

Seaside Rehabilitation and Healthcare Center
Portland, Maine

SECTION 02220 - EXCAVATION, BACKFILL, AND COMPACTION

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Documents affecting Work of this Section include, but are not necessarily limited to, The CONDITIONS OF THE CONTRACT General Conditions, Supplementary Conditions, Addenda and all Sections of Division 1, which are hereby made a part of this Section.
- B. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- C. The "*Standard Specifications*" referred to herein is the book entitled "*Standard Specifications, Highways and Bridges*" published by the State of Maine Department of Transportation (latest date), and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 through 109; numerical index of payment items included in each section.

Those Sections of the aforementioned Standard Specifications which are cited herein are applicable to the Work of this Contract as they may be modified, amplified, or added to by this Section.

- D. Reference is made to the Erosion Control Report and Drawings for this project. Strict adherence to the Report and Drawings must be followed in order to prevent adverse downstream impacts from erosion and sedimentation, originating from on-site construction activity.
- E. Reference is made to OSHA Safety and Health Standards for the Construction Industry, 29 CFR 1926/1910, 1991 Revision.

1.02 DESCRIPTION OF WORK:

A. Provide all labor, material, equipment and services required to complete the following:

- 1. Excavation, trenching, filling, backfilling and compaction as required, for the building, utility lines, driveway entrances, parking areas and sidewalks, site drainage, detention basins, wetlands mitigation, landscaping, etc., including removal and replacement of unsuitable subsurface materials.
- 2. Provide and install compacted structural fill as necessary to raise sub-grades under footings and slabs within the building area, compacted granular fill as necessary for site, driveway entrance, parking lot and sidewalk subgrades, and crushed stone or sand bedding materials for utility piping, and the building floor slab and footing drains, etc.; all as required to complete the construction as indicated on the Contract Drawings and as specified herein.
- 3. Provide all necessary sheeting, shoring and bracing as required, to protect the Work and assure safety of Workmen, adjacent property and the public.
- 4. Maintain all excavations free from water.

Seaside Rehabilitation and Healthcare Center
Portland, Maine

5. Remove and properly dispose of any loose or disturbed marine deposits, glacial till, or other unsuitable material within the building area, pavement areas, or other subgrade areas, as directed by the Geotechnical Engineer, and replace with suitable compacted fill as directed.
6. Pre-compact undisturbed original soil or existing fill as appropriate and as directed, prior to construction and placement of new fill and backfill.
7. Perform field density tests as required herein and as directed by the Geotechnical Engineer.

B. Related Work specified elsewhere:

Site Special Conditions	- Section 02000
Subsurface Investigation	- Section 02010
Layout of Work	- Section 02030
Site Preparation	- Section 02100
Grading	- Section 02210
Rock Excavation	- Section 02229
Gravel Base Courses	- Section 02230
Slope Protection & Erosion Control	- Section 02270
Paving, Walks & Curbing	- Section 02500
Water Distribution System	- Section 02660
Gas Distribution System	- Section 02685
Subdrainage Systems	- Section 02710
Storm Drainage Systems	- Section 02720
Sanitary Sewerage System	- Section 02730
Power & Communications	- Section 02780
Site Improvements	- Section 02800
Landscaping	- Section 02900

1.03 QUALITY ASSURANCE; SUBMITTALS:

- A. General: Comply with requirements of Division 1 Sections for Submittals and Quality Control.
- B. Field Measurements:
 1. Verify that survey horizontal and vertical control reference points are present and correct as indicated. Protect from disturbance during the course of the Work, or correctly re-establish as necessary. Refer to Section 02030 - Layout Of Work.
 2. During construction, provide all necessary line and grade staking to properly control the Work, as specified in Refer to Section 02030 - Layout Of Work.
- C. Testing and Inspection:
 1. The Owner may engage a testing and inspection service for excavation classification and quality control testing during earthwork operations.

