excavating to prevent disturbance of the base beyond the lines shown.

3.4 FOUNDATION PREPARATION

- A. Excavate foundation soil as required for footing or base dimension shown on the Contract Drawings, or as directed by the Project geotechnical engineer.
- B. The Project geotechnical engineer will examine foundation soil to ensure that the actual foundation soil strength meets or exceeds that indicated on the Drawings. Remove soil not meeting the required strength. Oversize resulting space sufficiently from the front of the block to the back of the reinforcement, and backfill with suitable compacted backfill soils.
- C. The Project geotechnical engineer will determine if the foundation soils will require special treatment or correction to control total and differential settlement.
- D. Fill over-excavated areas with suitable compacted backfill, as recommended by the Project geotechnical engineer.

3.5 BASE COURSE PREPARATION

- A. Place base materials to the depths and widths shown on the Contract Drawings, upon undisturbed soils, or foundation soils prepared as specified in this section.
 - 1. Extend the leveling pad laterally at least 6 inches in front and behind the lowermost concrete retaining wall unit.
 - 2. Provide aggregate base compacted to 6 inches thick (minimum).
 - 3. The Contractor may at their option, provide a concrete leveling pad as specified in Subparagraph 2.01.C.2, in lieu of the aggregate base.
 - 4. Where a reinforced footing is required by local code official, place footing below frost depth.
- B. Compact aggregate base material to provide a level, hard surface on which to place the first course of units.
- C. Prepare base materials to ensure complete contact with retaining wall units. Gaps are not allowed.

3.6 ERECTION

- A. General: Erect units in accordance with manufacturer's instructions and recommendations, and as specified herein.
- B. Place first course of concrete wall units on the prepared base material. Check units for level and alignment. Maintain the same elevation at the top of each unit within each section of the base course.
- C. Ensure that foundation units are in full contact with natural or compacted soil base.
- D. Place concrete wall units side-by-side for full length of wall alignment. Alignment may be done by using a string line measured from the back of the block. Gaps are not allowed between the foundation concrete wall units.
- E. Place at least 12 inches (305mm) of drainage aggregate between, and directly behind the concrete wall units. Fill voids in retaining wall units with drainage aggregate. Provide a drainage zone behind the wall units to within 9 inches of the final grade. Cap the backfill and drainage aggregate zone with 12 inches (305mm) of impervious material.
- F. Install drainage pipe at the lowest elevation possible, to maintain gravity flow of water to outside of the reinforced zone. Slope the main collection drainage pipe, located just behind the concrete retaining wall units, 2 percent grade minimum to provide gravity flow to the daylighted areas. Daylight the main collection drainage pipe through the face of the wall, and/or to an appropriate location away from the wall system at each low point and at 50 foot (15.25 m) maximum intervals along the wall. Alternately, the drainage pipe can be connected to a storm sewer system at 50 foot (15.25 m) maximum intervals.
- G. Remove excess fill from top of units and install next course. Ensure drainage aggregate and backfill are compacted before installation of next course.
- H. Check each course for level alignment. Adjust units as necessary to maintain level and alignment prior to proceeding with each additional course.

- I. Install each succeeding course placing units in a random pattern. Backfill as each course is completed. Pull the units forward until the locating surface of the unit contacts the locating surface of the units in the preceding course. Interlock wall segments that meet at corners by overlapping successive courses. Attach concrete retaining wall units at exterior corners with adhesive specified.
- J. Install geosynthetic reinforcement in accordance with geosynthetic manufacturer's recommendations and the Contract Drawings.
 1. Orient geosynthetic reinforcement with the highest strength axis perpendicular to the wall face.
 2. Prior to geosynthetic reinforcement placement, place the backfill and compact to the elevation of the top of the wall units at the elevation of the geosynthetic reinforcement.
 3. Place geosynthetic reinforcement at the elevations and to the lengths shown on the Contract Drawings.
 4. Lay geosynthetic reinforcement horizontally on top of the concrete retaining wall units and the compacted backfill soils. Place the geosynthetic reinforcement within one inch of the face of the concrete retaining wall units. Place the next course of concrete retaining wall units on top of the geosynthetic reinforcement.
 5. The geosynthetic reinforcement shall be in tension and free from wrinkles prior to placement of the backfill soils. Pull geosynthetic reinforcement hand-taut and secure in place with staples, stakes, or by hand-tensioning until the geosynthetic reinforcement is covered by 6 inches (152mm) of loose fill.
 6. The geosynthetic reinforcements shall be continuous throughout their embedment lengths. Splices in the geosynthetic reinforcement strength direction are not allowed.
 7. Do not operate tracked construction equipment directly on the geosynthetic reinforcement.
 8. At least 6 inches of compacted backfill soil is required prior to operation of tracked vehicles over the geosynthetic reinforcement. Keep turning of tracked construction equipment to a minimum.
 9. Rubber-tired equipment may pass over the geosynthetic reinforcement at speeds of less than 5 miles per hour. Turning of rubber-tired equipment is not allowed on the geosynthetic reinforcement.
- K. Place reinforced backfill, spread and compact in a manner that will minimize slack in the reinforcement
- L. Place fill within the reinforced zone and compact in lifts not exceeding 6 to 8 inches (loose thickness) where hand-operated compaction equipment is used, and not exceeding 12 inches (loose thickness) where heavy, self-propelled compaction equipment is used.
 1. Only lightweight hand-operated compaction equipment is allowed within 4 feet of the back of the retaining wall units. If the specified compaction cannot be achieved within 4 feet of the back of the retaining wall units, replace the reinforced soil in this zone with drainage aggregate material.
- M. Compaction testing shall be done in accordance with ASTM D1556 or ASTM D2922.

N. Minimum Compaction Requirements for Fill Placed in the Reinforced Zone

1. The minimum compaction requirement shall be determined by the project geotechnical engineer testing the compaction. At no time shall the soil compaction requirements be less than 95 percent of the soil's standard Proctor maximum dry density (ASTM D698) [modified Proctor maximum dry density (ASTM D1557)] for the entire wall height
2. Utility Trench Backfill: Compact utility trench backfill in or below the reinforced soil zone to 98 percent of the soil's standard Proctor maximum dry density (ASTM D698) [modified Proctor maximum dry density (ASTM D1557)], or as recommended by the Project geotechnical engineer. If the height from the utility to finish grade is higher than 30 feet, increase compaction to 100 percent of the standard Proctor density [modified Proctor density].
 - a. Utilities must be properly designed (by others) to withstand all forces from the retaining wall units, reinforced soil mass, and surcharge loads, if any.
3. Moisture Content: Within 2 percentage points of the optimum moisture content for all wall heights.
4. These specifications may be changed based on recommendations by the Project geotechnical engineer.
 - a. If changes are required, the Contract Sum will be adjusted by written Change Order.

