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 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. 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 his Bid.

2  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 used for common fill. Boulders (rocks over eight (8) inches) shall be removed from excavated material before using for fill.

2. 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 rocks 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 - M.D.O.T. 703.06, (a), Type C. Size of stone no larger than six (6) inches, and further limited to a maximum particle size equal to three (3) inches within twelve (12) inches of slab grade. Compacted at 95% ASTM D-1557

7. Aggregate for Foundation Backfill: M.D.O.T. 703.6 (a) Type B. Size of stone no larger than four (4) inches.


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:

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>% by Weight Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot;</td>
<td>100</td>
</tr>
<tr>
<td>#4</td>
<td>95-100</td>
</tr>
<tr>
<td>#40</td>
<td>20-45</td>
</tr>
<tr>
<td>#200</td>
<td>0-5</td>
</tr>
</tbody>
</table>

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 graduation 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
3 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. Rock Excavation - Removal and disposal of materials encountered that cannot be excavated without continuous and systematic drilling and blasting or continuous use of a ripper or other special equipment except such materials that are classed as earth excavation.

1. Typical Materials: Boulders 2 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

2. Intermittent drilling performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

C. 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.

D. Topsoil Removal – Topsoil shall be stripped to its entire depth from area within the Limit Of Work and reusable materials shall be temporarily removed from the site, screened, and returned to the site as needed. Stripped topsoil shall be free from clay, large stones, debris, and peat. Topsoil for reuse on site shall be screened and tested in accordance with Section 32 90 00 – Planting.

E. 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 owner’s representative prior to pouring concrete for footings.

2. The Contractor shall provide temporary drains, ditches 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.

4. Excavation shall not be made below specified subgrades except where rock or unstable material is encountered. If suitable bearing is not found at levels shown on the Drawings, the Architect, Engineer and or the Owner’s Representative shall be notified in writing immediately so that adjustments or changes may be made. Material removed below specified subgrade without the approval of the Project Engineer and or Owner’s Representative shall be replaced and compacted with an approved gravel 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.

F. 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.

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 Project Engineer and or Owner’s Representative.

G. 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.

H. 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 as nearly vertical as practical 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.
   d. Telephone Conduits: 18 inches minimum to top of conduit, or as required by the local utility company, whichever is deeper.

I. 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.

J. 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.

K. 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.

L. 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. All excavations for structures shall be sheeted, braced, sloped, or otherwise protected in the same manner and meeting the safety requirements and conditions specified above under paragraph Section 3.6 (B). Any excess excavated material shall be removed from the site.

M. 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.

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.

N. 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 under footings, floor slabs, roads, parking areas and walks shall be compacted to not less than 95 percent of the ASTM D - 1557 maximum dry density.

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 Project Engineer and/or the Owner's Representative. 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 Project Engineer and/or Owner's Representative and at the expense of the Contractor.

O. Filling and Subgrade Preparation

1. All materials shall be placed and compacted to conform to the lines, elevations and cross-sections indicated on the Drawings. Do not start fills until the area has been inspected and approved by the Project Engineer and/or Owner's Representative.

2. 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 Project Engineer and/or Owner's Representative before being placed.

3. 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 native sands or silty sands 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 recompacted as stated above.

4. 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.

5. Stones in fills shall be well distributed. Do not have stones over six (6) inches in diameter within twelve (12) inches of subgrade.

P. 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, Architect 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 Owner’s Representative 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 31 05 12
SECTION 32 12 16

ASPHALT PAVING

1 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.

2 PART 2 PRODUCTS

2.1 MATERIAL:

A. Bituminous Concrete (roadway, parking and heavy duty pavement) – An approved hot plant mix conforming to MDOT Standard Specifications (latest revision). Use Grading B mix for binder and C mix for surface.

B. Bituminous Concrete (sidewalks) – An approved hot plant mix conforming to MDOT Standard Specifications (latest revision). Pavement shall be grading B mix for binder and C mix for surface.

3 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.