Seaside Rehabilitation and Healthcare Center
Portland, Maine

2. The Contractor shall assist Testing Agency as required and shall deliver samples of all materials required to the Testing Agency at Contractor's expense. Coordinate testing with Owner and Architect/Engineer.
 3. The Geotechnical Engineer may act as the Architect/Engineer's representative to inspect critical phases of earth excavation, fill placement, and footing excavation prior to placement of fill materials, pavement bases, or footings. Coordinate with the Architect/Engineer for inspection of Work.
 4. Tests for Proposed Soil Materials:
 - a) Test soil materials proposed for use in the Work and promptly submit test reports to Architect/Engineer
 - b) For granular fill materials, perform a mechanical analysis (ASTM D421) and moisture-density curve (ASTM D-1557 modified). Submit samples and test results to Architect/Engineer prior to placement of fill
 5. Tolerances:
 - a) Maintain the moisture content of fill material as it is being placed within plus or minus two percent of the optimum moisture content of the material as determined by the laboratory tests herein specified
 - b) Grading - See Section 02210 Grading.
- D. Submittals:
1. Soils material test results for compacted granular fill, compacted structural fill, stone bedding material, and sand bedding material.
 2. Field density test results.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Fill Material from on-site excavations:

1. Suitable excavated material may be used for general filling and rough grading of the site, provided the soil can be compacted to required density. On-site material shall not be used as fill beneath or adjacent to structures, driveways, parking areas or sidewalks, unless it meets the appropriate requirements for granular borrow or structural fill, as specified below.
2. Unsuitable soils are materials that cannot be compacted to required density, or contain organic material, peat, muck, coal, ash or debris.
3. Excavated bedrock may not be used as fill material, except as general site fill outside pavement or structure limits. Rock or stones over 5 inches in diameter shall not be permitted within 12 inches of building foundation, or within 12 inches of finish grade at surface.

Seaside Rehabilitation and Healthcare Center
Portland, Maine

- B. Compacted Structural Fill: Structural granular fill shall be used below and adjacent to the building floor slab, retaining walls, exterior foundation walls and where indicated in Contract Documents. Compacted structural fill shall consist of sand and gravel of hard durable particles, free of organic material, loam, lumps or balls of clay, trash, snow, ice, frozen soil, stones over 3-inch diameter, or other objectionable material, and the gradation of the material shall meet the following limits:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieve</u>
3 in.	100
No. 4	30 - 90
No. 40	10 - 50
No. 200	0 - 8

- C. Granular Borrow: Granular borrow shall be used as fill as necessary to raise site grades to sub-grade below pavement areas. Granular borrow shall be suitable sand or gravel, free of organic materials, loam, lumps or balls of clay, trash, snow, ice, frozen soil, stones over 6-inch diameter, or other objectionable material, and the gradation of that portion passing a 3-inch sieve shall meet the following limits: Granular Borrow shall conform to MDOT Specification 703.19.

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieve</u>
No. 40	0 - 70
No. 200	0 - 10

Granular Borrow shall contain no particles or fragments with a maximum dimension larger than 8". Material encountered during on-site excavation which falls within the above Specifications may be stored in segregated stockpiles for reuse as granular borrow.

- D. Stone Bedding Material: Crushed drainage stone for all perimeter drains, underdrains, sub-drainage, and pipe or structure bedding material shall conform to MDOT Specification 703.22, Type C, for underdrain backfill material, as presented below:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieve</u>
1 in.	100
3/4 in.	90 - 100
3/8 in.	0 - 75
No. 4	0 - 25
No. 10	0 - 5

- E. Sand Bedding Material: Sand bedding material for the water lines and electrical and telephone lines and conduits shall be clean granular material, free from lumps, balls of clay, and organic material, and shall conform to the following table:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieve</u>
3/8 in.	85 - 100
No. 200	0 - 5

Seaside Rehabilitation and Healthcare Center
Portland, Maine

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Be sure that all required erosion and sedimentation controls are in place and properly maintained, prior to and during any earthwork.
- B. Stripping and grubbing operations shall be completed in a given Work area, and loam properly stockpiled, prior to beginning earthwork in that area.
- C. Locate and mark any and all existing underground and aboveground utilities before beginning any earthwork. Notify "Dig-Safe" (811 or 1-888-DIG-SAFE) at least 3 days prior to beginning any excavation Work.
- D. Remove and properly dispose of any pavement, structures, fences, etc. scheduled for removal (See Section 02070 - Selective Demolition). Save and properly store and protect any materials, trees or shrubs scheduled for re-use or transplanting.
- E. Contractor shall secure any necessary sources of borrow materials promptly, so that materials can be tested and earthwork can proceed expeditiously once materials are approved. Complete all earthwork activities in a given area as soon as possible once the area is stripped and grubbed. Completed areas should be loamed, seeded or stabilized as soon as possible after final grade is established, in accordance with Section 02270 - Erosion Control, and the Erosion and Sedimentation Control Report.
- F. Bring each area to final grade, and install loaming and seeding (either temporary or permanent) as soon as possible, and no longer than 15 days after completing final grading. Maintain all necessary erosion controls as required until grass and plant growth is firmly established.