O. At the end of each day's operation, slope the last level of compacted backfill away from the interior (concealed) face of the wall to direct surface water runoff away from the wall face.

1. The General Contractor is responsible for ensuring that the finished site drainage is directed away from the retaining wall system.
2. In addition, the General Contractor is responsible for ensuring that surface water runoff from adjacent construction areas is not allowed to enter the retaining wall area of the construction site.

P. Refer to Article 3.10 for compaction testing.

a. CAP UNIT INSTALLATION

- i. Apply adhesive to the top surface of the unit below and place the cap unit into desired position.
- ii. Cut cap units as necessary to obtain the proper fit.
- iii. Backfill and compact to top of cap unit.

b. SITE CONSTRUCTION TOLERANCES

i. Site Construction Tolerances:

1. Vertical Alignment: Plus or minus 1 1/2 inches (38mm) over any 10 foot (3048mm) distance, with a maximum differential of 3 inches (76mm) over the length of the wall.

2. Horizontal Location Control From Grading Plan.
 - a. Straight Lines: Plus or minus 1 1/2 inches (38mm) over any 10 foot (3048mm) distance.
 - b. Corner and Radius Locations: Plus or minus 12 inches (305mm).
 - c. Curves and Serpentine Radii: Plus or minus 2 feet (610mm).
 3. Immediate Post Construction Wall Batter: Within 2 degrees of the design batter of the concrete retaining wall units.
 4. Bulging: Plus or minus 1 1/4 inches (32mm) over any 10 foot (3048mm) distance.
- c. FIELD QUALITY CONTROL
- i. Installer is responsible for quality control of installation of system components.
 - ii. The Owner or General Contractor, at their expense, will retain a qualified professional to perform quality assurance checks of the installer's work.
 - iii. Correct work which does not meet these specifications or the requirements shown on the Drawings at the installer's expense.
 - iv. Perform compaction testing of the reinforced backfill placed and compacted in the reinforced backfill zone.
 1. Testing Frequency:
 - a. One test for every 2 vertical feet (610mm) of fill placed and compacted, for every 50 lineal feet (15.25 lm) of retaining wall.
 - b. Vary compaction test locations to cover the entire area of the reinforced soil zone, including the area compacted by the hand-operated compaction equipment.
- d. ADJUSTING AND CLEANING
- i. Replace damaged units with new units as the work progresses.
 - ii. Remove debris caused by wall construction and leave adjacent paved areas broom clean.

END OF SECTION

SECTION 32 90 00

PLANTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
- B. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.
- C. Related work:
 - 1. Section 31 05 12, Site Earthwork.
 - 2. Section 12 93 00, Site Furnishings

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on product characteristics, performance criteria and limitations.
- C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- E. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- F. Tests specified in this Section shall be paid for by the Contractor. **Certifications required must be submitted to the Landscape Architect and or Owner's Representative for approval before use of materials on the site.**
- G. The **Contractor shall be required to take representative soil samples of the topsoil** to be provided from several locations (on-site) in the area(s) under consideration for testing. Imported topsoil shall also require test results prior to placement. Tests shall be made by a State Commercial Soil Testing Laboratory using methods approved by the Association of Official Agricultural Chemist or the State Agricultural Experiment Station, or by the University of Maine at Orono. Testing shall include chemical balance (pH) **as well as organic content.** The required pH level shall be between 6.6-7.3% and the organic content shall be between 6.5-8%.
- H. The Contractor shall provide testing data for composted soil amendment if required to supplement the required minimum organic content.
- I. The Contractor shall provide the Dealer's Guarantee Statement for grass seed mix.

1.3 DESCRIPTION:

- A. Bidding requirements, conditions of the contract and pertinent portions of sections in Division One of these specifications, apply to the section as fully as though repeated herein.
- B. Work under this section shall include all labor, materials, services, equipment and accessories necessary to furnish and install trees, shrubs, and turf in accordance with the specifications and applicable Drawings.

1.4 QUALITY ASSURANCE:

- A. Provide plants which are true to name. Tag one of each bundle or Lot with the name and size of plants and shall conform to ANSI Z260.1 - Nursery Stock, latest edition, of the American Association of Nurserymen, Inc.
- B. Workmanship: Perform work in accordance with the best standards of practice for Landscape work and under the continual supervision of a competent foreman capable of interpreting the Drawings and Specifications.
- C. Submit documentation to Landscape Architect of Record within twenty-five (25) days after award of contract stating that plant material is available. Any and all substitutions due to unavailability must be requested in writing prior to confirmation of ordering.
- D. Plants shall be subject to review and approval of Landscape Architect of Record at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of review and rejections during progress of the work. Submit written request for review of plant material at place of growth or project location to Landscape Architect of Record. Notification for on-site inspection shall be a minimum of 48 hours before inspection. Written request shall state the place of growth and quantity of plants to be reviewed. Landscape Architect of Record reserves the right to refuse review at this time if, in his judgment, sufficient quantity of plants is not available for review. Review shall be for character and form.
- E. Certificate of Acceptability: Inspection of the work covered by this Section to determine completion of the work involved will be made at the conclusion of the Maintenance Period upon written notice requesting such inspection submitted by the Landscape Contractor at least ten (10) days prior to the anticipated date. The condition of turf and plantings will be noted and determination made by the Landscape Architect whether maintenance shall continue.

1.5 GUARANTEE:

- A. Turf and plantings shall be guaranteed for one (1) full year after certification of acceptability by the Landscape Architect and shall be alive and in satisfactory growth at the end of the guarantee period, except for damage resulting from causes beyond the responsibility of the Contractor. The Contractor shall provide the Owner with a written guarantee upon certification of acceptability. For plant material in question at the end of the guarantee, the Landscape Architect, Owner and Contractor shall determine a reasonable extension of the guarantee period.

PART 2 PRODUCTS

2.1 MATERIALS:

- A. Topsoil - The Contractor shall furnish and place topsoil to give the specified depths. The Contractor shall furnish and place 18 inches of loam in all shrub beds, and 6 inches under all turf areas. Topsoil mix shall be placed in all tree and shrub pits as shown on the Drawings. Natural

loam topsoil shall be of uniform quality, free from hard clods, still clay, hard pan sods, stones over ¾ inches and undesirable inorganic materials. The Owner and/or Landscape Architect reserves the right to reject on or after delivery any materials which do not, in his or her opinion, meet these Specifications.

B. Additives:

1. Humus - Ground or shredded peat that has been stockpiled at least one year prior to use, or commercial bagged peat.
2. Manure - Well-rotted unleached stable manure with no more than 25% straw, shavings, or sawdust content. A mixture of one (1) cubic yard of peat humus or peat moss and 100 lbs. of commercial dehydrated-bagged manure such as Bovung or Spurigon may be used.
3. Mulch for Plants - Well-rotted (**black**) shredded pine bark as approved by the Landscape Architect.
4. Lime - Commercial ground lime with no less than 85% total carbonates, 50% passing a 100 mesh sieve and 90% passing a 200 mesh sieve as approved by the Landscape Architect. Coarser material will be accepted provided that specific rates of application increased proportionately.
5. Compost soil amendment – Acceptable compost for “compost manufactured topsoil” shall conform to EPA Chapter 40 CFR 503 (pathogen, metals and vector attraction reduction) as well as applicable state regulations.

