

TABLE OF CONTENTS

DIVISION 2 – SITE CONSTRUCTION

<u>SECTION NO.</u>	<u>SECTION TITLE</u>
02100	Site Preparation
02210	Earthwork, Backfill and Grading
02498	Restoration of Disturbed Areas
02521	Concrete Pavers
02522	Concrete Paving
02524	Granite Curb
02525	Paving and Surfacing
02910	Planting Soils
02920	Lawn and Seeding

## SECTION 02100

### SITE PREPARATION

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

##### 1.2 SUMMARY

- A. This section includes the following:
  - 1. Provide labor, material, tools and equipment to prepare site as indicated and specified.
  - 2. Protection of existing structures, trees and vegetation within the limit of work that are called out for protecting.
  - 3. Stripping existing vegetation and preparing to regrade.
  - 4. Removal of existing driveways and curbing within the limit of work.
- B. Related sections include the following:
  - 1. Section 02210: Earthwork, Backfill and Grading.

##### 1.3 PROJECT CONDITIONS

- A. Traffic: Conduct site preparation operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.
- B. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements indicated to remain in place or outside of the limit of work. Existing trees and shrubbery to remain shall be protected from injury. Except as otherwise directed, cutting and trimming of existing trees will not be permitted. Existing trees which are liable to be damaged by construction operations, shall be boxed and protected as directed. Protection shall be maintained until completion of the work of the Contractor, unless otherwise directed.
  - 1. Protect improvements on adjoining properties and on Owner's property.

2. Restore improvements damage by Contractors clearing activities to their original condition, at no additional expense to the Owner.
- C. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place or outside of the limit of work indicated on the drawings.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 – EXECUTION

### 3.1 EXISTING TREES AND VEGETATION

- A. Existing trees and shrubbery shall be protected from injury. Except as otherwise directed, cutting and trimming of existing trees will not be permitted. Existing trees which are liable to be damaged by construction operations, shall be boxed and protected as directed. Protection shall be maintained until completion of the work of the Contractor, unless otherwise directed.
- B. Avoid cutting or injuring trees and vegetation outside easement line and outside areas to be cleared as indicated, without Engineer's permission.
- C. Accept responsibility for damages outside these lines.
- D. Any trees within the limit of work that are required to be removed shall be flagged by the Contractor, who will notify the Owner. Owner shall determine appropriate course of action.

### 3.2 EXISTING STRUCTURES AND PROPERTY

- A. Remove and reset at completion of project existing signs, posts, other surface structures, catch basin frames and grates, manhole frames and covers, and granite curbing within construction path unless directed otherwise. Locations for resetting structures and property shall be at their existing location unless otherwise indicated in the Contract Drawings or directed by the Engineer during construction.
- B. Store at a site designated by Owner, items in reusable condition as determined by Engineer.
- C. For work in grassed areas, strip loam to one side to avoid mixing with excavation materials. Do not take loam from site.

### 3.3 STOCKPILES

- A. The topsoil shall be transported and deposited in storage piles convenient to the areas which are subsequently to receive the application of topsoil, separate from other excavated materials, and in approved locations. The topsoil shall be stockpiled free of roots, stones and other undesirable material. The Contractor shall take all necessary precautions to prevent other excavated material or other objectionable material from becoming intermixed with the topsoil, either before or after the stripping and stockpiling operation. Stockpiles shall be neatly trimmed and graded to provide drainage from surfaces and to prevent depressions where water may become impounded. All construction operations shall be performed so as not to cause mixing of objectionable materials with the topsoil, and stockpiles shall be protected and shall not be disturbed except for subsequent operations for replacing topsoil. The location of stockpiles shall be approved by the Owner and the Engineer.

### 3.4 EXCESS TOPSOIL

- A. Topsoil which has been stripped and stockpiled, but is not needed after the completion of all final topsoiling and grassing shall be stockpiled on site in a location to be approved by the Engineer and shall remain the property of the Owner.

### 3.5 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION 02100

## SECTION 02210

### EARTH EXCAVATION, BACKFILL, FILL AND GRADING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

##### 1.2 SUMMARY

- A. This section includes the following:
  - 1. Perform the following earth excavation, backfill, fill and grading as indicated or specified:
  - 2. Provide materials for backfilling excavations and constructing embankments and fills as indicated and specified.
  - 3. Construct embankments of compacted materials.
  - 4. Grade surfaces to meet finished grades indicated.
  - 5. Immediately notify the Engineer if suspected hazardous materials are encountered and cease operations in that part of work.
  - 6. Remove boulders within the excavation limits.
  - 7. Remove, transport and dispose of surplus or unsuitable excavated material.
  - 8. See Contract Drawings for General Notes for restoration of sand dunes.
- B. Related sections include the following:
  - 1. Contract Drawings
  - 2. Section 02100 - Site Preparation.

### 1.3 DEFINITIONS

- A. Percentage of compaction is defined as the ratio of the field dry density, as determined by ASTM D1556 or ASTM D2922 to the maximum dry density determined by ASTM D1557 Procedure C, multiplied by 100.
- B. Proof Roll: Compaction with a minimum of 4 passes of a vibratory steel drum or rubber tire roller. Vibratory plate compactors shall be used in small areas where vibratory steel drum or rubber tire roller can not be used.
- C. Acceptable Material: Material which does not contain organic silt or organic clay, peat, vegetation, wood or roots, stones or rock fragments over 8-inch in diameter, porous biodegradable matter, loose or soft fill, excavated pavement, construction debris, or refuse. Stones or rock fragments shall not exceed 40 percent by weight of the backfill material.
- D. Unacceptable Materials: Materials that do not comply with the requirements for the acceptable material or which cannot be compacted to the specified or indicated density.

### 1.4 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
  - 1. Qualifications of the Contractor's Independent Testing Laboratory as specified in Paragraph 1.5 F, four (4) weeks prior to the execution of any earth excavation, backfilling, filling, or compaction process.
  - 2. Backfill Materials: Submit grain size analysis and curve performed in accordance with ASTM D422 and compaction test results (ASTM D1557 Procedure C) for each proposed source of backfill for review by the Engineer at least two weeks prior to use of the material. The grain size analysis shall indicate that the backfill material conforms to the gradation requirements specified.
  - 3. Other Acceptable Materials: Laboratory testing results of gradation and moisture-density relationship. Submittal shall include specific location of the source and the date when sample was taken.
  - 4. Controlled Density Fill Mix Design:
    - a. Prior to beginning the work the Contractor shall submit for review, flowable fill mix designs which shall show the proportions and gradations of all materials for each class and

type of flowable fill specified herein.

## 1.5 QUALITY ASSURANCE AND CONTROL

- A. Provide in accordance with Section 01400 and as specified.
- B. Excavations shall be performed in the dry, and kept free from standing water, snow and ice during construction. Bedding and backfill material shall not be placed in water. Water shall not be allowed to rise upon or flow over the bedding and backfill material.
- C. The Contractor shall be solely responsible for making all excavations in a safe manner. All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.
- D. Do not excavate, construct embankments, or fill until all the required submittals have been reviewed by the Engineer.
- E. Formulate excavation, backfilling, and filling schedule and procedures to eliminate possibility of undermining or disturbing foundations of partially and completed structures, pipelines and embankments or existing structures and pipelines.
- F. Employ an independent testing laboratory to perform particle size and gradation analyses in accordance with ASTM D422, and to determine compactibility in accordance with ASTM D1557 for all the proposed backfill, sand, and fill materials, and monitoring field compaction operations. The independent testing laboratory shall have the following qualifications:
  - 1. Be accredited by the American Associates of State Highway and Transportation Officials (AASHTO) Accreditation Program.
  - 2. Have three (3) years experience in sampling, testing and analysis of soil and aggregates, and monitoring field compaction operations.
  - 3. Able to provide three (3) references from previous work.
- G. Methods of Field Testing:
  - 1. In-Place Density: ASTM D1556, ASTM D2167, or ASTM D2922.
  - 2. In-Place Moisture Content: ASTM D3017, ASTM D4944, or ASTM D4959.
- H. Construction Tolerances:

1. Construct finished surfaces to plus or minus 1 inch of the elevations indicated.
  2. Grade cut and fill areas to plus or minus 0.20 foot of the grades indicated.
  3. Provide the Engineer with adequate survey information to verify compliance with above tolerances.
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- I. Cut pavement with a saw or pneumatic tools to prevent damage to remaining pavement without extra compensation. Where pavement is removed in large pieces, dispose of pieces before proceeding with excavation.
  - J. Pipes, drains, and other utilities may exist in certain locations not indicated on drawings. No attempt has been made to show all services. Completeness or accuracy of information given is not guaranteed. Pipes, drains and other utilities shall be protected and shall remain functional during and after construction.
  - K. Carefully support and protect from damage, existing pipes, poles, wires, fences, curbs, property line markers, and other structures, which the Engineer determines must be preserved in place without being temporarily or permanently relocated. Should such items be damaged, restore without compensation therefor, to at least as good condition as that in which they were found immediately before the work was begun.
  - L. Restore existing property or structures as promptly as practicable.
  - M. If material is unacceptable for foundation support (in the opinion of the Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the drawings and/or specifications, remove such material to the required width and depth as directed by the Engineer and replace it with screened gravel, select borrow, or concrete.
  - M. Do not remove excavated materials from the site of the work or dispose of except as directed or permitted by the Engineer.
  - N. Haul away and dispose of surplus excavated materials at locations directed by the Engineer at no additional cost to the Owner.
  - O. During progress of work, conduct earth moving operations and maintain work site so as to minimize the creation and dispersion of dust. Furnish and spread calcium chloride if the Engineer decides that it is necessary for more effective dust control.



PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS

- A. Use only acceptable materials from excavations or borrows, as determined by the Engineer.
- B. Beach Sand: As Specified on Drawings.
- C. Common Fill:
  - 1. Common fill shall be soil containing no stone greater than 2/3 loose lift thickness. The materials shall be free of trash, ice, snow, tree stumps, roots and other organic and deleterious materials. Common fill shall not contain more than 30 percent of weight of silt and clay. It shall have a maximum dry density of not less than 110 pounds per cubic foot and it shall be of such a nature and character that it can be compacted to the specified densities in a reasonable length of time. Topsoil, silt and clay shall not be considered common fill. Common fill shall not be placed under pavements, structures, slabs, utilities or roadways.

D. Sand Borrow:

- 1. Sand borrow shall consist of clean, inert, hard, durable grains of quartz or other hard durable rock free from clay and loam or other deleterious or organic material. Sand borrow may be used as pipe bedding. The sand borrow shall conform to Massachusetts Highway Department (MHD) Specification Designation, M1.04.1, and the following gradation:

Sieve Size	Percent Passing by Weight
1/2-inch	100
3/8-inch	85-100
No. 4	60-100
No. 16	35-80
No. 50	10-55
No. 200	2-10

E. Structural Fill:

- 1. Structural fill shall consist of gravel and sand consisting of hard durable particles, and free from trash, ice and snow, tree stumps, roots and other organic and deleterious or organic matter. Structural fill shall be used

for trench backfill beneath building foundations and slabs and roadways below the two (2) foot gravel subbase layer, and for replacement of soft organic soils below pipe and culvert inverts and below structures. Structural fill shall conform to the following gradation requirements.