3.02 EARTH EXCAVATION:

- A. Excavation consists of the removal, re-use as site fill, and/or satisfactory disposal of all materials encountered, to establish sub-grades shown on the Plans. Maintain surface drainage to prevent ponding or erosion. Do not excavate extremely wet or frozen material. In wet areas, provide pumping equipment or grade the area so that water drains from the soil to allow proper excavation or drilling operations. Provide any special equipment necessary to perform earthwork operations. When excavating near trees to be saved, protect trees and prune exposed roots to minimize injury to same.
 - 1. Mass Excavation - Removal of soil materials in open areas where equipment with blade or bucket, such as bulldozer or front end loader, is used.
 - 2. Trench Excavation - Removal of soil materials in confined areas, such as trenches or pits, where equipment such as backhoe, shovel, or trencher is used.
- B. Contractor shall remove all existing material, including but not necessarily limited to soil, rubble, debris, trash, existing stone or masonry walls, minor structures, unsuitable material and soils of all types. If the Contractor uncovers material of a suspicious or hazardous nature, regulated material, unhealthful or contaminated soils or other unanticipated conditions, immediately inform the Architect/Engineer, and do not proceed in affected areas until instructed to do so in writing by the Architect/Engineer.

Seaside Rehabilitation and Healthcare Center
Portland, Maine

- C. Contractor shall remove existing site materials as follows:
1. Footings and Foundations - As defined on Drawings and in these documents.
 2. Building Floor Slabs - As defined on Drawings and in these documents.
 3. Utility Trenches - Excavate to required depths below pipe invert or utility structure base, allowing for pipe bedding material or gravel base material, as defined on Drawings and in these documents.
 4. New paving and planting areas - Excavate to required depths below finish grades, allowing for new material and base material, as defined on Drawings and in these documents.
 5. Detention Ponds - Excavate existing or new detention areas to required depths; re-grade, reconstruct berms, modify outlet structures, etc., all as shown on Drawings or as required. Excavation shall include allowance for loam, wetlands mitigation measures, etc. to be placed for final grades.
- D. Prepare subgrade for grass areas 6" below finish grade. See Plans and Details for depth to subgrade for other areas.
- E. Excavations carried below the depths indicated or as required for construction, without written authorization from the Architect/Engineer, shall be filled with concrete or compacted structural fill, as specified by the Architect/Engineer, at the Contractor's expense.
- F. When excavating and filling in tree areas, protect root systems of trees to be saved. Prune roots as directed. (See Section 02100, SS 3.02 - Protection of Trees)

3.03 BUILDING AND STRUCTURAL EXCAVATION:

- A. Conform to elevations and dimensions shown within a tolerance of 0.10 ft., and extending a sufficient distance from footings and foundations to permit proper foundation and subdrain construction.
- B. Structural backfill and compaction under buildings and footings shall be as Specified by Architect's structural requirements and Specifications.
- C. Excavate all unsuitable materials to the material limits, extending beyond all footings in fill a distance equal to the depth of fill required below the footing plus two feet on all sides. Final excavation to subgrade in marine deposits shall be made with equipment suitable for the purpose (such as with a smooth bladed backhoe or by hand) so as to minimize disturbance to bearing surfaces.
- D. In all cases, excavate all topsoil.
- E. For adequate frost protection, excavation for all exterior foundations, utility structures, guard rails, etc., must extend to a minimum depth of 4.5 feet below the lowest surrounding exterior finish grade. Excavation for interior footings must extend to a depth of at least 1.5 feet below the finished floor slab unless otherwise Specified by Architect.. Protect bottoms of excavations from

Seaside Rehabilitation and Healthcare Center
Portland, Maine

freezing when atmospheric temperature is below 35 degrees Fahrenheit, or when directed by the Geotechnical Engineer.