C. Commercial Fertilizer

1. Seeding - 19-26-5 dust free homogenous granular material such as Scotts Pro-Turf Starter Fertilizer or an approved equal (application rate as recommended by manufacturer).
2. Sodding - 10-6-4 with 50% nitrogen derived from urea form, such as Agway Turfwood Special Premium or an approved equal (application rate as recommended by manufacturer).
3. Super phosphate - 0-20-0 in unopened bags with manufacturer analysis printed on the bag.

D. Plant Materials - Furnish plants shown and specified on the Drawings and listed in the plant materials list. Discrepancies between the number of plants shown on the Drawings and the number listed in the plant list shall not be grounds for additional remuneration for the Contractor. Plants shall be nursery grown, typical of their species or variety and have a normal habit of growth. Any plant with broken, damaged, or badly bruised branches, trunks, or root balls shall be rejected.

1. Sizes: Plants larger than specified in the plant list may be used if approved by the Landscape Architect but use of such plants shall not increase the contract price. If the use of the larger plants is approved, the spread of roots or ball of earth shall be increased in proportion to the size of the plants.
2. Substitutions: In the event that trees, shrubs or other plant material specified in the plant list are impossible or unreasonably difficult to obtain, the Contractor shall immediately notify the Landscape Architect to discuss appropriate substitutions. No substitutions of plant material may be made without the approval of the Landscape Architect.

E. Grass Seed

1. Grass Seed mixtures shall be fresh, clean, new crop seed. Seed may be mixed by an approved method on the site, or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers which shall bear the dealer's guaranteed statement of the composition of the mixture and the percentage of purity of each variety. The Dealer's Guarantee Statement shall be delivered to the Landscape Architect.
2. Grass seed mixture for Lawn Areas shall be of the following types of seed:

Park Mix by Allen, Sterling & Lothrop or approved equal

35%	Kentucky Bluegrass 85/80
20%	Creeping Red Fescue
15%	Chewings Fescue
15%	Perennial Ryegrass
15%	Ryegrass

- F. Sod - Sod shall be well-established turf of even thickness consisting of a Bluegrass blend, 90% Bluegrass and 10% Fescue. Sod shall be as provided by Winding Brook Sod Farm, Lyman, Maine or approved equal.
- G. Roof Garden Soil – Soil shall be "Rooflite" Intensive ag mix, or approved equal, in quantities as shown on Architectural plans A 1.21 and A 105. Provided by Read Custom Soils 125 Turnpike Street, Canton, MA 02021 (888) 475-5526.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Pre-Plant Weed Control

1. If live perennial weeds exist on site at the beginning of work, spray with a non-selective systemic contact herbicide, as recommended and applied by an approved licensed landscape pest control advisor and applicator. Leave sprayed plants intact for at least fifteen days to allow systemic kill or as directed by advisor.
2. Maintain site weed free until final acceptance by Owner utilizing mechanical, manual and/or chemical treatment.
3. Project Planting Beds adjacent to seeded lawn areas from over spray of seed mix. Germinating grass shall be removed before planting and mulching of beds. Contractor shall be responsible for removal of grass and or weeds after installation of plant material during maintenance period.

B. Planting of Trees and Shrubs

1. Plants must be located by the Contractor and approved by the Landscape Architect before pits are dug. The Contractor shall notify the Landscape Architect at least 48 hours prior to scheduling installation of plant material. Locations as shown on the Drawings may be varied due to existing conditions.

2. Preparation of Soil - Manure, peat humus and super phosphate additives shall be incorporated into topsoil by placing the additives over topsoil piles and turning piles at least 3 times or until thoroughly mixed. (Refer to planting detail).
 3. Staking and guying: Trees shall be staked at the time of planting as shown on the typical section of Tree Planting Detail.
 4. Pruning and Mulching:
 - a. Remove all dead wood and/or suckers and all broken or badly bruised branches. All pruning shall conform to standards established by the National Arborist Association. Trees damaged during installation shall be removed and replaced at the direction of Project Landscape Architect and or Owner's Representative.
 - b. Immediately after planting operations are completed, cover all tree and shrub pits with three (3) inch layer of specified mulch. The limit of this mulch for trees shall be the area of the pit and for shrubs in beds, the entire area of the shrub bed. Mulch depth shall not exceed (3) inches.
 5. Watering
 - a. The Contractor shall be responsible for thoroughly watering all plant material upon installation.
 - b. Watering shall be monitored on a daily basis when temperatures exceed 70 degrees. The depth of moisture in all tree and shrub plantings shall be adequate to prevent wilting.
 - c. Watering (as required) of plant material shall continue for the duration of the maintenance period until certification of acceptability.
- C. Loaming and Seeding
1. Conduct planting operations under favorable weather conditions. Areas not required to be developed otherwise shall be seeded to turf.
 2. Compost Manufactured Topsoil – The soil (source material) shall be free of lumps, plants, weeds, roots and other debris over 2 inches in any dimension and free of stones over inch in any dimension. The organic compost shall be uniformly incorporated into the loam source by rolling and tumbling, by a front-end loader or by processing in a mixing plant. The material shall be mixed sufficiently to produce a homogenous soil, free of lumps and clods. In addition to the requirements for the compost amendment, the Contractor shall provide documentation that the recommended rate of fertilizer, per the testing analysis, has been applied to lawn areas prior to seeding.
 3. Prior to placing loam, scarify subgrade areas; remove all rocks over two (2) inches and debris; and set grade stakes as necessary. Place topsoil evenly over all areas to be loamed to a minimum thickness of six (6) inches. Hand rake to remove clods, lumps, brush, roots, and stones over ¾ inches in diameter. Hand roll to show depressions and uneven grades. Regrade as necessary to obtain smooth, even grades. Surplus topsoil shall become the property of the Contractor and shall be removed off the site.
 4. Apply additives (lime, fertilizer, compost etc.) as per the recommendation of the testing lab. Apply additives and harrow into top two (2) inches of the seedbed.