Sieve Size	Percent Finer by Weight
6-inch	100
No. 4	30-90
No. 40	10-50
No. 200	0-8

F. Gravel Subbase:

- Gravel subbase shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The gravel subbase shall be used in the upper two (2) feet of trench backfill material immediately below pavements and graded in accordance with Massachusetts Highway Department (MHD) specification section M1.03.1 as indicated below:

Sieve Size	Percent Passing by Weight
3-inch	100
1-1/2-inch	70-100
1/4-inch	50-85
No. 4	30-60
No. 200	0-10

G. Crushed Stone:

- Crushed stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, or other deleterious or organic material. Crushed stone may be used as pipe bedding and initial backfill under culverts, support of sewer and drainage structures, as a working mat or as a filter around perforated drain pipe. Crushed stone shall be wrapped in filter fabric, placed in maximum 6-inch thick layers, loose measure, and compacted with a minimum of four (4) passes of a vibratory plate or roller compactor. The crushed stone shall be uniformly blended and shall conform to the following requirements.

Sieve Size	Percent Passing by Weight
1-inch	100
3/4-inch	90-100
5/8-inch	---
1/2-inch	10-50
3/8-inch	0-20
No. 4	0-5
No. 8	---

H. Filter Fabric:

1. Filter Fabric used as a drainage medium shall consist of a nonwoven fabric made from polypropylene or polyethylene filaments or yarns. The fabric shall be inert to organic chemicals commonly encountered in the soil.

The fabric shall conform to the following recommended property tests:

Property	Unit	Test Method	Minimum Value
Weight	oz/sy	ASTM D-3776	4.5
Grab Strength	lbs	ASTM D-4632	120
Grab Elongation	percent	ASTM D-4632	55
Trapezoid Tear Strength	lbs	ASTM D-4533	50
Mullen Burst Strength	psi	ASTM D-3786	210
Puncture Strength	lbs	ASTM D-4833	70

Edges and ends of filter fabric shall overlap a minimum of two feet.

I. Controlled Density Fill:

1. Controlled density fill shall consist of a cementitious hard excavatable mixture of aggregate, Portland Cement, Fly Ash and air entraining admixtures. The material shall be of the type specified in the Massachusetts Highway Department 1995 Standard Specifications for Highway and Bridges, Type 2E. Controlled density fill shall be used as trench backfill material at locations where compaction equipment is inaccessible as directed by the Engineer.

2.2 EQUIPMENT

- A. The compaction equipment shall be selected by the Contractor, and shall be capable of consistently achieving the specified compaction requirements. The selected compaction equipment shall meet the following minimum requirements:
  - 1. Manually operated vibratory plate compactors weighing no less than 200 pounds with vibration frequency no less than 1600 cycles per minute.
  - 2. Vibratory steel drum or rubber tire roller weighing at least 12,000 pounds.
  - 3. Water jetting and puddling will not be allowed.

### PART 3 - EXECUTION

#### 3.1 SITE MAINTENANCE

- A. Site Leveling: Grade site as to maintain in a level unrutted condition and to eliminate puddling of surface and subsurface water.

#### 3.2 EXCAVATION

- A. Execution of any earth excavation shall not commence until the related required backfill and fill materials submittals are reviewed by the Engineer and all Engineer's comments satisfactorily addressed.
- B. Carry out program of excavation, dewatering, and excavation support systems to eliminate possibility of undermining or disturbing foundations of existing structures or of work previously completed under this contract.
- C. Do not plow, scrape or dig by machinery near to finished subgrade in a manner that would result in disturbance of subgrade.
- D. Excavate to lines and grades indicated in an orderly and continuous program.
- E. Establish limits of excavation to allow adequate working space for installing forms and for safety of personnel.
- F. Excavate to elevations indicated, or deeper, as directed by the Engineer, to remove unacceptable subgrade material.
- G. Exercise care to preserve material below and beyond the lines of excavations.
- H. Boulders, rock fragments, and concrete less than one cubic yard encountered during excavation shall not be included for payment as rock.

### 3.3 SEPARATION OF EXCAVATED MATERIALS FOR REUSE

- A. Remove only existing pavement and curbing that is necessary for prosecution of work.
- B. Carefully remove loam and topsoil from excavated areas. Store separately for further use or furnish equivalent loam and topsoil as directed.
- C. Carefully remove acceptable material from excavated areas and store separately for further use as backfill material.

### 3.4 TRENCH EXCAVATION

- A. When pipe is to be laid in bedding material or concrete cradle, excavate trench by machinery to, or just below designated subgrade. If material remaining at bottom of trench is disturbed, recompaction shall be required.

### 3.5 DEPTH OF TRENCH

- A. Excavate trenches to depths to permit pipe to be laid with backfill depths at elevations, slopes, or depths of cover indicated on drawings, and at uniform slopes between indicated elevations.

### 3.6 WIDTH OF TRENCH

- A. Make pipe trenches as narrow as practicable and do not widen by scraping or loosening materials from the sides. Make every effort to maintain sides of trenches firm and undisturbed until backfilling has been placed and compacted.
- B. Trench widths shall be as detailed on the drawings.

### 3.7 EXCAVATION NEAR EXISTING STRUCTURES

- A. Discontinue digging by machinery when excavation approaches pipes, conduits, retaining walls, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation in work to be done when incidental to normal excavation and under items involving normal excavation.
- B. Excavate test pits when determination of exact location of pipe or other underground structure is necessary for doing work properly.

### 3.8 REMOVAL OF SUBSURFACE OBSTRUCTIONS

- A. Remove indicated subsurface structures and related obstructions to complete the work.

- B. Promptly notify the Engineer when any unexpected subsurface facilities are encountered during excavation such as utility lines and appurtenances, walls and foundations.

### 3.9 UNAUTHORIZED EXCAVATION

- A. When the bottom of any excavation for structures is taken out beyond limits indicated or specified, backfill, with screened gravel and crushed stone wrapped with non-woven geotextile fabric or with 1,500 psi concrete.

### 3.10 REUSE AND DISPOSAL OF SURPLUS EXCAVATED MATERIALS

- A. Reuse surplus acceptable excavated materials for backfill; deposit neatly and grade so as to make or widen fills, flatten side slopes, or fill depressions; or legally dispose off-site; all as directed or permitted and without additional compensation.

### 3.11 SUBGRADE PREPARATION AND PROTECTION

- A. Remove loam and topsoil, loose vegetable matter, stumps and large roots from areas upon which embankments will be built or material will be placed for grading. Shape subgrade as indicated on drawings, and prepare by forking, furrowing, or plowing so that the first layer of new material placed thereon will be well bonded to it.
- B. As directed by the Engineer, overexcavate unacceptable materials below the foundation subgrade. Backfill the overexcavation with compacted screened gravel or crushed stone wrapped with nonwoven geotextile fabric. In no case shall the screened gravel be placed directly on the exposed subgrade prior to placing the geotextile fabric.
- C. Proof roll the foundation subgrade prior to backfilling and filling operation, or placing foundation concrete.
- D. Proof roll the pipe trench foundation subgrade prior to backfilling and filling operation, or placing soil-supported pipeline.
- E. Utilize excavating equipment equipped with a toothless or smooth edged, excavating bucket to expose the pipe trench foundation subgrade to avoid disturbance of the bearing surface. Tamp the exposed subgrade with the excavating bucket prior to backfilling and filling operation, or placing soil-supported pipeline.

### 3.12 CARE AND RESTORATION OF PROPERTY

- A. Enclose uncut tree trunks adjacent to work in wooden boxes of such height as may be necessary for protection from injury from piled material, equipment, operations, or otherwise due to work. Operate excavating machinery and cranes of suitable type with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.
- B. Cut all branches, limbs, and roots smoothly and neatly without splitting or crushing. Neatly trim, cut the injured portions and cover with an application of grafting wax or tree healing paint as directed by the Engineer.
- C. Protect cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations by suitable means or dig up and temporarily replant and maintain. After construction operations have been substantially completed, replant in original positions and care for until growth is reestablished. If cultivated hedges, shrubs, and plants are injured to such a degree as to effect their growth or diminish in their beauty or usefulness, replace by items of equal kind and quality existing at the start of the work.
- D. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces when their treads or wheels of which are so shaped as to cut or otherwise damage such surfaces.
- E. Restore surfaces damaged by the Contractor's operations to a condition at least equal to that in which they were found immediately before work commenced. Use suitable materials and methods for such restoration.

### 3.13 BACKFILLING - GENERAL

- A. Do not place frozen materials in backfill or place backfill upon frozen material. Remove previously frozen material or treat before new backfill is placed.
- B. Do not place, spread, roll or compact fill material during unfavorable weather conditions. If interrupted by heavy rain or other unfavorable conditions, do not resume until ascertaining that the moisture content and density of the previously placed soil are as specified.
- C. Do not use puddling, ponding, flooding or water jetting as a means of compaction.
- D. Reuse suitable excavated materials when performing backfill operations, at no additional cost to the Owner.

### 3.14 STRUCTURAL FILL AND BACKFILL UNDER STRUCTURES

- A. Compact fill and backfill under structures and pavements with screened gravel, crushed stone, select borrow, or fine aggregate as specified and indicated.

### 3.15 NON-STRUCTURAL BACKFILL AROUND STRUCTURES

- A. Use acceptable materials for non-structural backfill around structures and compacted as specified and indicated.
- B. Deposit material evenly around structure to avoid unequal soil pressure.
- C. Do not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking, or other damage.

### 3.16 MATERIAL FOR FILLING AND EMBANKMENTS

- A. Use acceptable materials for filling and building embankments unless otherwise indicated.

### 3.17 PLACING AND COMPACTING EMBANKMENT MATERIAL

- A. Compact fill material as specified and indicated.
- B. Perform fill operation in an orderly and systematic manner using equipment in proper sequence to meet the specified compaction requirements.
- C. Place fill on surfaces which are free of unacceptable materials.
- D. Begin filling in lowest section of work area. Grade surface of fill approximately horizontal but provide with sufficient longitudinal and transverse slope to allow for runoff of surface water from every point.
- E. Conduct filling so that no obstruction to drainage from other sections of fill area is created at any time.
- F. Install temporary dewatering sumps in low areas during filling operation where excessive amounts of rain runoff collect.
- G. Reduce moisture content of fill material in source area by working it over under warm and dry atmospheric conditions. A large disc harrow with two to three foot diameter disks may be required for working soil in a drying operation.
- H. Compact uniformly throughout. Keep surfaces of fill reasonably smooth and free from humps and hollows which would prevent proper and uniform compaction. Do not permit hauling equipment to follow a single track on the same layer but direct equipment to spread out to prevent overcompaction in localized areas. Take care in obtaining thorough compaction at edges of fill.
- I. Slightly slope surface of fill to ensure drainage during periods of wet weather. Do not place fill while rain is falling or after a rain-storm until the Engineer



considers conditions satisfactory. During such periods and upon suspension of filling operations for any period in excess of 12 hours, roll smooth the surface of fill using a smooth wheel static roller to prevent excessive absorption of rainfall and surface moisture. Prior to resuming compaction operations, remove muddy material off surface to expose firm, compacted material, as determined by the Engineer.