- F. All backfilling and compaction Work shall be inspected and tested as specified by the Architect/Engineer prior to the pouring of footings. The Contractor shall notify the Architect/Engineer when areas are ready for testing, and shall have the Architect/Engineer's approval in writing prior to beginning the construction of footings. See requirements for Compaction, Section 3.13.

3.04 TRENCH EXCAVATION AND BACKFILL (utilities):

- A. Trench excavation includes excavation for underground lines and structures as shown on the Plans. Make trench walls as near vertical as practical, consistent with OSHA requirements (See OSHA Regulations - 29 CFR 926.65-" Excavations" -Appendix B) and safe Working practices. Shore and brace as necessary. Keep excavations free from water in order to carry on Work properly.
- B. Do not excavate to full depth in freezing temperature unless structure or line can be installed immediately. Protect excavation bottom from freezing.
- C. Excavation shall be made to such a point as to allow a minimum of six inches (6") of bedding to be placed beneath the bottom of all barrels, bells or couplings of all pipes installed. The maximum clear width of trench at the top of the pipe shall be not more than the outside diameter of the pipe plus two feet. The bottom of the trench shall be accurately graded to provide a uniform layer of bedding material for each Section of pipe. Safety shall be the controlling factor in determining minimum trench widths.
- D. Before installation of any sewer or drain pipe, the Contractor shall first place and consolidate a minimum six inch (6") layer of 3/4" crushed stone or approved bedding on the trench bottom. After the pipe has been laid, additional crushed stone or bedding shall be placed and consolidated to the top of the pipe. The trench shall then be carefully backfilled with sand or approved backfill deposited in six inch (6") layers, thoroughly consolidated by hand or mechanical tampers, until the pipe has at least twelve inches (12") of cover over the top of the pipe. (Refer to "Typical Pipe Bedding Detail" on Plans.)
- E. The remainder of the trench shall be backfilled as follows:
 - 1. In Roads, Walks, Drives, Etc.
 - a) The area between a line 12 inches over the top of the pipe and a line at sub-grade elevation below finished pavement (see pavement details on Plans), shall be carefully backfilled in not over twelve (12) inch layers using suitable material taken from the excavation or approved granular borrow hauled in for the purpose, as approved by the Architect/Engineer. No mud, frozen earth, or stone larger than four (4) inches in diameter is to be used for trench backfilling.
 - b) The trench shall be consolidated by tamping, rolling, or other mechanical means, as proposed by the Contractor subject to the approval of the Architect/Engineer. The approval by the Architect/Engineer of the proposed method of compaction of the backfill shall in no way be construed as relieving the Contractor of responsibility for settlement of

Seaside Rehabilitation and Healthcare Center
Portland, Maine

trenches, and any settlement shall be repaired by Contractor at his own cost and expense. If the pipe is displaced from alignment, it shall be re-laid at the Contractor's expense.

- c) The remaining distance to the top of the trench shall be filled with road subbase and base gravel as specified, hauled in for the purpose and furnished by the Contractor. This gravel shall be placed, graded and compacted in maximum 8-inch layers to the finished surface. (See Section 02230 - Gravel Base Courses).
2. In Landscaped areas, etc.
- a) Trenches in landscaped and other non-traffic areas shall be filled with material excavated from the trench, unless directed otherwise by the Architect/Engineer. In all other respects, backfilling operation shall be carried out as specified in 1a. & 1b. above. (See landscaping details on Plans for proper sub-grade elevations).
- F. After the completion of all backfilling operations, the Contractor shall grade the site to the lines, grades and elevations shown on the Contract Drawings, taking into account any subsequent topsoil and paving requirements. Finished grading shall not be done until the installation of all underground utilities has been completed in the affected area.
- G. When installation of utilities is in fill areas, place compacted fill to proposed height of top of pipe and then trench to required elevation to set pipe. Extend fill at least 10 ft. on both sides of pipe. Backfill around pipe as specified above and compact to required density.