D. Pavement mix for roads and parking areas shall be as herein specified and shall consist of the following courses after compaction:

<table>
<thead>
<tr>
<th>Course</th>
<th>Binder Course</th>
<th>Wearing Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Duty Pavement</td>
<td>2.5&quot;</td>
<td>1.5&quot;</td>
</tr>
<tr>
<td>Standard Duty Pavement</td>
<td>2&quot;</td>
<td>1.5&quot;</td>
</tr>
<tr>
<td>Sidewalk Pavement</td>
<td>1&quot;</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

E. 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.

F. 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.

G. 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.

H. Mix placed by hand shall be placed on a steel dump board or wheelbarrow from the truck and then shoveled into place.

I. 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.

J. Stamping the Asphalt: In specified areas, stamping can be performed on a freshly placed asphalt surface when the asphalt is still pliable. Using flexible templates; stamp the pattern into the asphalt using a vibratory plate compactor.

3.1 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:


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 32 12 16
SECTION 1
STABILIZER FOR AN AGGREGATE PATHWAY – PEDESTRIAN ACCESS

PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes material and labor requirements for construction with decomposed granite or crushed 3/8” or 1/4” minus aggregate pathway with Stabilizer binder additive for the following items:
   1. Stabilized aggregate pathway and patios
B. Related Sections:
   1. Section 02100 – Site Preparation
   2. Section 02200 – Earthwork
   3. Section 02230 – Granular Materials

1.2 PERFORMANCE REQUIREMENTS
A. Perform gradation of decomposed granite material or 3/8” or 1/4” minus crushed aggregate in accordance with ASTM C 136 – Method for Sieve Analysis for Fine and Course.

1.3 SUBMITTALS
A. Products Data: For each product specified. Submit a 5 lb. sample and sieve analysis for grading of decomposed granite or crushed 3/8” or 1/4” minus aggregate to be sent to Stabilizer Solutions, Inc. prior to any construction – (allow 2 week turn around). Must be approved by Landscape Architect and owner.
B. Shop Drawings: Show details of installation, including plans and sections.

1.4 PROJECT/SITE CONDITIONS
A. Field Measurements: Each bidder is required to visit the site of the Work to verify the existing conditions. No adjustments will be made to the Contract Sum for variations in the existing conditions.
   1. Where surfacing is indicated to fit with other construction, verify dimensions of other construction by field measurements before proceeding with the work.
B. Environmental Limitations: Do not install decomposed granite or crushed 3/8” or 1/4” minus aggregate paving during rainy conditions or below 40 degrees Fahrenheit and falling.
1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer to provide evidence to indicate successful experience in providing decomposed granite or crushed 3/8” or 1/4” minus aggregate surfacing containing Stabilizer binder additive or ability to follow installation instructions.

B. Mock-ups: Install 4 ft. wide x 10 ft. long mock-up of decomposed granite or 3/8” or 1/4“ minus crushed aggregate surfacing with Stabilizer additive at location as directed by owner’s representative.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the installer agreeing to repair or replace components of stabilized surfacing that fail in materials or workmanship within the specified warranty period. Stabilizer Solutions, Inc. does not warranty imitation “Stabilizer” purchased from a non-approved Stabilizer Solutions, Inc. licensee. Failures include, but are not limited to, the following:

1. Premature wear and tear, provide the material is maintained in accordance with manufacturer’s written maintenance instructions.
2. Failure of system to meet performance requirements.

C. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.

D. Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs as required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Stabilizer for crushed aggregate surfaces provided by the following manufacturer:

1. Stabilizer Solutions, Inc. 33 South 28th St., Phoenix, AZ 85034; phone (602) 225-5900, (800) 336-2468; fax (602) 225-5902; website stabilizersolutions.com; email info@stabilizersolutions.com

2.2 MATERIALS

A. Decomposed Granite or 3/8” or 1/4" crushed aggregate screenings

1. Sand and crushed stone shall consist of inert materials that are hard and durable, with stone free from surface coatings and deleterious materials. Gradation requirements shall be as follows:
2. Crushed Stone Sieve Analysis Percentage of Weight Passing a Square Mesh Sieve AASHTO T11-82 and T2782

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1/4" MINUS AGGREGATE GRADATION

<table>
<thead>
<tr>
<th>U.S. Sieve No.</th>
<th>Percent Passing by Weight</th>
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<tbody>
<tr>
<td># 3/8&quot;</td>
<td>100</td>
</tr>
<tr>
<td># 4</td>
<td>90 – 100</td>
</tr>
<tr>
<td># 8</td>
<td>75 – 80</td>
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3. Acceptable local supplier list to be provided by Architect

B. Stabilizer Binder

1. Patented, non-toxic, organic binder that is a colorless and odorless concentrated powder that binds decomposed granite or crushed 3/8" or 1/4" minus aggregate.