- J. When fill is placed against an earlier fill or against in-situ material under and around structures, including around piping beneath structures or embankments, slope junction between two sections of fill, 1 vertical to 1.5 horizontal. Bench edge of existing fill 24-in. [60 cm] to form a serrated edge of compact stable material against which to place the new fill. Ensure that rolling extends over junction between fills.
- K. When fill is placed directly upon another older fill, clean surface thoroughly of debris and remove any loose material. Then proof roll the entire old surface.
- L. After spreading each loose lift to the required thickness and adjusting its moisture content as necessary, roll with sufficient number of passes to obtain the required compaction. One pass is defined as the required number of successive trips which by means of sufficient overlap will insure complete coverage and uniform compaction of an entire lift. Do not make additional passes until previous pass has been completed.
- M. In case material of any fill sinks and weaves under roller or under hauling units and other equipment, required degree of compaction is not being obtained. Reduce the moisture content. If such sinking and weaving produces surface cracks, suspend operations on that part of the embankment until it becomes sufficiently stabilized. Ideal condition in fill is that attained when the entire fill below the surface being rolled is so firm and hard as to show only the slightest weaving and deflection as roller passes. Spread out rolling operations over the maximum practicable area to minimize condition of sinking and weaving.
- N. If because of defective workmanship, compaction obtained over any area is less than that required, remedy condition at no cost to Owner. If additional rolling or other means fail to produce satisfactory results, remove material in that area down to a level of satisfactory density. Perform removal, replacement, and rerolling without additional compensation.

### 3.18 CONTROLLED DENSITY FILL (CDF)

- A. Quality Control Testing During Construction
  - 1. Slump: ASTM C143; one test at point of discharge for each day's placement; additional tests when CDF consistency seems to have changed.

2. Compression Test Specimen: ASTM C31; one set of four (4) standard cylinders for each compression strength test, unless otherwise directed.
3. Compressive Strength Tests: ASTM C39; one set for each day's pour plus additional sets for each 100 cu. yds more than the first 50 cu. yds placed in any one day; two specimens tested at 28 days, and two specimens tested at 90 days.
4. Test results will be reported in writing to Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of placement, name of testing service, fill type and class, location of fill batch along route, design compressive strength limits at 28 days and 90 days, fill mix proportions and materials, compressive breaking strength, and type of break for both 28 day tests and 90 day tests. Testing will be performed at no additional expense to the Owner.

### 3.19 COMPACTION CONTROL OF BACKFILL, FILL, AND EMBANKMENT

A. Compaction Requirements: The degree of compaction is expressed as a percentage of the maximum dry density at optimum moisture content as determined by ASTM Test D1557, Method C. The compaction requirements are as follows:

Area	ASTM Density Degree of Compaction
Below footings	95%
Below slabs	95%
Pavement base course	92%
Pavement sub-base	95%
General fill below pavement sub-base	92%
Trench backfill - below pavements	95%
- below landscaped areas	90%
- below structures	95%
Other areas	90%

B. Moisture Control:

1. Fill that is too wet for proper compaction shall be disced, harrowed, or otherwise dried to a proper moisture content to allow compaction to the

required density. If fill cannot be dried within 24 hours of placement, it shall be removed and replaced with drier fill.

2. Fill that is too dry for proper compaction shall receive water uniformly applied over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.

C. Unfavorable Conditions:

1. In no case shall fill be placed over material that is frozen. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until the moisture content and the density of the previously placed fill are as specified.
2. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of the day's operations. Prior to terminating work for the day, the final layer of compacted fill shall be rolled with a smooth wheeled roller to eliminate ridges of soil left by compaction equipment.

D. Compaction Control:

1. In place density tests shall be made in accordance with ASTM D1556, D2922 or D2167 as the work progresses, to determine the degree of compaction being attained by the Contractor. Any corrective work required as a result of such tests, such as additional compaction, or a decrease in the thickness of layers, shall be performed by the Contractor at no additional expense to the Owner. In place density tests shall be made at the Contractor's expense by the geotechnical testing laboratory.
2. The Engineer's duties do not include supervision or direction of the actual work by the Contractor, his employees or agents. Neither the presence of the Engineer nor any observation and testing performed by him shall excuse the Contractor from defects discovered in his work at that time or subsequent to the testing.
3. In-place density tests shall be performed as directed by the Engineer:

E. Compaction Methodology:

1. Vibratory mechanical compaction is the preferred method for compaction. Should jetting be proposed by the Contractor, its viability to achieve the required degree of compaction shall be proven on a test section of trench, prior to allowing its use on a widespread basis. Compaction testing shall be used to determine the effectiveness of the jetting operation. Jetting shall be accomplished using a rigid pipe, long

enough to reach deep into the trench. Large volumes of water under high pressure, equivalent to that available from fire hydrants, are necessary for jetting. The Contractor is made aware that municipal water may not be available due to limited supply, especially during the warm weather months. The Contractor shall provide water for jetting operations at his own expense. Jetting locations shall be frequent enough to achieve required compaction.

2. In backfilling trenches, each layer of backfill material shall be moistened and compacted to a density at least equal to that of the surrounding undisturbed earth, and in such a manner as to permit the compaction of the filled trench or excavation with the adjoining earth to provide the required bearing value, so that paving of the excavated and disturbed areas, where required, can proceed immediately after backfilling is completed.

### 3.20 ALLOWANCE FOR SHRINKAGE

- A. Build embankments or backfill to a height above finished grade which will, in the opinion of the Engineer, allow for the shrinkage or consolidation of material. Initially, provide at all points, an excess of at least one percent of total height of backfill measured from stripped surface to top of finished surface.
- B. Supply specified materials and build up low places as directed, without additional cost if embankment or backfilling settles so as to be below the indicated level for proposed finished surface at any time before final acceptance of the work.

### 3.21 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION 02210

## SECTION 02498

### RESTORATION OF DISTURBED AREAS

#### PART 1 - GENERAL

##### 1.1 WORK INCLUDED

- A. The work covered under this Section of the Specifications includes furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with restoration to preconstruction conditions of all areas affected by work under this Contract, complete in accordance with the Drawings and Specifications.

##### 1.2 GENERAL

- A. Remove and reset or replace all fencing, guardrails, trees, shrubs, lawns, posts, benches, curbing, signs, and other items which interfere with the progress of the work. Shore or guy any utility pole as required by the utility company.
- B. Contractor shall make arrangements and notify property owners for any work which will affect their properties and indicate what will be done to restore the area after construction is completed.
- C. Contractor shall notify all utility companies and local, state and federal authorities which will be affected by his work.
- D. Wherever streets, lawns, or sidewalks within or outside the contract limit lines have been excavated in fulfilling the work required under this Contract, the Contractor shall furnish and install all materials necessary to bring finished surfaces level with the existing adjacent surfaces.
- E. If, during the progress of the contract work, any water pipe, sewer, conduit, drain, or other construction is damaged as a result of operations under this Contract, the Contractor shall repair all such damage and restore work to its original condition.
- F. The Contractor shall restore all disturbed and damaged areas upon completion of the work in the affected area or prior to commencing work on an additional street. Failure to perform such restoration shall be cause for the Owner to engage outside work forces to do the required work and all related costs shall be deducted from payments due to the Contractor for work performed under this Contract.

### 1.3 TRENCHES NOT IN PAVED AREAS

- A. Where the trench occurs adjacent to paved streets in shoulders, or in sidewalks, the Contractor shall thoroughly consolidate the backfill and shall maintain the surface as the work progresses. If settlement takes place, he shall immediately deposit additional fill to restore the level of the ground. In areas adjacent to streets and highways which are not to be loam and seeded, the top 12-inch layer of trench backfill shall consist of compacted dense-blend gravel borrow or sand and gravel as required to match existing conditions. Trench backfill in unpaved roadways shall have the top 18-inch layer of backfill consist of compacted sand and gravel.
- B. If in the opinion of the Engineer, the top 12-inch layer is unsuitable for use as base course, he may order the Contractor to remove this layer and to provide material that meets specifications.
- C. For locations where lawn exists, the Contractor shall restore the surface with topsoil and seed as detailed.

END OF SECTION 02498

## SECTION 02521 – CONCRETE PAVERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Concrete pavers set in latex mortar setting bed
- B. Related Sections include the following:
  - 1. 02210 - Earth Excavation, Backfill and Grading
  - 2. 02525 – Paving and Surfacing
  - 3. 02522 – Concrete Paving

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Protect concrete pavers and aggregate during storage and construction against soiling or contamination from earth and other materials.
  - 1. Cover pavers with plastic or use other packaging materials that will prevent rust marks from steel strapping.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store liquids in tightly closed containers protected from freezing.

#### 1.4 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace concrete paver work damaged by frost or freezing. Do not place pavement when base surface or ambient temperature is less than 40 degrees F (4 degrees C) or if base surface is wet or frozen.

- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.5 WARRANTY

- A. All materials shall be warranted by the Manufacturer to be of uniform quality within manufacturing tolerances.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
  - 1. Concrete Pavers:
    - a. Hanover Architectural Products, Inc.
    - b. Unilock.

### 2.2 CONCRETE PAVERS

- A. Colors: Standard cream color or approved equal.
- B. Finish: Standard – Exposed aggregate finish
- C. Chamfer: No chamfer
- D. Size: Nominal 4" x 8" x 3" or approved equal.
- E. Concrete Pavers shall be Prest Brick Pavers as manufactured by Hanover Architectural Products, 5000 Hanover Road, Hanover, PA 17331 (717) 637-0500 or approved equal.
- F. Provide pavers meeting the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence shall not be a cause for rejection.
  - 1. Average compressive strength 8000 psi (55MPa) with no individual unit under 7,200 psi (50 MPa).
  - 2. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
  - 3. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C1645-06, with no breakage greater than 1.0% loss in dry weight of any individual unit. Conduct this test method not more than 12 months prior to delivery of units.



Note: Efflorescence is a whitish powder-like deposit that sometimes appears on concrete products. Calcium hydroxide and other water-soluble materials form or are present during the hydration of Portland cement. Pore water becomes saturated with these materials, and diffuses to the surface of the concrete. When this water evaporates, the soluble materials remain as a whitish deposit on the concrete surface. The calcium hydroxide is converted to calcium carbonate during a reaction with carbon dioxide from the atmosphere. The calcium carbonate is difficult to remove with water. However, the efflorescence will wear off with time, and it is advisable to wait a few months before attempting to remove any efflorescence. Commercially available cleaners can be used, provided directions are carefully followed. Some cleaners contain acids that may alter the color of the pavers.

- G. Accept only pigments in concrete pavers conforming to ASTM C 979. ACI Report No. 212.3R provides guidance on the use of pigments.
- H. Maximum allowable breakage of product is 5%.

## 2.3 ACCESSORIES

- A. Flush Granite Curb edge restraint: Comply with requirements in Section 02524 "Granite Curb"
- B. Asphaltic Joint Filler: Asphalt impregnated fiberboard, ASTM D1751, 1/2 inch (12mm) thick.