5. Sow seed specified by use of a mechanical spreader at the rates specified. Rake lightly in; roll with 200 lb. roller and water with a fine spray. Avoid spreading of grass seed mix in all designated planting beds.
6. Following compaction, apply a one- (1) inch layer of straw to hasten germination.
7. Full even growth in all areas must be guaranteed. The maintenance period shall continue after seeding and until the lawns are certified acceptable by the Landscape Architect. A minimum uniform catch of turf meeting 80% shall be required.
8. Repair damage resulting from erosion, gullies, washouts or other similar causes if such damage occurs before certification of acceptability of turf and planting by the Landscape Architect.
9. Sod - After all grading has been completed, the soil shall be irrigated within 12-24 hours before laying the sod. Sod shall not be laid on soil that is dry and powdery.
10. The first row of sod shall be laid in a straight line with subsequent rows placed parallel to and tightly against each other. Lateral joints shall be staggered to promote a uniform growth and strength. Care shall be exercised to insure that the sod is not stretched or overlapped and that all joints are butted tight in order to prevent voids which cause air drying of the roots.
11. The Contractor shall water sod immediately after installation to prevent drying during progress of the work. It shall then be thoroughly irrigated to a depth sufficient that the underside of the new sod pad and soil immediately below the sod is thoroughly wet.
12. Rolling of the sod shall be required to properly join sod to the bed after the sod is installed and twenty-four (24) to forty-eight (48) hours after initial watering. The Contractor shall roll the required area with a roller which weights seventy-five (75) to one hundred (100) pounds per square foot of roller width. The completed sod surface shall be true to finish grades as shown on plans and even and firm at all points.
13. Watering
 - a. First and Second Week - The Contractor shall provide all labor and arrange for all watering necessary for establishment of the turf. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first and second week and in sufficient quantities to maintain moist soil to a depth of at least four (4) inches. Watering should be done during the heat of the day to help prevent wilting.
 - b. Watering shall continue to be the responsibility of the Contractor until such time as the Owner or project Landscape Architect has certified acceptance of lawn areas.
14. Install soil in individual planters and garden structures to depth identified on drawings and or according to manufactures recommendation. Refer to drawings A 1.05 and A 7.21.

3.2 MAINTENANCE:

- A. General - Maintenance shall begin immediately after each portion of seed and each plant is planted and shall continue in accordance with the following:
 1. Lawns: The Contractor shall be responsible for establishing a uniform stand of the specified seed and until a Certification of Acceptability is received. No bare spots shall be allowed. After the seed has started, all areas and parts of areas that fail to show a uniform stand of grass, for any reason whatsoever, shall be seeded or sodded repeatedly until all areas are

covered with a satisfactory growth of grass. The Contractor shall be responsible for the first two (2) mowings.

2. New Plantings: Protect and maintain new planting until the end of the lawn maintenance period, or, if installed after the lawn maintenance period, until installation of planting is certified acceptable by the Landscape Architect. Maintenance shall include watering, spraying and dusting for insect and fungal control, mulching, tightening and repairing guys, replacement of sick or dead plants, resetting plants to proper grades or upright position, and restoration of planting saucer, and all other care needed for proper growth and maintenance of the plants. Planting completed after the lawn preparation shall provide proper protection to lawn areas. Any damage resulting from planting operations shall be promptly repaired.
3. Spraying and Dusting: During the maintenance and guarantee periods, the Contractor shall do all seasonal spraying and/or dusting of trees and shrubs as required.
4. Protection: Planting areas and plants shall be protected against trespassing and damage of any kind. If any plants become damaged or injuries occur, they shall be treated or replaced as directed.
5. Damage: Damage resulting from erosion, gullies, washouts, or other causes shall be repaired by filling with topsoil, tamping, re-fertilizing, and sodding by the Contractor at his own expense if such damage occurs prior to certification of acceptability of turf and plantings by the Landscape Architect.
6. Responsibility: The Contractor's responsibility for maintenance shall cease at the time of certification of acceptability by the Landscape Architect. During the guarantee period, the Contractor shall be held responsible for making replacements, but no maintenance shall be required, other than spraying and dusting.

3.3 REPLACEMENT:

- A. At the end of the guarantee period, inspection will be made by the Landscape Architect upon written notice requesting such inspection and shall be submitted by the Contractor at least ten (10) days before the anticipated date. Any plant required under this Contract that is dead or not in satisfactory condition, as determined by the Landscape Architect, shall be removed from the site. These, and any other plants missing due to the negligence of the Contractor, shall be replaced with plants of the same type and size as originally specified. Replanting shall be done as soon as conditions permit, but during the normal planting season. Plant items in accordance with these specifications.

3.4 CLEANUP:

- A. The Landscape Contractor shall remove all debris, construction equipment, excess fill, rocks, and other excess material caused by his work, from the site upon completion of his portion of the work.

END OF SECTION

SECTION 33 10 00

WATER UTILITIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions and documents of the Contract, including General and Special Conditions, apply to the work specified in this Section.
- B. Section 33 05 12 - Site Earthwork
- C. Section 33 40 00 - Storm Drainage
- D. Portland Water District Standards (Attached)
- E. Construction Drawings

1.2 TESTS, PERMITS, INSPECTIONS, AND CODES

- A. Water lines shall be tested before use.
- B. Utility installations shall comply with all applicable local and state codes and with requirements of local water districts. See attached Portland Water District Standards.
- C. All utility installations shall be inspected and approved by the utility company inspectors, local code enforcement, city engineer where applicable and Landscape Architect or Owner's authorized representative before being backfilled.
- D. The Contractor shall obtain and pay for any permits required for this portion of the work.

1.3 SUBMITTALS

- A. Refer to Section 33 40 00 - Storm Drainage, Paragraph 1.2.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, meter pit and accessories.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. **Project Record Documents: Record actual locations of piping mains, valves, connections; thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities. Complete as built record documents shall be provided to owner.**
- E. All materials including pipe, valves, hydrants, etc., shall be subject to approval by project landscape architect, project engineer or designated authority.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Unload materials so as to avoid shock or damage. Handle and store all pipe in such a manner as to avoid deterioration or other injury thereto. Place no pipe within pipe of larger size. Store pipe and fittings on sills above storm drainage level and delivery for laying after trenches are excavated. Valves and hydrants shall be drained and stored to protect them from damage.

1.5 DAMAGES

- A. If, during the process of this work, utilities in place are damaged, they shall be restored to their proper condition at no added cost to the Owner.

PART 2 PRODUCTS

2.1 WATER DISTRIBUTION SYSTEM

- A. The Contractor shall install new fire suppression and potable water service to new addition as shown on Drawings. Pipe shall be HPDE polyethylene pipe with working pressure of 200 psi and conform to AWWA C901, ASTM D3350 and ASTM D 2737. Pipe, valves and connection requirements shall conform to specifications of the Portland Water District.

PART 3 EXECUTION

3.1 TRENCHES

- A. Pipe trench excavation and backfill shall be as specified in Section 33 05 12 - Site Earthwork.

3.2 WATER DISTRIBUTION SYSTEM

- A. Work shall be in accordance with applicable AWWA, 10 State Standards and specifications of Portland Water District. Coordinate installation and inspection with Portland Water District.

3.3 LINES AND GRADES

- A. All mains, valves, and curb stops locations shall be verified by the project engineer and Portland Water District Representative.