2.3 EXCESS MATERIALS

A. Provide owner’s authorized rep. with the following excess materials for use in future decomposed granite or 3/8" or 1/4" minus crushed aggregate surfacing repair: 40 to 50 lb. Bags of the aggregate paving blended with proper amount of Stabilizer.

PART 3 - EXECUTION

3.1 BLENDING STABILIZER

A. Blend 12 to 16-lbs (call manufacturer for exact blend) of Stabilizer per 1-ton of decomposed granite or crushed 3/8" or 1/4" minus aggregate screenings. It is critical that Stabilizer be thoroughly and uniformly mixed throughout decomposed granite or crushed ½” or 3/8” minus aggregate screenings. Bucket blending is not acceptable. Blending with a rake and or shovel is not acceptable. Blend material dry as water will make the material hard.

3.2 PLACEMENT

A. After pre-blending, place the Stabilized decomposed aggregate or 3/8" or 1/4” crushed aggregate screenings on prepared sub-grade. Level to desired grade and cross section.

B. Depth of pathways – 3” for heavy foot traffic and light vehicles.

3.3 WATERING
A. Water heavily for full-depth moisture penetration of the Stabilized pathway profile. Water activates Stabilizer. To achieve saturation of Stabilized pathway profile, 25 to 45-gallons of water per 1-ton must be applied. During water application randomly test for depth using a probing device, which reaches full depth.

3.4 COMPACTION

A. Upon thorough moisture penetration, compact aggregate screenings to 85% relative compaction by equipment such as; a 2 to 4-ton double drum roller or a 1,000-lb. single drum roller. The roller size will depend on the depth of the pathway. DO NOT use a vibratory plate compactor or vibration function on roller as vibration separates large aggregate particles. Do not begin compaction for 6 hours after placement and up to 48 hours.

B. If surface aggregate dries significantly quicker than subsurface material, lightly mist surface before compaction.

C. Take care in compacting decomposed granite or crushed 3/8” or ¼” minus aggregate screenings when adjacent to planting and irrigation systems. Hand tamping with 8” or 10” hand tamp recommended

3.5 INSPECTION

A. Finished surface of pathway shall be smooth, uniform and solid. There shall be no evidence of chipping or cracking. Cured and compacted pathway shall be firm throughout profile with no spongy areas. Loose material will not be present on the surface after installation, but may appear after use and according to environmental conditions. Pathway should remain stable underneath the loose granite on top. It is a “natural” looking pathway, yet stable throughout. Any significant irregularities in path surface shall be repaired to the uniformity of entire installation.

3.6 MAINTENANCE

A. Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed. Any plowing program required during winter months shall involve the use of a rubber baffle on the plow blade or wheels on the plow that lifts the blade 1/4” off the paving surface.

B. During the first year, a minor amount of loose aggregate will appear on the paving surface (1/16” to 1/4”). If this material exceeds a 1/4”, redistribute the material over the entire surface. Water thoroughly to the depth of 1”. Compact with power roller of no less than 1000 lbs. This process should be repeated as needed.

C. If cracking occurs, simply sweep fines into the cracks, water thoroughly and hand tamp with an 8” – 10” hand tamp plate.

3.7 REPAIRS

A. Excavate damaged area to the depth of the Stabilized aggregate and square off sidewalls.

B. If area is dry, moisten damaged portion lightly.

C. Pre-bend the dry required amount of Stabilizer powder with the proper amount of aggregate in a concrete mixer.

D. Add water to the pre-blended aggregate and Stabilizer. Thoroughly moisten mix with 25 to 45 gallons per 1-ton of pre-blended material or to approximately 10% moisture content.

E. Apply moistened pre-blended aggregate to excavated area to finish grade.

F. Compact with an 8” to 10” hand tamp or 250 to 300 pound roller. Keep traffic off areas for 12 to 48 hours after repair has been completed.
Stabilizer for aggregate trails, pathways, and patios
Materials

Stabilizer- The Original Natural Binder
Stabilizer is an organic powder that stabilizes soil by binding soil particles. It is a natural, non-toxic, non-staining, odorless, environmentally safe powder derived from crushed seed hulls. Stabilizer can be used with a variety of crushed aggregates: Decomposed Granite, Crushed Stone, Hard Rock, or Limestone, etc. to create natural looking fire lanes, driveways, and parking areas. Stabilizer strengthens aggregates to withstand traffic and weather extremes. Stabilizer is patented and manufactured solely by Stabilizer Solutions, Inc. One-ton of Stabilized aggregate typically covers 65-sqft. at a 3" depth. Coverage will vary depending on aggregate.