## 2.4 AGGREGATE SETTING-BED MATERIALS

- A. Graded Aggregate for Subbase: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 57.
- B. Latex Mortar Leveling Course: Latex mortar leveling course shall be 254 Platinum as manufactured by Laticrete International Inc., 1 Laticrete Park North, Bethany, CT 06524 (203) 393-0010 or approved equal.
  - 1. Surface Preparation: All surfaces should be between 40°F (4°C) and 90°F (32°C) and structurally sound, clean and free of all dirt, oil, grease, paint, concrete sealers or curing compounds. Rough or uneven concrete surfaces should be made smooth with a wood float(or better) finish. Dry, dusty concrete slabs or masonry should be dampened, and excess water swept off. Installation may be made on a damp surface. Concrete slabs must be plumb and true to within 1/4" (6 mm) in 10 ft (3 m).
- C. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.
  - 1. Provide sand of color needed to produce required joint color.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Verify compacted subgrade is ready to support paving, reinforced subbase and imposed loads, free of frost, smooth and properly compacted.
- B. Verify gradients and elevations of base are correct, and proper drainage has been provided so water does not stand in the area to receive reinforced concrete slab and pavers.
- C. Beginning of installation means acceptance of existing conditions.

### 3.2 PREPARATION

- A. Vacuum clean reinforced concrete slab to remove dirt, dust, debris, and loose particles.
- B. Remove substances, from reinforced concrete slab including curing and sealing compounds, form oil, and laitance.
- C. Proceed with concrete paver installation only after deficient subgrades have been corrected and are ready to receive setting bed for concrete pavers.

### 3.3 INSTALLATION, GENERAL

- A. Do not use concrete pavers with chips, cracks, voids, discolorations, and other defects that might be visible or cause staining in finished work.
- B. Mix concrete pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
  - 1. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. A block splitter may be used. Hammer cutting is not acceptable.
- C. Joint Pattern: As indicated
- D. Tolerances: Do not exceed 1/16-inch (1.6-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches (3 mm in 600 mm) and 1/4 inch in 10 feet (6 mm in 3 m) from level, or indicated slope, for finished surface of paving.
- E. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide joint filler as backing for sealant-filled joints where indicated. Install joint filler before setting pavers. Sealant materials and installation are specified in Division 7 Section "Joint Sealants."
- F. Expansion and Control Joints: Provide joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.

- G. Provide edge restraints as indicated. Install edge restraints before placing concrete pavers.
  - 1. Install job-built concrete edge restraints to comply with requirements in Section 02522 "Concrete Paving."

### 3.4 AGGREGATE SETTING-BED PAVER APPLICATIONS

- A. Compact subgrade uniformly to at least 95 percent of ASTM D 1557 laboratory density.
- B. Place dense graded subbase over compacted subgrade. Provide compacted thickness indicated. Compact dense graded subbase to 100 percent of ASTM D 1557 maximum laboratory density.
- C. Install reinforced concrete slab to comply with requirements in Section 02522 "Concrete Paving."
- D. Place latex mortar setting bed and screed to a thickness of 1" (25 mm), taking care that moisture content and density remains constant until pavers are set and leveled.
- E. Set pavers with a minimum joint width of 1/16 inch (1.6 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
  - 1. When installation is performed with mechanical equipment, use only concrete pavers with spacer bars on sides of each unit.
- F. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
  - 1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
  - 2. Before ending each day's work, fully compact installed concrete pavers to within 36 inches (900 mm) of the laying face. Cover open layers with non-staining plastic sheets overlapped 48 inches (1200 mm) on each side of the laying face to protect it from rain.
- G. Spread dry sand and fill joints immediately after vibrating pavers into setting bed. Vibrate pavers and add sand until joints are completely filled, then remove excess sand.
- H. Do not allow traffic on installed pavers until sand has been vibrated into joints.
- I. Repeat joint-filling process 30 days later.

END OF SECTION 02521

## SECTION 02522 – CONCRETE PAVING

### PART - 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This section includes the following:

1. Reinforcement for Concrete Pavement.
2. Concrete Curbs

- B. Related sections include the following:

1. 02210 – Earth Excavation, Backfill, Fill and Grading.
2. 02521 – Concrete Pavers.
3. 02525 – Paving and Surfacing.

#### 1.3 REFERENCES, STANDARDS, CODES, REGULATIONS

- A. Refer to the latest editions of the following, unless otherwise specified herein:

1. ACI Manual of Concrete Practice
2. AWS D1.4 Structural Welding Code – Reinforcing Steel
3. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
4. CRSI Manual of Standard Practice
5. ASTM C33 - Concrete Aggregates
6. ASTM C94 - Ready Mixed Concrete
7. ASTM C150 - Portland Cement
8. ASTM C260 - Air-Entraining Admixtures for Concrete
9. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete
10. ASTM C494 - Chemical Admixtures for Concrete
11. All applicable State and local codes and regulations
12. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces

- B. Where one or more of the references cited conflict, the more stringent shall govern.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle materials under provisions of Division 1 specification sections.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

#### 1.5 PROJECT CONDITIONS

- A. Do not place pavement when base surface or ambient temperature is less than 40 degrees F (4 degrees C) or if base is wet or frozen.
- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

#### 1.6 WARRANTY

- A. All materials shall be warranted by the Manufacturer to be of uniform quality within manufacturing tolerances.

### PART - 2 PRODUCTS

#### 2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150 Normal-Type I Portland type, gray color.
- B. Fine and coarse Aggregates: ASTM C33
- C. Fiber reinforcing to be added per manufacturer's recommendations.
- D. Water: Clean and not detrimental to concrete

#### 2.2 FORM MATERIALS

- A. Unless otherwise indicated, construct formwork with plywood, metal, metal framed plywood faced or other acceptable panel type materials to provide continuous, straight, smooth, exposed surfaces.
  - 1. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
  - 2. Provide forms that comply with US Product Standard PS 1 and the following:
    - a. B-B High Density Overlaid Concrete Form, Class I.

- b. B-B (Concrete Form) Plywood, Class I, exterior grade or better, mill oiled and edge sealed, with each piece bearing legible inspection trademark.
- B. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- C. Form Ties: Provide factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
- 1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1/2 inch (12.7 mm) inside concrete for steel ties and 1/4 inch (6.35 mm) for wire ties.
  - 2. Unless otherwise indicated, provide form ties which will not leave holes larger than 1 inch (25 mm) diameter in concrete surface.

## 2.3 REINFORCEMENT

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed billet steel bars, epoxy coated.
- B. Epoxy Coated Reinforcing Bars: ASTM A615, Grade 60, deformed bars, epoxy coated, with less than 2% damaged coating in each 12" bar length.
- 1. Provide Grade 60 bars No. 5, except as otherwise noted.
- C. Joint Dowel Bars: ASTM A615, Grade 60, stainless-steel bars, cut true to length with ends square and free of burs.
- D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place.
- 1. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, stone, broken block or pieces of concrete.
  - 2. For concrete-on-grade, use supports with sand plates or horizontal runners if base material will not adequately support chair legs.
  - 3. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected, stainless steel protected, or special stainless complying with CRSI Classes, C, D, or E respectively.
- E. Shop fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with ACI 315. In case of fabricating errors, do not rebend or straighten reinforcement in manner that will injure or weaken material.

## 2.4 ACCESSORIES

- A. Curing Compound: SF TT-C-800, Type 1, 30 percent solids.
- B. Preformed Joint Filler and Backer Rod: Expanded polyethylene joint filler and backer rod, as manufactured by A. H. Harris and Sons, Medfield, Mass. or approved equal.
- C. Sealant shall be "Sikaflex-1A" as manufactured by Sika Corporation, Lyndhurst, New Jersey or approved equal. Sealant shall be in accordance with Federal Specification TT-S-00230C, Type II, Class A and ASTM C-920, Type S, Grade NS, Class 25.

## 2.5 ADMIXTURES

- A. Air Entrainment: ASTM C260.
- B. Use accelerating admixture in cold weather only when approved by Owner's Representative. Use of admixture will not relax cold weather placement requirements.
- C. Use set-retarding admixtures during hot weather only when approved by Owner's Representative.
- D. Use water-reducing admixture in all concrete.
- E. Use air-entraining admixture in exterior exposed concrete.

## 2.6 CONCRETE MIX

- A. Mix concrete in accordance with ASTM C94.
- B. Provide concrete of the following characteristics:
  - 1. Compressive Strength of 28 days: 4000 psi (276 mPa). ( 4500psi if subject to de-icers )
  - 2. Slump: of 3 inches
  - 3. Air Content: Between 5% and 7%

## PART - 3 EXECUTION

### 3.1 INSPECTION

- A. Verify compacted subgrade and base is ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are as shown on the drawings.
- C. Beginning of installation means acceptance of existing conditions.

### 3.2 PREPARATION

- A. Remove water from excavations. Before placement of concrete, remove wood chips, shavings, and hardened concrete from forms.
  - 1. Clean all equipment.
  - 2. Wet forms, except in freezing weather, or oil forms.
- B. Earth shall be uniformly moist when concrete is placed. Sprinkling method shall not be such as to form mud or pools of water. Watering subgrade immediately prior to placing concrete is not sufficient to make the soil uniformly moist.
- C. Notify other crafts to permit installation of their work. Coordinate installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
- D. Notify Owner's Representative a minimum of 24 hours prior to commencement of concreting operations.

### 3.3 FORMING

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure.
- B. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- C. Design and fabricate formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- D. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades.
- E. Tolerances: Set forms with the upper edge true to line and grade with an allowable tolerance of 1/8 inch (3 mm) in any 10 foot (3 m) long section
- F. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

### 3.4 REINFORCEMENT

- A. Comply with CRSI's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, oil, concrete splatter from previous pours, and other materials which reduce or destroy bond with concrete.



- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- D. Install welded wire fabric of same gage in as long of lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps of adjacent widths to prevent continuous laps in either direction.
- E. Interrupt reinforcement at expansion joints.
- F. Place reinforcement to achieve slab and curb alignment as detailed.

### 3.5 JOINTS

- A. Place expansion joints at 20 foot maximum intervals or as shown on plan to correct elevation and profile.
- B. Place joint filler and sealant where pavement meets curbing or structures including building, light bases, hydrants, and at other conditions as shown on drawings.
- C. Apply joint sealer where indicated on drawings. Apply in accordance with manufacturer's instructions.

### 3.6 PLACING CONCRETE

- A. Field Inspection: Do not place concrete until forms and reinforcing steel have been inspected and approved.
  - 1. Place Ready-Mix concrete within specified time after batching.

Below 40 degrees F (4 degrees C)	See Cold Weather Placing
40 - 85 degrees F (4 - 29 degrees C)	90 minutes
86 - 90 degrees F (30 - 32 degrees C)	75 minutes
Above 90 degrees F (32 degrees C)	60 minutes
  - 2. Adding Water: Do not add water after initial introduction of mixing water for batch except when slump of concrete is less than that specified upon arrival at job site, and maximum water/cement ratio for mix has not been exceeded
    - a. Add water to bring slump within specified limits. Turn drum at least 30 additional revolutions at mixing speed. Do not add water to batch at any later time.
    - b. Insure that concrete strength meets specified requirements, and water does not exceed maximum amount specified in CONCRETE MIX DESIGN.
- B. General: Comply with ACI 304, and as specified herein.
  - 1. Deposit concrete continuously or in layers of such thickness that concrete will not be placed on concrete which has hardened sufficiently to cause formation of seams or

planes of weakness.

2. If section cannot be placed continuously, provide construction joints. Deposit concrete as nearly as practicable to its final location to avoid segregation.