3.4 EXCAVATION

- A. Excavation for trenches for the placing of water mains, valves, and fittings must be of sufficient width to permit the work to be done in the manner and to the depths specified or as shown on the plans. The trench shall be dug to the required level, and the bottom shaped by hand to conform to the shape of the pipe or appurtenances being installed.

3.5 PIPE LAYING

- A. All pipe shall be laid to line as indicated on the Drawings. Pipes shall be laid with a minimum of 5 1/2 feet of cover over the pipe. This depth of cover shall be measured from finished grade. Pipe, fittings and valves shall be carefully handled to avoid damage.

- B. Suitable equipment shall be provided by the Contractor for handling the pipe. Any damage to the pipe in handling or laying shall be at the Contractor's expense. Poured concrete thrust blocks shall be provided for all fittings shown on the Drawings and in accordance with the manufacturer's recommendations.
- C. The Contractor shall install a warning tape in the water main trench that is detectable with an inductive type metal detector. The tape shall be blue and have printing that warns of a water line below. The tape shall be Allen Detectatape, as manufactured by Allen Systems, Inc., of Wheaton, Illinois or approved equal and have a 3" width.
- D. Depth of installation shall be one to two feet below grade. The tape shall be detectable with an inductive type metal detector. Splicing of the tape shall be accomplished with manufacturer furnished metal clips. Where required by the Project Engineer, No. 9 gauge copper wire shall be clipped to the tape and brought to the ground surface or attached to other metal risers.

3.6 VERTICAL SEPARATION FROM SANITARY SEWER

- A. Whenever water mains must cross sewer, lay at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be buried to meet the above requirements, center one full length of water main over the sewer so that both joints will be as far from the sewer as possible.

3.7 INSPECTION

- A. The manufacturer shall certify to the Owner that all pipe and fittings furnished under this contract conform to these Specifications.
- B. Acceptability of pipe shall be determined by results of strength tests and by inspection at point of delivery to determine whether pipe conforms to Specifications in design and free from defects. Rejection on results of field inspection may be made on account of any of the following:
 - 1. Variations in any dimensions exceeding permissible variations.
 - 2. Visible cracks, holes, foreign inclusions or other injurious defects.
 - 3. Any pipe or fittings 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 work.
 - 4. Variation of more than 1/16 inch per linear foot in alignment of pipe intended to be straight.
 - 5. Insecure attachment of spurs or branches.

3.8 BACKFILLING

- A. Backfilling shall be done with approved materials free from roots, frozen pieces, rubbish, large clods or stones. Backfill materials shall be placed in trenches evenly and carefully around and over the pipe in layers. Each layer shall be thoroughly and properly compacted.

3.9 TESTING

- A. Whenever practical, before the trench has been backfilled or the joints covered, the pipe shall be tested for leaks. The test may also be made with one foot of backfill placed on the pipe, or the

pipe may be completely backfilled. All leaks above the allowable maximum shall be repaired, however regardless of when tests are made. The Contractor shall provide all necessary equipment including but not limited to an appropriate pump, water container, pressure gauge, valve, hydrant connection and corporation stop connection, and he shall perform all work required in connection with the test.

- B. Each section tested shall be slowly filled with water, care being taken to expel all air from the mains and service lines, if installed. If necessary, the pipes shall be tapped at high points to vent the air. All foreign material shall then be flushed from the main. If possible, a flushing velocity of 2.50 fps shall be run through the mains until clean.
- C. The portion to be tested shall be placed under constant 150 percent of working pressure or 100 psi whichever is greater as designated by the project engineer, all leaks shall be repaired, additional tests instituted and continue the process until all major leakages are eliminated. The test pressure shall be at the minimum pressure at highest point in the water line. Further, line test pressure shall not exceed 15% of the pressure rating at the lowest point.
- D. Allowable maximum leakage shall be determined, as follows $L = (ND / P) / 7400$, where L = allowable leakage in gallons per hour, N if the total length tested divided by the standard length of pipe, D is the nominal diameter of the pipe in inches and P is the test pressure specified above.
- E. A complete approved pressure test of a minimum of two hour duration will be accomplished prior to disinfection. Obtaining water at the site for testing shall be the Contractor's responsibility.

3.10 DISINFECTION OF WATER MAINS AND FITTINGS

- A. Disinfection of water mains and appurtenances shall be in accordance with the AWWA Standard C651-86, however, the tablet method is not allowed. Chlorinated water shall be directed along and through all lines and appurtenances to be disinfected until a minimum of fifty ppm of chlorine is detected at representative points throughout the line.
- B. At the end of the 24-hour contact period, a minimum chlorine residual of 5 ppm free chlorine must be detected before disinfection will be considered successful. If unsuccessful, the lines must be re-chlorinated. Otherwise, the line shall be flushed out with clean water until a maximum of 0.4 ppm chlorine residual is detected. All valves and hydrants shall be operated several times during the twenty -four hour contact period. The disinfection water shall be wasted in an environmentally safe manner subject to the approval of the project engineer.
- C. After disinfection, bacteriological samples will be collected and forwarded by the Contractor to a certified lab, such as the State Health Department, for analysis. If positive results are obtained, the system shall be repeated until negative results are obtained.
- D. The method of disinfection and the chlorinating materials used shall be subject to the approval engineer.

3.11 INTERFERENCE

- A. The Contractor shall be responsible for maintaining proper clearance between adjacent pipes and between pipes and structures. If an interference situation arises, any proposed new routing shall be approved by the Landscape Architect.

3.12 CLEAN-UP

- A. Upon completion of the installation of the water distribution system and any other work incidental thereto, the Contractor shall remove from the project all equipment, surplus construction materials and debris of any type resulting from the work and shall leave the area in as good or better condition as prior to construction.

SECTION 33 30 00
SANITARY SEWERAGE UTILITIES

PART 1 GENERAL

1.1 DESCRIPTION:

- A. Bidding requirements, conditions of the contract and pertinent portions of sections in Division One of these specifications, apply to the section as fully as though repeated herein.
- B. Work under this section includes furnishing and installing sanitary sewerage utilities.
- C. Related work:
 - 1. Section 31 05 12, Site Earthwork.
 - 2. Section 33 40 00, Storm Drainage Utilities
- D. Contractor shall provide test pit excavation as shown on drawings to confirm location and elevation of existing utilities in public right-of-way.
- E. All work shall be in conformance with the City of Portland Technical Design Standards. Please see website at **City of Portland Public Services**.

1.2 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. The Contractor shall submit the following information with sets of As-Built Drawings:
 - a. Shop Drawings of pipe and precast units.
 - b. Provide data on pipe materials, pipe fittings and accessories.
 - c. Manufacturer's information of joint sealants, gaskets and waterproofing.
 - d. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 - e. Sewerage pipe. Pipe of the same manufacturer shall be used throughout the project.
 - f. Source and gradation reports for soil materials.
 - g. Manufacturer's information of physical, filtration/hydraulic and mechanical properties of geotextile fabrics.
 - h. Drainage stone source and gradation analysis report.
 - i. Structural fill source and gradation analysis report.