3.05 DEWATERING:

- A. Control surface and sub-surface runoff so as not to allow water to enter or accumulate in excavations or areas to be filled. Remove water from excavations to prevent softening of foundation bottoms, undercutting of footings, and soil changes detrimental to the stability of subgrades, foundations and undisturbed bearing surfaces. Control water level to at least 12 inches below subgrade elevation to reduce disturbance of the subgrade soils and provide a more stable Working surface during construction. Provide and maintain sumps, pumps, suction and discharge lines and other dewatering systems and components necessary to convey water away from the work area. Discharge water in safe, legal manner into temporary sedimentation ponds or existing waterways or drainage systems, as required. Do not allow water carrying excessive soil particles to be discharged directly to existing waterways or drainage systems. Under no conditions shall surface water or groundwater be discharged into sanitary sewer systems (combined systems excepted).
- B. Install temporary sedimentation controls in drainage basins as required, to prevent sediment damage to drainage systems or adjacent properties. Correct any erosion or sedimentation problems as directed at no additional cost to the Owner. Conform to all requirements of the City of Portland, Cumberland County Soil Conservation Service, and, if applicable, U. S. Environmental Protection Agency NPDES Permit Requirements.

3.06 UNSUITABLE SOILS:

- A. Test pits and borings have been taken on the site. Refer to the Geotechnical Report referenced in prepared by S. W. Cole Engineering. These borings are for information only and are not a guarantee as to actual subsurface conditions.

Seaside Rehabilitation and Healthcare Center
Portland, Maine

- B. The Contractor is responsible for doing his own on-site investigation to determine the extent of unsuitable subsurface material. Should unsuitable materials be encountered notify the Architect/Engineer before proceeding.
- C. Field locate the limits of and properly remove and dispose of all encountered unsuitable subsurface materials when so directed by the Architect/Engineer. All such materials shall become the property of the Contractor and shall be properly disposed of off-site.
- D. Secure all required state and local permits necessary for removal and disposal of any sewerage, toxins, or any other such classified materials that may be encountered on-site.
- E. Unsuitable material such as peat, muck, soils with high organic content, or junk fill which underlies the subgrade or the bottom of excavations, outside the normal limits of excavation as shown on the Drawings, shall be removed and replaced with suitable material when directed by the Architect/Engineer. The "Contract Price" will be adjusted in accordance with the General Conditions and Supplementary General Conditions to compensate for cost of additional excavation and suitable replacement materials.
- F. Unsuitable material which lies within the limits of required excavation will be removed as part of the Work without change in the "Contract Price".
- G. Soil rendered unsuitable for bearing by the Contractor's operations shall be removed at the Contractor's expense, and replaced with compacted gravel, crushed stone or concrete when so directed by the Architect/ Engineer, at no expense to the Owner.
- H. Unsuitable soils shall be legally disposed of off-site at the Contractor's expense.

3.07 ROCK EXCAVATION:

- A. Refer to Section - 02229 for Rock Excavation.

3.08 FROST:

- A. No fill materials shall be placed when the subgrade, the fill material, or the previous lift on which fill is to be placed is frozen. In the event that the subgrade or any fill which already has been placed becomes frozen, it shall be thawed, scarified and then re-compacted, or else removed, to the approval of the Architect/Engineer before the next lift is placed. Any soft spots resulting from frost shall be removed or re-compacted to the satisfaction of the Architect/ Engineer before new fill material is placed.

3.09 FILL AND BACKFILL:

- A. Filling is the placement of satisfactory soil materials, whether originating from on-site or off-site, in areas where existing grade is to be raised in elevation. Where the existing ground has a density less than that specified herein (see SS 3.13 - "Compaction"), compact the soil to the required density. Where unsatisfactory soils occur in areas to be filled, remove same before filling and dispose of these soils in areas designated by the Specifications (see SS 3.06).
- B. Backfilling is the placement of satisfactory porous materials in trenches, pits, against structures or other areas previously excavated, or as shown on the Plans.

Seaside Rehabilitation and Healthcare Center
Portland, Maine

- C. Place fill and backfill in not over 12" layers (loose measure) and compact each layer to required density (see "compaction"). Areas to be filled and backfilled must be free of standing water. Do not place fill or backfill on surfaces that are muddy, frozen, or contain frost or ice.
- D. Backfilling at the foundation walls shall only be started after inspection and approval by the Architect/Engineer or his representative.
- E. Filling and backfilling of walls, foundations, trenches or retaining walls shall not commence until construction below finish grade has been inspected, forms removed and the excavation cleared of trash and debris. Stones larger than 2" maximum dimension will not be permitted in the upper layer of fill.
- F. Filling and backfilling of utility trenches shall not commence until all piping, conduit, etc., has been installed, tested and approved and the locations of all pipe, fittings, and underground structures have been measured and recorded. Fill and/or backfill shall be carefully placed by hand around the pipe or conduit to a depth of one foot above the top of the pipe and shall be carefully tamped, in not less than two lifts; compaction shall be done with hand rammers or mechanical tampers so as not to damage the completed pipe.
- G. The Contractor shall assume responsibility for site surface and subsurface drainage and shall maintain such drainage during the life of the Contract, and shall at all times protect adjacent property, structures and utilities.