C. Placing Concrete in Forms:

1. Consolidate placed concrete by high frequency mechanical vibrating equipment, supplemented as necessary by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

1. Do not use vibrators to transport concrete inside forms.
2. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine.
3. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing segregation of mix.\

- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in continuous operation, within limits of construction joints, until placement of panel or section is completed. Maintain reinforcing in proper position during concrete placement operations.

- E. Placing Concrete Sidewalks & Pads: Place concrete in forms in one (1) layer of such thickness that when consolidated and finished, sidewalks will be of thickness indicated in drawings.

- F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures; comply with ACI 306.

- G. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

- H. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.

- I. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

- J. Place concrete to pattern indicated.

3.7 BROOM FINISHING

- A. Exposed concrete shall have a Medium Broom, non-slip finish, saw-cut joints, tooled edge, and scored.

- B. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.
- C. Liquid Chemical Hardener Finish: Apply chemical hardener finish after complete curing and drying of the concrete surface.
  - 1. Dilute liquid hardener with water, and apply in three (3) coats; first coat, 1/3 strength; second coat, 1/2 strength; third coat, 2/3 strength. Evenly apply each coat, and allow 24 hours for drying between coats.
  - 2. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instructions.
  - 3. After final coat of chemical hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

### 3.8 CONCRETE PAVEMENT CURING AND PROTECTION

- A. Curing of the finished concrete surface shall be started as soon as it is possible to do so without damaging the surface. The surface shall be wetted or otherwise kept moist throughout a minimum six (6) day curing period through the use of polyethylene film, wetted burlap, or by a spray applied curing compound. The concrete surface shall be protected from all traffic or other disturbance during the curing period.
- B. The Contractor shall provide adequate surveillance for all poured-in-place concrete pavements until concrete has set firmly, to prevent unwarranted markings of the concrete surface. Any unauthorized marking or graffiti in the finished surfaces shall be a cause for rejection by the Owner's Representative and replacement by the Contractor.
- C. Adequate protection shall be provided where temperatures of forty degrees (40 degrees F.) or lower occur during placing of concrete, and during the early curing period. The minimum temperature of fresh concrete after placing, and for the first three (3) days shall be maintained above fifty-five degrees (55 degrees F). In addition to the above requirements, an additional three (3) days of protection from freezing shall be maintained.

END OF SECTION

## SECTION 02524 – GRANITE CURB

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Removing and resetting existing granite curb as needed
  - 2. All associated items and operations required to complete the installations, including surface preparation, concrete support, jointing, and finishing.

#### 1.3 REFERENCE MATERIAL

- A. References herein are made in accordance with the following abbreviations and, all work under this Section shall conform to the latest editions as applicable.
- B. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.
- C. ANSI/ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- D. ANSI/ASTM D1752 – Standard Specification for Preformed Sponge Rubber, Cork, and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- E. ASTM C33 – Standard Specification for Concrete Aggregates.
- F. ASTM C94 – Specification for Ready-Mixed Concrete.
- G. ASTM C150 – Standard Specification for Portland Cement.
- H. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
- I. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

## SECTION 02525

### PAVING AND SURFACING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

##### 1.2 SUMMARY

- A. Scope of Work
  - a. Environmental requirements defined in this Specification shall dictate permissible conditions for performing paving and surfacing work.
  - b. Permanent pavement of the parking area at Fisherman's Beach as indicated on the Drawings. A portion of which shall be reconstructed to full depth and a portion of which shall be milled and overlaid. Restripe parking lines to match pre-construction condition.
  - c. Streets, driveways, parking areas or sidewalk pavements damaged or disturbed by the Contractor's operations shall be repaired, replaced or restored in accordance with the requirements specified herein and as directed for the respective type of pavement replacement and in a manner satisfactory to the Owner.
  - d. Trench paving shall be provided for all excavations where water main work is conducted.
  - e. Installation of granite curb and raising castings where indicated on the Drawings.
- B. This section includes the following:
  - 1. Removal and replacement of existing bituminous pavement and subbase.
  - 2. Mill and overlay existing bituminous pavement.
  - 3. Installation of permanent trench pavement.
  - 4. Removal and replacement of curb and gutter.
  - 5. Removal and resetting of curbing.

6. Raising and adjusting castings and valve boxes.
  7. Installation of pavement markings.
- C. Related sections include the following:
1. Section 02210 – Earth Excavation, Backfill, Fill and Grading

### 1.3 GUARANTEE

- A. All pavement placed shall be maintained by the Contractor for a period of one year from substantial completion. During this period all areas, which have settled or are unsatisfactory for traffic shall be refilled and replaced at the Contractor's expense.

### 1.4 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES.
1. Product Data: Submit complete data on materials to be used in construction, including gradation tests for granular base.
  2. Design Data: Submit design mix for bituminous base, binder and top course.
  3. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

### 1.5 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 and as specified.
- B. Laboratory Testing Required:
1. The bituminous mixture shall be compacted to at least 95% of the density achieved on the laboratory testing of the design mix for the project. The density of the Bituminous Concrete Pavement will be determined by using the following test: Nuclear Density Gauge Method ASTM D2950.
- C. Thickness: Test in-place asphalt concrete courses for compliance with requirements for thickness. Repair or remove and replace unacceptable paving as directed by Engineer. In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:
1. Binder Course: 1/4-inch, plus no minus.
  2. Surface Course: 1/4-inch, plus no minus.

## 1.6 PROJECT\SITE CONDITIONS\PROJECT DESCRIPTION

### A. Environmental Requirements:

1. Do not place materials when underlying surface is muddy, frozen, or has frost, snow, or water thereon.
2. Do not place concrete when air temperature at time of placement, or anticipated temperature for following 24 hours, is lower than 40°F or higher than 90°F.
3. Apply prime and tack coats when ambient temperature is above 50 deg.F (10 deg.C), and when temperature has not been below 35 deg.F (1 deg.C) for 12 hours immediately prior to application.
4. Base course may be placed when air temperature is above 30 deg.F (-1 deg.C) and rising.
5. Grade Control: Establish and maintain required lines and elevations.

### B. Existing Conditions:

1. Drawings show approximate location of pavement work and existing structures within and adjacent to the work. Existing conditions drawings are not guaranteed and Contractor shall verify all field conditions prior to beginning the work.
2. The paving thicknesses specified may be increased based on permit or field requirements. Payment for additional thickness shall be made at the unit price bid in the proposal.

## 1.7 SEQUENCING AND SCHEDULING

- A. Paving of the Fisherman's Beach Parking Lot shall be coordinated with the Town at least four (4) weeks prior to beginning the work. Contractor shall work on continuous days to complete the work to minimize downtime of the parking lot.
- B. The Contractor shall provide temporary markings on the temporary pavements where existing markings are removed, at no additional cost to the Owner.
- C. Use of steel plates require the Contractor notify Owner's Public Works Department prior to use. If approved, steel plates shall be recessed into the roadway and welded as required.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Asphalt:
  - 1. Ensure that asphalt replacement conforms to Class I Bituminous Concrete, Type I-1, MHD - 460.
  - 2. Asphalt mixtures shall be within the composition limits for courses in accordance with MHD M3.11.03, and Table A.
  
- B. Concrete:
  - 1. Bituminous Concrete Base Course and Bituminous Tack Coat shall conform to the applicable subsections of Section 420, Class I Bituminous Concrete Base Course, Type I-1 of the "Standard Specifications". Tack coat shall be RS-1 emulsion.
  - 2. Bituminous Concrete Pavement shall conform to the applicable subsections of Section 460, Class I Bituminous Concrete Pavement, Type I-1 of the "Standard Specifications".
  
- C. Gravel
  - 1. Sub-grade material shall be new processed gravel conforming to MHD specification M1.03.1 "Processed Gravel for Sub-Base".
  
- D. Lane Marking Paint
  - 1. Fast Drying White Traffic Paint and Fast Drying Yellow Traffic Paint as specified in the "Standard Specifications" under Sections M7.01.10, and M7.01.11, respectively.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protection:
  - 1. Existing Roadway:
    - a. Saw cut existing pavement to required width and depth to avoid damage to adjacent pavement, curbs, gutters, or other structures and as indicated on the drawings.
    - b. Roadways which require full depth pavement reclamation and contain existing granite curbing shall have full depth reclamation end 24 inches away from the curbing. Limited depth excavation shall occur within 24 inches of the curbing to ensure the granite curb remains in place.

## PAVING AND SURFACING

02525-4



B. Surface Preparation:

1. Pavement Subbase:

a. The subbase to be placed under pavement shall be a minimum of 12-inches thick after compaction. Subbase shall be evenly spread and thoroughly compacted in accordance with Section 02210. Add approved suitable material to bring to required grade as necessary before placing base course.

b. The subbase shall be compacted to not less than 95 percent of the maximum dry density of the material as determined by ASTM D1557 Method C at optimum moisture content. All loose material shall be removed from the surface.

c. Complete subbase preparation, including dynamic compaction, for full width before placing surfacing materials.

d. Proof Roll the prepared subbase. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

2. Subgrade:

a. Bituminous concrete base and wearing courses for Town streets and parking areas shall be spread and compacted to a finished thickness of not less than 4-inches (2-1/2-inch binder course, 1-1/2-inch top course) on all Town and privately owned roadways and parking areas. A smooth even surface shall be produced.

b. Complete subgrade preparation, including dynamic compaction, for full width before placing surface materials.

c. Stabilize subgrades in so that loaded construction vehicles do not cause rutting or displacement when depositing materials.

d. Apply tack coat at a rate of 0.05 to 0.10 gallons per square yard over the binder course. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatiles.

3. Raising and Adjusting Castings:

a. Prior to top course paving, the Contractor shall raise all existing utility boxes, valve boxes, drainage castings, etc., to proper grade prior to paving. The Contractor shall replace all gate valve boxes, which are adjusted, with boxes meeting the municipality standards unless the Town agrees that the salvaged box is

acceptable for reuse. Contractor shall notify all other utilities to obtain their requirements prior to permanent paving taking place.

- b. Castings owned by private utilities shall be raised by the responsible utility. The Contractor shall be responsible for coordinating this work.
- c. The method of adjusting these castings shall be as follows: Cut around catch basin or manhole castings a minimum of 8 inches from casting. Excavate and if required rebuild up to 12 inches of masonry below the bottom of the casting. Backfill with suitable material and compact to bottom of casting. Place high, early strength cement or bituminous concrete collar, as directed by the Authority, to approximately 1½ inches below the raised casting grade.
- d. The method of raising valve boxes shall be as follows: Cut around valve box a minimum of 8 inches from valve box. Excavate as required and raise the valve box. Pour high early strength cement or bituminous concrete collar, as directed, to approximately 1½ inches below the top of the valve box.
- e. Castings which need to be raised or adjusted to complete final top course full-width paving shall be done immediately prior to paving.

## 3.2 INSTALLATION

### A. General

- 1. Pavement depths shall be as shown on the drawings or as specified herein.
- 2. Place bituminous concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225 deg.F (107 deg.C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness. Protect all adjacent construction from staining with mix or damage by mechanical equipment. Clean, repair or replace any construction stained or damaged at no additional cost to the Owner.