- j. Project Record Documents: Record actual locations of piping mains, valves, connections; thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities. Complete as built record documents shall be provided to owner.
- k. All materials including pipe, valves, hydrants, etc., shall be subject to approval by project landscape architect, project engineer or designated authority.
- l. Where test pit investigation is required, existing conditions shall be identified before approval of any structures. Conditions that vary from design shall be reported to the project Landscape Architect, Engineer or Owners Representative prior to proceeding with installation.

1.3 DELIVERY:

- A. Exercise care when handling pipe to prevent damage to pipe and finish. Unload materials so as to avoid shock or damage. Handle and store all pipe in such a manner as to avoid deterioration or other injury thereto.
- B. Immediately remove damaged materials and replace at no additional cost to the Owner.
- C. Store materials above ground on platforms, skids, or other adequate supports.
- D. Place no pipe within pipe of larger size.
- E. Protect geotextiles from ultraviolet light in accordance with manufacturer's requirements.

1.4 TESTS, PERMITS, INSPECTIONS AND CODES

- A. Sewer lines shall be tested before use.
- B. Utility installations shall comply with all applicable local and state codes and with requirements of local sewer district, refer to City of Portland Technical Design Standards.
- C. All utility installations shall be inspected and approved by the utility company inspectors, City of Portland Public Services Inspector where applicable and Engineer or Owner's authorized representative before being backfilled.
- D. The Contractor shall obtain and pay for any permits required for this portion of the work.
- E. The Contractor shall notify City of Portland Public Services Inspector prior to installation of sewer service.

PART 2 PRODUCTS

2.1 MATERIALS:

- A. The Contractor shall contact and coordinate with the City of Portland Public Services Inspector before beginning installation of sanitary sewer system.

B. Polyvinyl Chloride (PVC) Sanitary Sewer

1. Pipe and fittings shall comply with ASTM D 3034, rated SDR 35. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.
2. PVC Pipe Joints: PVC shall be supplied with the coupling or coupling integrally molded to the pipe barrel. All joints shall be bell and spigot. Fittings and couplings shall be of the "O" ring push on type as required for non-pressure sewer pipe. "O" rings shall conform to ASTM Designation D 1869 - Latest revision.
3. Fittings for PVC Sewer Pipe: Where fittings such as tee and wyes are required for service taps, "O" ring, PVC fittings shall be used. The material for the PVC fittings shall be compatible to the pipe material in characteristics.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pipe Jointing and Pipe Laying: Sanitary Sewer

1. Pipe Jointing - All joints shall be made in a dry trench and in accordance with the manufacturer's recommendations and the best practices for class of pipe laid. The ends of the pipe shall be wiped clean before making the joint.
2. Pipe Laying - The pipe shall be accurately laid to the line and grades to the satisfaction of the Engineer or the Owner's Representative. Sewer pipe shall be placed on six (6) inches of specified crushed material. The line and grade may be adjusted by the Engineer or Owner's Representative and City of Portland Public Services Inspector from that shown on the Drawings to meet field conditions and no extra compensation shall be claimed therefore. Whenever the nature of the material excavated is such as to render it unsuitable for bedding, the Contractor shall furnish suitable material as otherwise provided in these Specifications.
3. The interior of each length of pipe shall be swabbed and wiped clean before laying the next length. No length of pipe shall be laid until the previous length has had specified material placed and tamped around it to secure it firmly in place to prevent any disturbance. Bell ends shall be laid uphill. Whenever the work is stopped temporarily for any reason whatever, the end of the pipe shall be carefully protected against dirt, water or other extraneous material.
4. The pipe shall be cut as necessary. Sufficient short lengths of pipe shall be furnished so that pipe shall not be more than four (4) feet in length at points of connection with other piping.
5. Inspection - Pipe installation shall be subject to inspection by the Engineer, City of Portland Public Services Inspector and/or Owner's Representative for quality, adherence to line and grade, jointing and proper backfill. Any joint not satisfactory to the Inspector shall be removed and remade to his satisfaction at the Contractor's expense. No pipe shall be backfilled until it has been approved. All work must conform to the City of Portland standards for the sanitary installation.

6. Safety regulation of the State of Maine and the Department of Labor, Occupational Safety and Health Administration (OSHA) as applicable shall be followed in regards to work in trenches and trench excavations.
- B. Manhole Connection: Neatly cut off main flush with inside of existing manhole where they enter structure walls, and point up irregularities and rough edges with nonshrinking grout. Shape inverts for smooth flow across structure floor as shown on Drawings, coordinate requirements with City of Portland. Use concrete and mortar to obtain proper grade and contour and finish surface with fine textured wood float.
- C. Excavation for trenches for the placing of water mains, valves, and fittings must be of sufficient width to permit the work to be done in the manner and to the depths specified or as shown on the plans. The trench shall be dug to the required level, and the bottom shaped by hand to conform to the shape of the pipe or appurtenances being installed.
- D. Pipe Laying:
 1. All pipe shall be laid to line as indicated on the Drawings. Pipes shall be laid with a minimum of 4 feet of cover over the pipe, where cover is less than 4 feet, 2 inches of rigid insulation shall be provided. This depth of cover shall be measured from finished grade. Pipe and fittings shall be carefully handled to avoid damage.
 2. Suitable equipment shall be provided by the Contractor for handling the pipe. Any damage to the pipe in handling or laying shall be at the Contractor's expense.
 3. Install all pipe and fittings in accordance with the City of Portland Technical Design Standards.
 4. Vertical Separation from Water Service: Whenever sewer lines must cross water mains, coordinate installation with the standards of the City of Portland Technical Design Standards.
- E. Backfilling shall be done with approved materials free from roots, frozen pieces, rubbish, large clods or stones. Backfill materials shall be placed in trenches evenly and carefully around and over the pipe in layers. Each layer shall be thoroughly and properly compacted.
- F. Interference:
 1. The Contractor shall be responsible for maintaining proper clearance between adjacent pipes and between pipes and structures. If an interference situation arises, any proposed new routing shall be approved by the Engineer or Owner's Representative.
 2. If, during the process of this work, utilities in place are damaged, they shall be restored to their proper condition at no added cost to the Owner.

3.2 INSPECTION

- A. The manufacturer shall certify to the Owner that all pipe and fittings furnished under this contract conform to these Specifications.

- B. Acceptability of pipe shall be determined by results of strength tests and by inspection at point of delivery to determine whether pipe conforms to Specifications in design and freedom from defects. Rejection on results of field inspection may be made on account of any of the following:
1. Variations in any dimensions exceeding permissible variations.
 2. Visible cracks, holes, foreign inclusions or other injurious defects.
 3. Any pipe or fittings 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 work.
 4. Insecure attachment of spurs or branches.