3.10 PLACEMENT OF COMPACTED GRANULAR BORROW:

- A. In roadway and parking areas, compacted granular fill shall be used for all filling and backfilling to subgrade.
- B. Compacted granular borrow should be placed in maximum 10-in. thick lifts and compacted to a minimum of 92 percent of maximum dry density as determined by ASTM D1557. Before placing the first lift of compacted granular fill, all disturbed soil, loose rock, organic matter, asphalt, concrete, trash, rubble or other deleterious or compressible material shall be removed from the subgrade. The granular fill shall be spread evenly by mechanical equipment or by manual means above the approved (compacted) subgrade, and shall be built up in horizontal layers as nearly even as practicable to prevent the thickness of lift from exceeding that specified.
- C. If in the opinion of the Geotechnical Engineer, the granular borrow material becomes too wet for the required compaction, the fill shall be dried by a method approved by the Geotechnical Engineer prior to commencing or continuing compaction operations. Likewise, if in the opinion of the Geotechnical Engineer, the fill material becomes too dry for the required compaction, the fill shall be moistened by a method approved by the Geotechnical Engineer prior to commencing or continuing compaction operations.
- D. Puddling methods of compaction will not be permitted.

3.11 PLACEMENT OF COMPACTED STRUCTURAL FILL:

- A. In all footing and wall areas and areas within the building which are to have a concrete slab on grade, compacted structural fill (as Specified by Architect or Architect's Structural Engineer) shall be used for all filling and backfilling to subgrade, as indicated on the Drawings.

Seaside Rehabilitation and Healthcare Center
Portland, Maine

- B. Unless otherwise Specified by Architect or Architect's Structural Engineer, Compacted Structural Fill shall be placed in maximum 8-in. thick lifts and compacted to a minimum of 95 percent of maximum dry density as determined by ASTM D1557. In confined areas and within 3 ft. of basement walls, the fill shall be placed in 6-in. thick lifts, and compaction performed by hand-guided equipment. Before placing the first lift of compacted structural fill, all disturbed soil, loose rock, organic matter, asphalt, concrete, trash, rubble or other deleterious or compressible material shall be removed from the subgrade. The structural fill shall be spread evenly by mechanical equipment or by manual means above the approved (compacted) subgrade, and shall be built up in horizontal layers as nearly even as practicable, to prevent the thickness of lift from exceeding that specified.
- C. If in the opinion of the Geotechnical Engineer, the structural fill material becomes too wet for the required compaction, the fill shall be dried by a method approved by the Geotechnical Engineer prior to commencing or continuing compaction operations. Likewise, if in the opinion of the Geotechnical Engineer, the fill material becomes too dry for the required compaction, the fill shall be moistened by a method approved by the Geotechnical Engineer prior to commencing or continuing compaction operations.
- D. Puddling methods of compaction will not be permitted.

3.12 PLACEMENT OF COMPACTED STONE FILL:

- A. Compacted stone fill should be placed in maximum 8 inch thick lifts (6 in. under floor slab where Specified) and consolidated with hand compaction equipment. The compacted stone fill shall be spread evenly by mechanical equipment or by manual means, and shall be built up in horizontal layers as nearly even as practicable to prevent the thickness of lift from exceeding that specified. Care shall be taken during compaction not to damage perforated drainpipe, pipes, conduits or other utilities.