### B. Permanent Bituminous Pavement:

- 1. Repair asphalt roads, shoulders, and driveways or streets, cut by line of trench or otherwise damaged during construction operations.
- 2. Compact and finish pavement replacement to provide a smooth transition between new and existing surfaces.
- 3. Where new pavement abuts existing pavement outside the limits of work,

saw cut existing pavement full depth for a smooth, regular edge so that new pavement in-fill or new adjoining areas create a neat, straight seam with no feathering.

4. The bituminous paving mixture, equipment, methods of mixing and placing, and the precautions to be observed as to weather, condition of base, etc., shall be in accordance with MHD 460.
5. All paving thicknesses are measured after rolling. Permanent surface courses shall be evenly spread and rolled with a power roller having a minimum weight of 5 tons.
6. Binder Course Pavement:
  - a. Immediately prior to installing the binder course, the trimmed edges shall be made stable and unyielding, free of loose or broken pieces and all edges shall be thoroughly broomed clean. Contact surfaces of trench sides, curbs, manholes, catch basins, or other appurtenant structures in the pavement shall be painted thoroughly with a uniform coating of bitumen (Specification M 3.11.06, RS-1) just before any mixture is placed against them
  - b. The binder course shall be repaired as necessary to maintain the surface of the pavement until placement of asphalt top course.
7. Top Course Pavement:
  - a. The top course shall be placed as shown on the drawings or as specified.
  - b. Prior to placement of the top course, the entire surface which the top course or modified top course is to be placed shall be broom cleaned and tack coated.
  - c. Prior to placing full width top course a 4 foot wide transition keyway shall be cold planed at all intersecting streets. See paragraph 8.f.
  - d. Existing drainage patterns are to be maintained.
8. Pavement Placement:
  - a. Unless otherwise permitted by the Engineer for particular conditions, only machine methods of placing shall be used. Methods other than machine methods may be used, at no additional cost to the Owner. The equipment for spreading and finishing shall be mechanical, self-powered pavers, capable of spreading and finishing the mixture true to line, grade, width and crown. The mixtures shall be placed and compacted only at such

times as to permit proper inspection and checking by the Engineer.

- b. Place in strips not less than 10 feet wide, unless otherwise acceptable to Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.
- c. After the paving mixtures have been properly spread, initial and intermediate compaction shall be obtained by the use of steel wheel rollers having a weight of not less than 240 pounds per inch width of tread. Begin rolling when mixture will bear roller weight without excessive displacement. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers. 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. Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.
- d. Final rolling of the pavement shall be performed by a steel wheel roller weighing not less than 285 pounds per inch width of tread at a mix temperature and time sufficient to allow for final smoothing of the surface and thorough compaction. Continue rolling until roller marks are eliminated and course has attained maximum density.
- e. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot bituminous concrete. Compact by rolling to match the surrounding surface density and smoothness.
- f. Immediately after placement of the new pavement, make joints between existing 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 bituminous concrete course. Clean contact surfaces and apply tack coat. All joints between the existing and new pavements shall be keyed on an angle (4' x 10') or as approved by the Owner, and shall be sealed with bitumen RS-1 and sanded.
- g. Where there is no backing for the edges of the pavement, the Contractor shall provide a gravel transition. The transition shall be installed immediately after the pavement is placed, shall be feathered and extend a minimum of 18 inches, and shall be

compacted using the same equipment as for pavement compaction. Transition material to match surrounding conditions. The backing installation will be considered incidental to the pavement installation.

- h. The Contractor shall furnish and install paving to provide transition or aprons for driveways and walkways impacted by new pavement installation.

C. Pavement Markings:

1. Cleaning: Sweep and clean surface to eliminate loose material and dust.
2. The Contractor shall replace all pavement markings removed or covered-over in carrying out the work in-kind, and as directed by the Engineer, no sooner than 48 hours after paving. Markings shall conform to the latest standards of the municipality or agency having jurisdiction over the roadway. The markings shall be 4-inches wide, white or yellow, single or double lines as required, applied with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates. Furnish and place all barricades necessary to prevent tracking of wet paint by vehicles and pedestrians.
3. Markings shall conform to paragraph 2.1.D.
4. The Contractor shall provide markings within 3 days following temporary, base course, leveling, overlay and emergency paving, where existing markings are removed at no additional cost to the Owner.
5. Markings shall be replaced in-kind to those in place prior to construction, whether paint or thermoplastic tape.

D. Curb and Gutter Replacement:

1. Where required, Contractor shall remove, stack and reinstall curbing. Contractor shall mark all pieces removed and transport them to a stockpile site for reuse in the project. Curbing broken, chipped or otherwise damaged by the Contractor shall be replaced at no expense to the Owner.
2. Prior to removing curbing, Contractor shall cut adjoining paved surfaces to minimize damage to adjacent roadways.
3. Before replacing curb sections, suitable structural backfill shall be placed in the curb trench and compacted. After compaction, curbing shall be reset to pre-construction line and grade. Any settlement of curbing within one-year of completion of work shall be reset by the Contractor at not cost to the Owner.

4. Replace curb and gutter with same material to pre-construction lines and curb sections.
  5. Removal and replacement of curbing shall be done in accordance with Sections 501 and 580, as applicable of the MHD Specifications for Highways and Bridges.
  6. Provide expansion joints at each intersection with existing curb sections.
  7. Use expansion joints one inch wide.
    - a. Fill with expansion joint material and cut to shape of curb section.
- E. Sidewalk and Driveway Replacement:
1. Gravel sidewalks:
    - a. Gravel sidewalks shall be restored to a condition at least equal to that existing immediately before the work was started.
  2. Bituminous concrete sidewalks and driveways:
    - a. Construct in accordance with MHD Section 701, Sidewalks, Wheelchair Ramps and Driveways.
    - b. The subgrade shall be shaped parallel to the proposed surface of the sidewalk or driveway and shall be thoroughly rolled and tamped. All depressions occurring shall be filled with suitable material and again rolled or tamped until the surface is smooth and hard in order for a gravel foundation to be placed upon it.
    - c. The sidewalk or driveway shall be a minimum of 2-1/2 compacted inches thick, laid in two equal courses.
    - d. Sidewalk cross slopes shall not exceed 1.5 percent and cannot exceed 2 percent as required by the Americans with Disabilities Act (ADA). The Contractor shall merge new sidewalk slopes into existing sidewalk slopes as required by ADA.
  3. Cement concrete sidewalks, and driveways:
    - a. Construct in accordance with MHD Section 701, Sidewalks, Wheelchair Ramps and Driveways.
    - b. Use 6x6, W10xW10 welded wire reinforcement.
    - c. Concrete sidewalks shall be 4-inches thick and concrete driveways shall be 6-inches thick.

- d. The subgrade for the walk or driveway shall be shaped to a true surface conforming to the proposed slope of the walk, thoroughly rolled at optimum moisture content, and tamped with a power roller weighing not less than one ton and not more than 5 tons. All depressions occurring shall be filled with suitable material and again rolled or tamped until the surface is smooth and hard.
  - e. After the subgrade has been prepared, a subbase of gravel at optimum moisture content shall be placed, thoroughly rolled by a power roller, and tamped. The gravel shall be a minimum of 8 inches in thickness.
  - f. The forms shall be smooth, free from warp, strong enough to resist springing out of shape, and deep enough to conform to the thickness of the proposed walk or driveway. All mortar or dirt shall be completely removed from forms that have been previously used. The forms shall be well staked, thoroughly braced, and set to the established lines with their upper edge conforming to the grade of the finished walk or driveway.
  - g. The finished surface shall have sufficient pitch from the outside edge to provide for surface drainage. This pitch shall be 1/4 of an inch per foot unless otherwise directed by the Engineer. Before the concrete is placed, the subbase for sidewalks shall be thoroughly dampened until it is moist throughout but without puddles of water.
4. Handicap ramps:
- a. Handicap ramps will be installed where indicated on the drawings, in accordance with these contract documents.
  - b. Construct in accordance with MHD Section 701, Sidewalks, Wheelchair Ramps and Driveways.
  - c. The Contractor shall install curb cuts and accessible walkways in accordance with the requirements of the Americans with Disabilities Act and as required in 521 CMR (2/23/96 edition) Sections 21 and 22.
  - d. Handicap ramps are to be constructed of cement concrete unless otherwise approved by the Engineer.
  - e. Existing granite curbing shall be removed, cut if required and reset to allow for the ramp construction. New curbing shall be installed to replace granite curbing damaged by the Contractor.
5. General:

- a. Valve boxes, manhole frames, and all other castings shall be carefully set to the proposed finished grades.

F. Berms and Waterways

1. Bituminous berms shall be replaced as required. Berms shall be machine laid and conform to the grade of the roadways. Construct curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Place curb materials to cross-section indicated, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screen to smooth finish. Remove forms as soon as material has cooled. Berms shall be placed in accordance with MHD Specification 470.20.
2. Bituminous waterways which have been disturbed by construction operations shall be repaired or replaced. The waterways shall be repaired and constructed in accordance with the applicable requirements of Section 280 of the MHD Specifications. Waterways shall be placed in two 1-1/2-inch thick courses on a prepared gravel base. Material shall be compacted by tamping or rolling.

3.3 PROTECTION

- A. Protect replacement work with barricades or other devices as approved by Engineer so that no damage occurs as a result of subsequent construction operations.
  1. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
  2. Repair damages or other irregularities to satisfaction of Engineer, at no additional cost to the Owner, before final acceptance by the Engineer.

3.4 GUARANTEE

- A. The Contractor shall maintain pavement under this Contract during the guarantee period of one year and shall promptly (within 3 days of notice given by Engineer or Owner) refill and repave areas, which have settled or are otherwise unsatisfactory for traffic.

3.5 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION 02525



- J. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.

#### 1.4 SUBMITTALS

- A. Submit manufacturer's literature for granite curb, edging, corners and inlets indicating size, shape and dimensions, finish, and setting method for Owner's Representative's approval.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Granite and units shall be adequately protected from damage during transit to the site.
- B. Curbing shall be protected against staining, chipping, and other damage. Cracked, badly chipped, or stained units will be rejected and shall not be employed in the work.

#### 1.6 SAMPLES

- A. The Contractor shall supply to the site samples of all curb types for approval prior to ordering materials. Approved sample material may be used in the work upon approval by the Owner's Representative.