C. TESTING

1. Furnish all equipment and perform leak test in gravity sewer pipe by means of a low-pressure air test as specified herein.
2. Exfiltration and infiltration test shall be permitted in areas only when approved by the Portland Water District or City of Portland.
3. All testing shall be preformed in the presence of the Districts representative.
5. Air testing shall comply with ASTM D3034 and the standards and procedures established in the City of Portland Technical Design Standards.

3.3 CLEANUP

- A. Upon completion of the installation of the sanitary sewers, appurtenant structures, water distribution system and any other work incidental thereto, the Contractor shall remove from the project all equipment, surplus construction materials and debris of any type resulting from the work and shall leave the area in as good or better condition as prior to construction.

3.4 Building Sewer Location Records

1. A. Record location of all services, existing and new in accordance with the City of Portland Technical Design Standards.

END OF SECTION

SECTION 33 40 00
STORM DRAINAGE UTILITIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
- B. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on product characteristics, performance criteria and limitations.
- C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- E. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. The Contractor shall submit the following information with sets of As-Built Drawings:
 - a. Shop Drawings of pipe and pre-cast units, catch basins manholes, and field inlets.
 - b. Manufacturer's information of joint sealants, gaskets and waterproofing.
 - c. Storm drain pipe. Pipe of the same manufacturer shall be used throughout the project
 - d. Source and gradation reports for soil materials.
 - e. Where test pit excavations are required to confirm location and invert of structures or connections to existing infrastructure, test results shall be provided to project landscape architect, engineer and or Owners representative prior to approval of impacted structure submittals.
- F. Manufacturer's information of physical, filtration/hydraulic and mechanical properties of geotextile fabrics.
- G. Drainage stone source and gradation analysis report.
- H. Structural fill source and gradation analysis report.

1.3 DESCRIPTION:

- A. Bidding requirements, conditions of the contract and pertinent portions of sections in Division One of these specifications, apply to the section as fully as though repeated herein.
- B. Work under this section includes furnishing and installing pipes, manholes, catchbasins and filed inlets.
- C. Related work:
 - 1. Section 31 05 12, Site Earthwork.
 - 2. Section 32 12 16, Asphalt Paving.
 - 3. Section 31 50 00 Temporary Support of Earthwork
- D. Contractor shall provide test pit excavation as shown on drawings to confirm location and elevation of existing utilities in public right-of-way. Report conflicts or discrepancies with utility locations, inverts or other conditions where new structures or connections are proposed to project landscape architect, engineer or Owners representative.

1.4 DELIVERY:

- A. Exercise care when handling pipe to prevent damage to pipe and finish.
- B. Immediately remove damaged materials and replace at no additional cost to the Owner.
- C. Store materials above ground on platforms, skids, or other adequate supports.
- D. Protect geotextiles from ultraviolet light in accordance with manufacturer's requirements.

1.5 QUALITY ASSURANCE:

- A. It is the intention of this Section that the catch basins, manholes and other structures, including all component parts, have adequate space and strength considered necessary for the intended service. Space requirements and configurations shall be as shown on the Drawings.
- B. Catch basins, drywells, leaching galleys and manholes shall be an assembly of pre-cast sections with or without steel reinforcement, with approved jointing. In any approved structures, the complete structure shall be of such material and quality as to withstand loads of eight (8) tons (H-20 loading) without failure, continuously for the life of the structure. Assume a period in excess of 25 years for all structures.

PART 2 PRODUCTS

2.1 MANUFACTURER:

- A. Catch basin, Manhole, drywell and leaching galley structures listed as follows as provided by American Concrete Industries 1022 Minot Avenue, Auburn, ME 1022. Phone (207) 784- 1388 Fax: (207) 784-4039, or equal. Product of other manufactures may be considered subject to compliance with the requirements as judged by the Engineer and or Owner's Representative.

2.2 MATERIALS:

- A. Catch basin and Manhole Sections: Structures shall be pre-cast concrete structures, 4 foot interior diameter, unless otherwise specified, with T & G joints and rubber ring or asphalt filler seals.
1. Bases – Pre-cast sumps conforming to ASTM C478. Holes for pipes cast into the base section shall have a three (3) foot minimum clear distance between the inside bottom of the base section and the pipe invert.
 2. Barrels – Pre-cast sections of correct height, conforming to ASTM C478 or solid concrete barrel blocks conforming to ASTM C-139.
 3. Cones – Pre-cast, hunched type, conforming to ASTM C478.
 4. Leaching Galleys-Pre cast conforming to ASTM C478.
 5. Pipe to Catch-basin, Drywell and Leaching Galley Joints: Only as approved by the Engineer or Owner's Representative and, in general, will depend on water-tightness upon a rubber boot either cast-in-place or press-wedged in place.
 6. Frames and Grates to conform to AASHTO M-105, Class 30, of gray cast iron by Etheridge Foundry. Refer to Drawings for type and size.
 7. Each section of the pre-cast structure shall have two holes for the purpose of handling and setting. The holes shall be tapered and shall be plugged with nonshrink mortar or grout in combination with concrete plugs after installation. Note: For storm drain sections that serve as cutoff drains for groundwater, provide 1/4 inch perforations along the top of pipe. Refer to project details and plans.
- B. Storm Drain Pipe: PVC Pipe, Reinforced Concrete Pipe or Corrugated Polyethylene Pipe (refer to Drawings). Furnish as indicated on Drawings and of size shown. Provide couplings and special bends or elbows as shown or required by the work.
1. Polyvinyl Chloride (PVC) Pipe: Pipe and fittings shall comply with ASTM D 3034, rated SDR 35. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.
 2. Reinforced Concrete Pipe (RCP): Comply with requirements of ASTM C 76, Class III unless another class type is indicated on Drawings, installed with flexible plastic (Bitumen) gaskets at all joints. Gaskets shall comply with AASHTO M-198 75I, Type B, and shall be installed in strict accordance with pipe manufacturer's recommendations.
 3. Corrugated Polyethylene Pipe (CPP) Smooth Interior: Conform with AASHTO Designations M 294 and M252. Pipe must be installed in accordance with pipe manufacturer's installation Guidelines for Culvert and Other Heavy-Duty Drainage Applications. Acceptable manufacturers: Advanced Drainage Systems, Inc. (ADS) N-12) & Hancore, Inc. (Hi-Q smooth interior).
 4. Trench Drain: HDPE heavy duty trench drain with Ductile Iron Slotted grate as manufactured by ZURN Industries, LLC.
 5. Underdrains:

1. Perforated PVC pipe having a SDR of 35 or equivalent. Perforations shall consist of 3/8 inch diameter holes.
 2. Perforated Polyethylene Pipe (cpp) Smooth Interior: Conform to ASSHTO Designations M252 Type S.
- C. Brick: Comply with the ASTM Standard Specifications for Sewer Brick, Designation C32, for Grade SS, hard brick.
- D. Cement: Shall be Type II. Concrete shall have a minimum strength of 3,000 psi at 28 days.
- E. Drainage Stone: M.D.O.T. 703.22 Type C. 3/8 - inch, pea stone or 3/4- inch crushed stone.
- F. Geotextiles: Shall be Mirafi 160 N or equivalent for filtration fabric or equivalent.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. Catch basins, drywells, leaching galleys and manholes
1. After the excavation has been done and prior to installation of leaching galleys and drywells, the subsoil condition requires inspection by the owners site evaluator to confirm removal of impermeable soil layer. Contractor shall coordinate with site evaluator prior to all installations.
 2. After the excavation has been done and leveled, six (6) inches of bedding material shall be put in the bottom of the excavation, leveled and thoroughly compacted.
 3. Contractor shall coordinate installation inspection with project engineer prior to installation of all leaching galleys and drywells.
 4. Pre-cast concrete sections shall be set so as to be vertical and with section in true alignment, 1/4-inch maximum tolerance to be allowed.
 5. Invert channels of manholes may be formed in 3,000 psi concrete or using brick. When brick is used, coordinate with City of Portland Public Services Inspector, use Portland cement, ASTM C 150, Type II. Masonry cements shall not be used. The top shelf shall slope to drain towards the flowing through channel.
 6. The top of the pre-cast reinforced concrete unit shall be set at a grade that will allow a minimum of two (2) courses and a maximum of three (3) courses of brick and mortar before setting the cast-iron frame. Mortar for brick masonry shall be Portland cement, Type II, mixed in the proportion of one part cement to two parts sand, worked to the proper consistency.
 7. The inside and outside of the masonry work of all catch basins shall be plastered with 1:2 Portland cement mortar. The thickness of the mortar shall be one-half (1/2) inch and the mortar shall be carefully spread and thoroughly troweled, leaving a smooth, substantially waterproof surface. The mortar shall be extended to completely cover the outside and inside surfaces of all masonry work.

To enhance proper curing, completed masonry shall be covered with a polyethylene plastic sheet or other appropriate means for a minimum of 24 hours before backfilling. The inside and outside of each horizontal joint in the pre-cast manholes shall be filled with joint mortar and troweled smooth.

8. Backfilling shall be done in a careful manner in 6"-12" lifts and compacted with a vibratory compactor, bringing the fill up evenly on all sides.
 9. If any leaks appear in catch basins, or manholes the Contractor shall uncover the structure and disassemble the sections and reconstruct the catch basin, or perform other acceptable repairs approved by the Engineer or Owner's Representative so as to secure a watertight structure. The Contractor shall install the pre-cast units and pipeline connectors in a manner that will result in a watertight joint.
 10. Catch basins, drywells, leaching galleys and manholes, shall be constructed as the sections of the pipelines between them are completed, and unless this is done, the Engineer or Owner's Representative shall have the authority to stop trenching and pipe laying until manhole construction is brought up properly. All ground water shall be kept away from any newly placed concrete or freshly laid masonry work until cement has properly set and until a watertight job is obtained.
- B. Catch basin, field inlets and manholes, frames and grates
1. Catch basin, manhole, drywell, leaching galley and frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface, or as directed.
 2. Frames shall be set concentric with the top of the masonry and in full bed of mortar so that the space between the top of the masonry and the bottom flange of the frame shall be completely filled and made watertight.
 3. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on top of the bottom flange. Mortar shall be smoothly finished and have a slight slope to shed water away from the frame.
 4. Manholes, catch basin, dry well and leaching galley grates shall be left in place in the frames on completion of the other work at the manholes, catch basins, dry well and leaching galley.
- C. Drain pipes
1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
 2. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade, without high spots. Do not drive the pipe down to grade by striking it with a shovel handle, timber, hammer, or any other unyielding object. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment. After filling the

sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawing. Take all necessary precautions to prevent floatation of the pipe in the trench.

3. Temporary Plugs - When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated. Do not use the pipelines as conductors for trench drainage during construction.
 4. Jointing - Connect pipe in accordance with the latest manufacturer's instructions and recommendations. Clear each pipe length, coupling and fitting of all debris and dirt before installing. Provide and use coupling pullers for jointing the pipe. Provide gasket feeler gauges for use by the pipe layer for checking the position of the rubber gaskets in the completed joints.
 5. Shove home each length of pipe against the pipe previously laid and hold securely in position. Do not pull or cramp joints. Make all pipe joints as watertight as possible with no visible leakage and no sand, silt, clay, or soil of any description entering the pipeline at the joints.
 6. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.
 7. Pipe Cutting - Cut in accordance with manufacturer's recommendations. Cut the pipe with a hand saw, metal-inserted abrasive wheel or pipe cutter with blades (not rollers). Examine all cut ends for possible cracks caused by cutting.
- D. Under drain pipe
1. Bed all under drains in Drainage Stone, wrapped in Mirafi 160 N geotextile filter fabric or approved equal, as shown on the drawings.
 2. Shape subgrade to drain outlets as shown on the grading and drainage plan.
 3. Install geotextile stabilization fabric between subgrade and road subbase gravel, as determined by the Engineer or Owner's Representative.
- E. Pipe insulation
1. Install two (2) inch thick by four (4) feet wide Styrofoam SM insulation as manufactured by Dow Chemical Co., or approved equal, as shown on Detail Drawing.
 2. Install over and along the sides of the pipe when there is less than four (4) feet of cover between the top of pipe and original ground grade.
 3. Dow Chemical Co., or approved equal, as shown on Detail Drawing.
- F. Trench Drain
1. Install trench drain sections per manufacture requirements and as shown on Detail Drawing.

3.2 INSPECTION:

- A. Pipe installation shall be subject to inspection by the Engineer or Owner's Representative and City of Portland Public Services Inspector for quality, adherence to line and grade, jointing, and proper backfill. Any joint not satisfactory to the Engineer or Owner's Representative or City of Portland Public Services Inspector shall be removed and remade to his satisfaction at the Contractor's expense. No pipe shall be backfilled until it has been approved by the Engineer or Owner's Representative.
- B. Subsurface soil conditions for leaching galley and drywell locations shall require inspection by the Owners Site Evaluator prior to installation to confirm removal of impermeable soil profile below structure. No structure or pipe shall be set until it has been approved by the Site Evaluator project Engineer and Owner's Representative.
- C. Leaching Galley and Drywell installation shall be subject to inspection by the Engineer or Owner's Representative for quality, adherence to line and grade, jointing, and proper backfill. Any installation unsatisfactory to the Engineer or Owner's Representative shall be removed, adjusted and remade to his satisfaction at the Contractor's expense. No structure or pipe shall be backfilled until it has been approved by the Engineer and Owner's Representative.

END OF SECTION