Stabilizer is a 100% natural powder available in 40-lb bags or 2000-lb sacks.

Crushed Aggregate

Select a crushed aggregate for use with Stabilizer consisting of inert materials that are hard and durable, with stone free from coatings. Stabilizer will not bind every aggregate, so please keep to the following distribution. Please send any borderline aggregates in for testing.

<table>
<thead>
<tr>
<th>U.S. Sieve No.</th>
<th>Percent Passing by Weight</th>
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<tbody>
<tr>
<td># 3/8&quot;</td>
<td>100</td>
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<tr>
<td># 4</td>
<td>90 – 100</td>
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Preparation

Stabilized aggregate requires a 3" compacted layer of your state’s DOT recommended crushed granular road base. Pre-soak the base material with water and compact to 95% prior to installing Stabilized aggregate. Although porous, it is recommended to have proper drainage available to ensure no standing water on surface or adjacent to Stabilized aggregate, including downspouts when placed under roof overhang.
**Blending**

Stabilizer MUST be thoroughly pre-mixed with crushed aggregate at the rate of 12-lbs for planting areas to 15-lbs for heavier use, of Stabilizer per 1-ton of aggregate. Check with Stabilizer Solutions, Inc. for correct Stabilizer rate, as the amount may vary for your project and climatic conditions. Drop spreading of Stabilizer over pre-placed aggregate or mixing by rototilling is ONLY acceptable if approved by Stabilizer Solutions, Inc. Stabilizer should be mechanically blended (Bucket blending is not an approved blending method). Stabilizer can be blended by cement mixer, pug mill, Dakota blender, generally any paddle type blenders (no screw type blenders). If you wish to use another type of blender, please verify with the company. Always blend the material DRY and leave material in mixer for several passes of the mixing paddles. Stabilizer will disappear within the material quickly, but may not be blended completely.

![Stabilizer and aggregate blended in two different sized cement mixers](image)

After Stabilizer is blended into aggregate, confirm that Stabilizer has been thoroughly blended. The best way to do this is the ‘ball test.’

- Take a handful of blended aggregate and add a few ounces of water.
- Work material around in both hands to ensure no dry aggregate remains.
- Form aggregate into ball with your hand and apply pressure.

The result should be an aggregate ball with a doughy consistency that holds together. You should be able to toss the ball in your hand without it breaking apart.

![The ball test](image)

**Installing Stabilized Aggregate**

Place the Stabilizer and aggregate mixture on the prepared base, and rake smooth to desired grade and cross section. Place material to sufficient depth to allow 3” for light traffic or 4” depth
for high traffic, after compaction. Do not install Stabilized aggregate during rainy conditions or below 40 degrees Fahrenheit and falling.

**Machine Application**

**Hand Application**

**Watering**

Water activates Stabilizer. It is essential that Stabilizer be watered thoroughly, the entire depth of profile. To achieve saturation of Stabilized aggregate profile, 25 to 45-gallons of water per 1-ton must be applied. During water application, test moisture penetration using a probing device reaching full depth.
Compaction

Wait a minimum of 6 hours to a maximum of 48 hours, or until the aggregate is able to accept compaction from a 1 to 5-ton roller without separation, plowing or any other physical damage to the aggregate. The aggregate will begin to dry out and setup. Compaction can begin when you can walk on the material without significantly sinking in and material does not feel too muddy. Do not allow material to dry out completely.

If surface aggregate dries significantly quicker than subsurface material, lightly mist surface before compaction. Compact the material with a compactor as specified below making 3 to 4 passes (do not use a vibratory unit). Upon thorough moisture penetration, compact aggregate to 85% relative compaction by equipment such as; a 1,000-lb power roller for lighter use areas or 1 to 5-ton double drum roller for heavier. DO NOT use a vibratory plate compactor or vibration feature on roller, as vibration separates large aggregate particles.