### PART 2 - PRODUCTS

#### 2.1 GRANITE CURBS

- A. Granite curb shall be light gray in color, free from seams and other structural imperfections or flaws which would impair its structural integrity, and of a smooth splitting character. Natural color variation characteristic of the deposit from which the curb is obtained will be permitted.
- B. Whenever curbing is sawn, all surfaces that are to be exposed shall be thoroughly cleaned and any iron rust or iron particles removed by sandblasting or other methods approved by the Owner's Representative and any saw mark in excess of 1/8 inch shall be removed.
- C. Dimensions
  - 1. The stones for the granite curb shall be cut to the dimensions and curvature hereinafter needed:

Type	Minimum Length	Width at Top	Depth	Minimum Width at Bottom
Street	6 feet (except as required for transition sections)	6 inches	17 to 19 inches	4 inches (for 2/3 length)

2. Stones to be set on a radius of 100 feet or less shall be cut to the required curvature, unless otherwise approved and, except for making closures, shall be of the following minimum lengths:

Radius	Minimum Length
50 feet to 100 feet	6 feet
25 feet to less than 50 feet	4 feet-6 inches
10 feet to less than 25 feet	3 feet

D. Finish

1. Granite Street Curb shall have a smooth split face and a sawn top.
2. Cut ends that are exposed at a corner shall be finished to match the face finish.
3. All granite curb shall have a top surface free from wind, and shall be peen hammered or sawed to an approximately true plane, and shall have no projections or depressions greater than 1/8 inch. The front and back arris lines shall be pitched straight and true and there shall be no projection on the back surface for 3 inches down from the top which would exceed a batter of 4 inches to 1 foot.
  - a. The front face shall be at right angles to the planes of the top and ends of the curb unit and shall be smooth quarry split, free from drill holes and with no projection of more than 1 inch and no depression of more than 1/2 inch measured from the vertical plane of the face through the arris or pitch line for a distance down from the top of 8 inches. For the remaining distance, there shall be no projection or depression greater than 1 inch measured in the same manner.
  - b. The ends of all stones shall be square with the planes of the top and face of the curb so that when the stones are placed end to end as closely as possible, no space shall show in the joint at the top and face of more than 1/2 inch for the full width of the top and for 8 inches down on the face; after which the end may break back not over

8 inches from the plane of the joint. The arris formed by the intersection of the plane of the joint with the planes of the top and exposed faces shall have no variation from the plane of the top and exposed faces greater than 1/8 inch.

## 2.2 CEMENT MORTAR

- A. Cement mortar shall be composed of one part Portland cement and two parts of sand by volume with sufficient water to form a workable mix. Cement shall be Portland cement ASTM C150, Type II.

## 2.3 TRANSITION SECTIONS

- A. Vertical transition sections shall also be provided for curb sections at ramps. Vertical transition sections for granite curb shall be made as shown on the Drawings.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Trenching, excavation, backfilling, and compaction shall be completed in accordance with the MDOT Standard Specifications, except as modified within this Section.
- B. Cement mortar bedding, if required, shall be placed as shown on the Drawings.

### 3.2 GRANITE CURB INSTALLATION

- A. Furnish and install new curbing in the locations and in accordance with the details shown on the Drawings.
- B. Cut special curb sections as required, keeping curb profile at full depth, and with parallel sides. Excavate to the lines and grades required to establish the subgrade limits required for curbing construction.
- C. Curb, curb corners or edging shall be fitted together as closely as possible
- D. Radial curb shall be finished on the exposed face
- E. Where curb sections intersect at right angles, the curb parallel to the primary pathway shall overlap the end of the intersecting curb as shown on the plans. The exposed end face of the

overlapping section shall be finished to match other exposed face surfaces.

- F. Provide grade stakes to check alignment for curb setting. Install granite curb true to lines and grade. Install vertical, flush or transition curbing in locations and in accordance with the details shown on the Drawings.
- G. Transitions from normal curb settings to ramps shall be accomplished with transition curb as shown on the drawings. Transitions shall be of the same type curb and similar to that abutting the transition piece and, if on a curve, of the same radius.
- H. Set granite curb on concrete cradle as follows:
  - 1. All spaces under the curb shall be filled with dry placed, zero slump concrete so that the curb will be completely supported throughout its length.
  - 2. After proper alignment of curbing and concrete base has been established, place additional concrete, of slightly wetter consistency, to extend up each face of curbing as detailed on the Drawings.
  - 3. Joints between curb stones shall be filled full depth with cement mortar and neatly pointed on the top and exposed faces. After pointing, clean of all excess mortar and tool joints slightly below adjacent stone surfaces as approved by the Owner's Representative.
- I. Procedures for removal and resetting of existing granite curb, and new granite curb, in existing pavements shall include the following:
  - 1. Prior to excavation for existing granite curb removal, the pavement surface shall be saw cut a minimum of one foot from the face of curb.
  - 2. Existing curb shall be carefully excavated, and removed in a manner that protects the curb and existing pavement to remain from damage.
  - 3. Existing granite curb shall be cleaned by sandblasting as required to remove bituminous material, paint and concrete from exposed surfaces prior to resetting in the proposed work.
  - 4. New granite curb shall be set to match the top of existing granite curb remaining in place at abutting sections and, if required, transitioned to the typical section shown on Drawings within the first section of curb. Cement concrete shall be placed along the front face of the curb as shown on the Drawings.

END OF SECTION

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## SECTION 02910 – PLANTING SOILS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

#### 1.2 SUMMARY

- A. The work of this Section consists of providing all equipment and materials and doing all work necessary to supply and place planting soils as indicated on the Contract Documents and as specified. Supplying and placement of planting soils shall include, but not be limited to:
  - 1. Sampling and testing of topsoil and loam borrow.
  - 2. Supplying, placing, spreading and grading of topsoil and loam borrow.
- B. Related work under this section:
  - 1. Section 02210 Earth Excavation, Backfill, Fill and Grading
  - 2. Section 02498 Restoration of Disturbed Areas

#### 1.3 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. Commonwealth of Massachusetts Highway Department (MHD):  
Specifications: Standard Specifications for Highways and Bridges
  - 2. American Society for Testing and Materials (ASTM):  
D 75 Practice for Sampling Aggregates  
D 422 Test Method for Particle-Size Analysis of Soils  
D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort  
D 1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb Rammer and 18-in. Drop
  - 3. A.O.A.C.: Association of Official Agricultural Chemists.

#### 1.4 DEFINITIONS

- A. Finish Grade: Elevation of finished surfaces.

- B. Subgrade: Surface or elevation of subgrade soil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.
- C. Topsoil: Soil that is present at the top layer of the existing soil profile at the Project site. This shall be considered the “Base Loam 1” component of Planting Soil mixes.
- D. Loam: Soil that contains a combination of particles typically almost equal in parts sand, silt and clay and including organic matter.
- E. Loam Borrow: Loam soil formed under natural conditions and obtained from off-site sources without admixtures of sand or organic matter sources (composts). This shall be considered the “Base Loam 2” component of Planting Soil mixes when Base Loam 1 component is found to be contaminated with subsoil, or there is insufficient quantity of Base Loam 1 to complete the work of this Section.
- F. Sand: Clean, inert, rounded to sub-angular grains of quartz or other durable rock free from loam or clay, surface coatings and deleterious materials graded as specified herein.
- G. Compost (Organic Amendment Material): a stable, humus-like material produced from the aerobic decomposition and curing of leaf yard waste, composted for a minimum of one year (12 months), free of debris, stones larger than 1/2", larger branches and roots and wood chips over 1" in length or diameter. The compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor.
- H. Planting Soil: Unless otherwise indicated throughout this Section, the term “Planting Soil” shall apply to either on-site blended planting soil or pre-blended planting soil from off-site source, as indicated.
- I. Blended Planting Soil: To the extent available, existing on-site topsoil stripped and stockpiled for reuse, existing in-place topsoil; and/or loam borrow; that is modified on-site with planting soil components and soil amendments to meet the specific Planting Soil mix requirements specified herein.
  - 1. The planting soils shall consist of a blend of natural topsoil and/or loam borrow, uniform sand, and organic material. The quality of the blend depends on the quality of the original components. The Contractor shall be responsible for locating and obtaining approval of sources of natural topsoil, uniform sand, and organic material that meet the Specification requirements. The Contractor shall then be responsible for mixing the components. Approximate mixing ratios are provided, but may require adjustment, depending on the final materials and with the approval of the Owner’s Representative and testing laboratory, in order to meet Specification requirements for each blend.
  - 2. Base Components
    - a. Base Loam is approved topsoil and/or loam borrow.
    - b. Sand is uniformly graded coarse sand.
    - c. Organic Material is fully decomposed organic material – Compost.

- J. Pre-Blended Planting Soil: Planting Soil produced off-site by homogeneously blending natural loam soil with planting soil components and soil amendments to meet the specific Planting Soil mix requirements specified herein, and delivered to the Project site.
1. The planting soils consist of a blend of natural loam soil, uniform sand, and organic material. The quality of the blend depends on the quality of the original components. The Contractor is responsible for locating and obtaining approval of the source capable of producing the pre-blended planting soil meeting the Specification requirements of this Section.

## 1.5 QUALITY ASSURANCE

- A. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the Massachusetts Highway Department (MHD) as "Approved Qualified ASR Testing Labs", with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed. Other testing laboratories approved by the Owner's Representative include the following:
1. Woods End Research Laboratory, P.O. Box 297, Mt. Vernon, ME, 04352, tel: 201.293.2457, fax: 201.293.2488.
  3. A&L Great Lakes Laboratories, Inc. 3505 Conestoga Drive Fort Wayne, IN 46808 - 4413 Phone: (260) 483-4759 Fax: (260) 483-5274 E-mail: lab@algreatlakes.com Website: <http://www.algreatlakes.com>
  4. UMass Soil and Plant Tissue Testing Lab West Experiment Station 682 North Pleasant Street University of Massachusetts Amherst, MA 01003 Phone: (413) 545-2311 Fax: (413) 545-1931 E-mail: soiltest@psis.umass.edu Website: <http://www.umass.edu/plsoils/soiltest/>
  5. Allied Testing Laboratories 115 Saint George Rd, Springfield, MA 01104-3333 (413) 736-1846
- B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
  2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Owner's Representative. A minimum of three representative samples shall be taken from every 500 cubic yards of stockpiled topsoil to be used or amended for planting purposes.
  3. Report suitability of tested soil for plant growth.
    - a. Based upon the test results, state recommendations for ratio of soil components and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a gradation, organic content and pH for planting soil suitable for supporting healthy, viable plant growth.



- b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- C. Work will be subject to inspection at all times by the Owner's Representative. The Owner reserves the right to engage an independent testing laboratory to analyze and test materials used in the construction of the work. Where directed by the Owner's Representative, the testing laboratory will make material analyses and will report to the Owner's Representative whether materials conform to the requirements of this specification.
  1. Cost of tests and material analyses made by the testing laboratory will be borne by the Owner when they indicate compliance with the specification, and by the Contractor when they indicate non-compliance.
  2. Testing equipment will be provided by and tests performed by the testing laboratory.
- D. Samples of individual components of planting soil mixes in addition to blended soil mixes shall be submitted by the Contractor for testing and analysis to the approved testing laboratory. Include verification testing of on-site stripped stockpiled topsoil. Comply with specific materials requirements specified.
  1. No base component material or planting soil mixes shall be used until certified test reports by an approved testing laboratory have been received and approved by the Owner's Representative.
  2. The soil mix ratios listed herein are approximate and shall be adjusted based on soil tests and physical examination, as interpreted by the Owner's Representative. As necessary, the Contractor shall make any and all soil mix adjustments requested by the Owner's Representative and resubmit test reports indicating conformance until soil mix is approved.
- E. The Owner's Representative may request additional testing by Contractor for confirmation of mix quality and/or soil mix amendments at any time until final acceptance.

#### 1.6 TESTING AND SUBMITTALS

- A. Certificates: Provide certificates required by authorities having jurisdiction, especially for any composted materials. Contractor shall submit certification that all planting soil components and all planting soil mixes meet all environmental standards of the State of Massachusetts.
- B. Contractor Testing:
  1. At least 14 days prior to intended use, the Contractor shall provide the samples and submittals for approval in conformance with the requirements of this Section and Division 1 GENERAL REQUIREMENTS. Do not order materials until Owner's Representative's approval of samples, certifications or test results has been obtained. Delivered materials shall closely match the approved samples. Acceptance shall not constitute final acceptance. Owner's Representative reserves the right to reject on or after delivery any material that does not meet these Specifications.