3.13 COMPACTION (Subgrade):

- A. Unless otherwise Specified by Architect or Architect's Structural Engineer, all fill and backfill shall be placed in maximum 8-inch lifts and compacted in accordance with the following:
 - 1) Under Building Areas, Footings & Slabs 95%
 - 2) Exterior Foundation Areas 95%
 - 3) Driveway and Parking Areas 92%
 - 4) Under Building Entrances, Slabs & Walks 95%
 - 5) Top 6" of Subgrade for Lawn Areas 90%
- B. The in-place density and the degree of compaction shall be determined in accordance with ASTM D 2922 (nuclear in-place density) as Work progresses. Each layer of fill shall be placed and tested and no succeeding layers shall be placed until approval of the previous layer has been given. Any corrective Work required as a result of the testing and the expense of re-testing shall be borne by the Contractor, at no additional cost to the Owner.
- C. Backfill of excavations and walls:

Any excavation (e.g. utilities, walls, footings, etc.) made in areas where compacted granular or structural fill is required, shall be backfilled with compacted granular or structural fill as designated. Where compacted fill is placed adjacent to walls, the difference in elevation of the

Seaside Rehabilitation and Healthcare Center
Portland, Maine

top of the fill on either side of the wall can be no more than one foot at any time, or else the wall must be adequately braced.

D. Final Approval:

Immediately before placing of footings, foundations, or floor slab on compacted structural fill or virgin soil, the Geotechnical Engineer will observe the foundation and floor slab subgrade. The Contractor shall remove any soft fill if directed, and replace it with properly compacted structural fill material. The pouring of foundations or floor slab shall commence within 24 hours of final approval. Rain, frost and other factors (which, in the opinion of the Geotechnical Engineer, are potentially damaging to the fill) occurring after the final approval, but before or during pouring, shall require an additional observation of the compacted fill for approval by the Geotechnical Engineer.

3.14 FIELD QUALITY CONTROL:

- A. All of the material testing shall be performed by a testing laboratory experienced in performing the required tests, and shall be approved by the Geotechnical Engineer. The Owner will employ the testing laboratory and pay for all of the tests, except for re-testing as specified below.
- B. Materials test reports and in-place field density test reports shall be submitted by the testing laboratory directly to the Architect/ Engineer with a copy to the Contractor.
- C. The standards for all tests shall be as follows:
 - 1) Mechanical Analysis: ASTM D421.
 - 2) Modified Proctor Method: ASTM D1557M.
 - 3) In-place Field Density: ASTM D2922.
- D. The actual locations of all tests shall be determined in the field by the Architect/Engineer or his representative.
- E. The in-place field density tests shall be taken generally as follows:
 - 1. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2000 sq. ft. of paved area and 1000 sq. ft. of building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2000 sq. ft. of paved area and 1000 sq. ft. of overlaying building slab, but in no case less than 3 tests.
 - 2. Foundation Wall Backfill Outside of Structure: Make at least ten field density tests at locations and elevations as directed.
 - 3. Fill and backfill at inside walls and foundations: One (1) test will be required for each 20 linear feet on the inside face of the walls and foundations, for each 2' vertical depth of fill and backfill and at the finished subgrade.
 - 4. Fill and backfill other than at the walls and foundations: One (1) test will be required for each 500 cubic yards of fill and backfill.
 - 5. Backfill in utility trenches: One (1) test will be required for each 100 lineal feet of trench line, for each 2' vertical depth of backfill and at the finished subgrade.
- F. If any of the in-place field density tests as specified above indicate that the compaction is less than specified herein, the extent of the unacceptable compaction shall be clearly established by additional testing. All of the material which has failed to meet the compaction requirements shall

Seaside Rehabilitation and Healthcare Center
Portland, Maine

be removed, refilled or rebackfilled, compacted and tested until the specified compaction requirements are met. All of the corrective Work shall be in accordance with the Contract Documents, and all costs related to the corrective Work and re-testing shall be paid by the Contractor.

3.15 DISPOSAL OF EXCESS AND WASTE MATERIALS:

- A. Transport waste material, including unsuitable subsurface materials, trash, stumps and debris, to off-site disposal area in accordance with these Specifications and local regulations, at Contractor's expense.

3.16 MAINTENANCE AND RESTORATION:

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances, until final project acceptance.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and re-compact to required density before proceeding with other affected Work.
- D. Restore lawns, pavement, walks and curbs, or other exterior surfaces displaced or marked by the Work of this Contract, to their original conditions, to the satisfaction of the Architect/Engineer or his representative.
- E. Restore areas affected by settlement, due to the Work of the Contractor, to original lines, grades or levels. Correct conditions contributing in any way to such settlement in a manner approved by the Architect/Engineer. Remove and replace any improperly placed or compacted fill material at no additional cost to the Owner.
- F. Restore lawn areas by topsoiling, grading and seeding. Water as directed by Architect/Engineer until final project Acceptance.

END OF SECTION