Installation of Stabilized aggregate more than 3” must be installed in lifts. If 4” thick compact in (2) 2” lifts. If 5” thick, compact in (2) 2.5” lifts. If Stabilized aggregate is pre-moistened before installation entire 4” or 5” lift may be installed.

Inspection

Allow aggregate to dry completely. Drying time may vary depending on amount of water used and weather conditions. Once completely dried, the surface should be smooth, uniform and solid. No evidence of chipping or cracking. Cured and compacted surface should be firm throughout profile with no spongy areas. Loose material will not be present on the surface after installation, but may appear after use. Surface should remain stable underneath the loose granite on top. Stabilizer will not turn the aggregate into concrete- you can still feel the crunch of the gravel under foot. It is a “natural” looking pathway, yet stable throughout and can withstand vehicle traffic and weather extremes. Any significant irregularities in surface should be repaired to the uniformity of entire installation.

Maintenance

Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed. Any plowing program required during winter months should involve the use of a rubber baffle on the plow blade or wheels on the plow that lifts the blade 1/4” off the aggregate surface. During the first year, a minor amount of loose aggregate will appear on the surface (1/16 to 1/4”). If this material exceeds a 1/4 of an inch, redistribute the material over the entire surface. Water material thoroughly to the depth of 1”, and compact with power roller of no less than 1000-lbs.
References
Stabilizer is the original natural binder in use internationally for over 26 years. Some of the world's greatest projects use Stabilizer, here are a few.

The Royal Botanical Garden - Melbourne, Australia

The Constantine Brancusi Sculpture Garden - Tar Jiu, Romania

The Lincoln Park Zoo, Chicago, IL USA
PermaTURF® Lawn Panels.... The Professional's Choice!

Durable load bearing capacity of 100 tons per square yard!  
With PermaTURF® panels, resulting damage of ruts and tire tracks is eliminated.

Adaptable to follow the surface contours while allowing natural drainage.  
Attractive landscape that is a permanent solution to erosion.

Root development and healthy growth maintained and protected in the cells of the panel.  
Durable interlocking tabs secure the panels and ensure stability, both vertically and horizontally.

PermaTURF® Specifications /Description

Material: HDPE/PP  
100% Recycled Polyethylene Grass Green

http://www.permaturf.com/specs.htm
Panel Size/Coverage: 13" x 13" x 1 ½" / 1 Sq. Foot
Cells per Unit: 30
Weight per Unit: 1.1 lb.
Stabilization: UV Inhibitors
Design: Patented 4-sided Interlocking System
Permeability: 94% Load Bearing
Capacity: 100 Tons per Square Yd.
Superhumus
Jay, ME

"Our customers demand the highest possible quality products. We have selected earthlife™ Compost for its consistent quality and reliable service."

Josh Oldfield
Thayer Nursery
Milton, MA

National Recognitions for earthlife™ Products:
**2004 U.S. Composter of the Year
**2001 EPA National Biosolids Exemplary Management Award
**2000 Maine Governors Award for Environmental Excellence
**US Golf Association (USGA) specifications for greens & tees

PRODUCT ANALYSES
pH...........................................6.5%
Total Nitrogen..........................0.34%
Organic N................................0.34%
Total Phosphorous.....................0.04%
Total Potassium.........................0.11%
Organic Matter..........................70.0%
Conductivity.............................0.44 mmhos/cm
Particle size............................<7/8"

USE RECOMMENDATIONS:
Soil amendment: Mix 10-30% uniformly by volume. Additional fertilizer may be needed.
Container growing: Use aged superhumus for container growing of many ornamentals and as an ingredient in custom blended potting mixes.
Slope stabilizer: Apply 3-6” of Superhumus to soil surfaces to effectively stabilize slopes.
Park & trail mulch: Apply 2-4” of Superhumus to achieve a natural appearance and smooth walking surface.

PRODUCT INFORMATION
Unique in the landscape industry, Superhumus is processed from a blend of forest soil, fine bark, organic matter, sand and fine stone. These natural ingredients are washed off of logs in a wood yard water flume in Jay, Maine. Superhumus is screened (<7/8”) and has been used extensively since 1990 as a potting mix, park and trail mulch, slope stabilizer and as an amendment for heavy soils.

ADDITIONAL INFORMATION:
Feed Stocks: Forest soil, bark, organic matter, sand and fine stone.
Classifications: Available for use in ME, NH, MA, VT, & CT.

For orders/information, call 1-800-933-6474.