2. The Contractor shall be responsible for recognizing that these critical project materials warrant timely and serious attention, that the testing process to achieve Approved materials should be considered a lead time item, and that under no circumstance shall failure to comply with all specification requirements be an excuse for “staying on project construction schedule.”
  3. Testing shall be at the Contractor’s expense. Contractor shall deliver all samples to testing laboratory via overnight courier and shall have the testing report sent directly to the Owner’s Representative.
- D. Testing reports shall include the following tests and recommendations. Report shall indicate whether or not the material meets the required specifications and any proposed recommendation for amending the soil mix component to meet specifications. Testing is required at the following intervals:
1. Testing of individual components for planting soil mixes. Tests are as described in Paragraph 1.06, D.
  2. After test results for components have been accepted, create sample mixes of each planting soil mix and perform tests described in Paragraph 1.6, D.
  3. After the test results for planting soil mixes have been accepted, test every 200 cubic yards of planting soil mix blended and before placement.
  4. In-place tests: Compaction tests of each type of material placed in accordance with Paragraph 1.06, D.
  5. Testing of Subgrade: Prior to placement of the planting soil profile, test the subgrade as described in this Section. Coordinate the testing of the subgrade with the Sitework Contractor before the planting soil is placed.
  6. Test Planting Soil Mixes specified herein.
- E. Test Reports: Submit certified reports for tests as described in this Section.
1. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System using sieve size nos. 10, 18, 35, 60, 140 and 270. Percent clay (0.002 mm) shall be reported separately in addition to silt (ASTM D-422-63, hydrometer method).
  2. The silt and clay content shall be determined by a Hydrometer Test of soil passing the #270 sieve.
  3. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH.
  4. Tests shall be conducted in accordance with Recommended Soil Testing Procedures for the Northeastern United States, 2nd Edition, Northeastern Regional Publication No. 493; Agricultural Experiment Stations of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont and West Virginia; Revised - December 15, 1995. Referenced Document may be obtained on the web at <http://ag.udel.edu/extension/agnr/soiltesting.htm>. Tests include the following:
    - a. Test for soil Organic Matter by loss of weight on ignition, as described in Northeastern Regional Publication No. 493, p. 59.
    - b. Test for soil CEC by exchangeable acidity method as described in Northeastern Regional Publication No. 493, p. 64.

- c. Test for soil Soluble Salts shall be by the 1:2 (v:v) soil:water Extract Method as described in Northeastern Regional Publication No. 493, p. 74.
  - d. Test for Buffer pH by the SMP method as described in Northeastern Regional Publication No. 493
  5. Certified reports on analyses from producers of composted organic materials are required, particularly when sources are changed. Analyses will include all tests for criteria specified herein.
  6. Density Tests: ASTM D1556 Density of soil and rock in place using Sand Cone Method". ASTM D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
    - a. In-place density tests shall be carried out at a rate of one test per 2,000 square feet for each type of material placed.
- F. Soil Test Reports: Submit reports in two phases. Submit reports concurrent with samples in both phases. Submit as phase one, reports for planting soil base components above for approval. Only after approval of phase one components, submit as phase two, reports for soil blend mixes for approval. All reports must be from recent analyses, less than 90 days old and represent materials that are available for delivery to the site.

Submit reports for each of the above samples as described in Paragraph 1.06D.: Submit sample from each proposed source for testing and approval. Deliver samples to the testing laboratory and pay costs. Send report directly to Owner's Representative.

- G. Sources for Sand and Compost: Submit information identifying sources for all soil components and, in the case of pre-blended planting soil, the firm responsible for mixing and delivery of planting soil.
1. Owner's Representative shall have the right to reject any soil supplier.
  2. Submit supplier name, address, telephone and fax numbers and contact name.
  3. Submit certification that accepted supplier is able to provide sufficient quantities of materials for the entire project.

## 1.7 EXAMINATION OF CONDITIONS

- A. All areas of the existing site where topsoil is to be sampled for testing shall be inspected by the Contractor before starting work and any issues that might inhibit or prevent the sampling operation shall be reported to the Owner's Representative prior to beginning this work.
- B. The Contractor and any sub-Contractor responsible for the execution of the Work of this Section shall review and confirm in writing that the subgrade soil elevations have been brought to the proper subgrade elevations prior to proceeding with the spreading of planting soil.
- C. Carefully review the requirements of this Section to understand the requirements of percolation testing, compaction, slope and absence of debris of the subgrade prior to spreading planting soil.

## 1.8 DELIVERY, STORAGE AND HANDLING

- A. Material shall not be handled, hauled, placed, spread or compacted when it is wet as after a heavy rainfall or is frozen. Soil shall be handled only when the moisture content is less than at field capacity. The Owner's Representative shall be consulted to determine if the soil is too wet to handle.
- B. Store and handle packaged materials in strict compliance with manufacturer's instructions and recommendations. Protect all materials from weather, damage, injury and theft.
- C. Sequence deliveries to avoid delay. Deliver materials only after preparations for placement of planting soil have been completed.
- D. Prohibit vehicular and pedestrian traffic on or around stockpiled planting soil.
- E. Protection of Planting Soil on-site: All planting soil delivered or stockpiled on the site shall be protected from erosion at all times. Materials shall be spread immediately. Otherwise, materials that sit on site for more than 24 hours shall be covered with tarpaulin or other soil erosion system acceptable to the Owner's Representative and surrounded by silt fence as specified under the work of the Division 1 Section, ENVIRONMENTAL PROTECTION PROCEDURES of this Specification and installed under the work of the Division 2 Section, EARTHWORK, BACKFILL AND GRADING of this Specification.
- F. Vehicular access to the site is restricted. Refer to Division 01, GENERAL REQUIREMENTS for permissible routes and access.

## 1.9 PROJECT/SITE CONDITIONS

- A. Soil Moisture Content
  - 1. Contractor shall not move, blend or grade soil when moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in the air or that clods will not break readily, nor when it is frozen. Apply water, if necessary, or allow to dry to bring soil moisture between 60% of optimum moisture content as determined by ASTM D698 for compaction, grading and plantings.
  - 2. Field Soil Moisture Test
    - a. Form soil in palm of hand, if soil retains shape and crumbles upon touching, the soil may be worked.
    - b. If the soil will not retain shape it is too dry and should not be worked.
    - c. If the soil retains shape and will not crumble, it is too wet and should not be worked.
    - d. If the soil glistens or free water is observed when the sample is patted in the palm of hand the soil is too wet and should not be worked.

## PART 2 PRODUCTS

### 2.1 PLANTING SOIL COMPONENTS

A. Base Loam 1

1. Shall be stockpiled topsoil stripped from the site as required for mixing with Sand and Compost to produce the Planting Soil Mixes specified herein. If Base Loam 1 is found to be contaminated with subsoil during stripping or storage, or quantities are not sufficient to complete the work of this Section, the Contractor shall supply Base Loam 2 from off-site sources.

B. Base Loam 2

1. Shall be loam borrow, a "sandy loam" determined by mechanical analysis (ASTM D 422) and based on the "USDA Classification System". It shall be of uniform composition, without admixture of subsoil. It shall be obtained from naturally well-drained areas that have never been stripped before and have a history of satisfactory vegetative growth. All loam borrow shall be mechanically screened and free of subsoil, stones 1 in. or larger diameter, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris. Base Loam 2 shall also be free of extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quack-grass rhizomes, Agropyron Repens, and the nut-like tubers of nutgrass, Cyperus Esculentus, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis. Base Loam 2 shall not be delivered or used for planting while in a frozen or muddy condition. Base Loam 2 for mixing shall conform to the following grain size distribution for material passing the #10 sieve:

U.S. Sieve Size Number	Percent Passing	
	Minimum	Maximum
10	---	100
18	85	100
35	70	95
60	50	85
140	36	53
270	32	42
0.002mm	3	6

2. The ratio of the particle size for 80% passing (D<sub>80</sub>) to the particle size for 30% passing (D<sub>30</sub>) shall be 8 or less. (D<sub>80</sub>/D<sub>30</sub> < 8) Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic

- matter by ignition.
- 3. The organic content shall be between 4.0 and 8.0 percent by weight.
- 4. pH: Shall be between 5.5 and 7.0.

C. Sand

- 1. Sand for Planting Soil Mixes shall be uniformly graded medium to coarse sand consisting of clean, inert, rounded to sub-angular grains of quartz or other durable rock free from loam or clay, surface coatings and deleterious materials with the following gradation.

U.S. Sieve Size Number	Percent Passing	
	Minimum	Maximum
10	100	--
18	65	85
35	35	50
60	15	28
140	4	10
270	0	5
0.002mm	0	0.5

- 2. Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.0 or less. (D70/D20 <3.0) Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
- 3. pH: Shall be less than 7.2.

D. Compost

- 1. Organic Matter for amending planting soil mixes shall be a stable, humus-like material produced from the aerobic decomposition and curing of Leaf Yard Waste Compost, composted for a minimum of one year (12 months). Compost shall be free of debris such as plastics, metal, concrete or other debris. Compost shall be free of stones larger than 1/2", larger branches and roots, and wood chips over 1" in length or diameter. The compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor, and meeting the following criteria as reported by laboratory tests. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
  - a. The ratio of carbon to nitrogen shall be in the range of 12:1 to 25:1.
  - b. Stability shall be assessed by the Solvita procedure. Protocols are specified by the Solvita manual (version 4.0). The compost must achieve a maturity index of 6 or more as measured by the Solvita scale. Stability tests shall be conducted by Woods End Research Laboratory, Mt. Vernon, Maine.
  - c. Pathogens/Metals/Vector Attraction reduction shall meet 40 CFR Part 503 rule, Table 3, page 9392, Vol. 58 No. 32, and Commonwealth of Massachusetts 310 CMR 32.00 (for applications to soils with human activity).

- d. Organic Content shall be at least 20 percent (dry weight). One hundred percent of the material shall pass a 3/8-inch (or smaller) screen. Debris such as metal, glass, plastic, wood (other than residual chips), asphalt or masonry shall not be visible and shall not exceed one percent dry weight. Organic content shall be determined by weight loss on ignition for particles passing a number 10 sieve according to the following procedures. A 50-cc sub-sample of the screened and mixed compost is ground to pass the number 60 sieve. Two to three grams (+ 0.001g) of ground sample, dried to a constant weight at 105 degrees C is placed into a muffle furnace. The temperature is slowly raised (5C/minute) to 450C and maintained for three hours. The sample is removed to an oven to equilibrate at 105C and the weight is taken. Organic matter is calculated as loss on ignition.
- e. pH: The pH shall be between 6.0 to 7.0 as determined from a 1:1 soil-distilled water suspension using a glass electrode pH meter American Society of Agronomy Methods of Soil Analysis, Part 2, 1986.
- f. Salinity: Electrical conductivity of a one to five soil to water ratio extract shall not exceed 2.0 mmhos/cm (dS/m).
- g. The compost shall be screened to 3/8 inch maximum particle size and shall contain not more than 3 percent material finer than 0.002mm as determined by hydrometer test on ashed material.
- h. Nutrient content shall be determined by the University of Massachusetts Soil Testing Laboratory or equivalent laboratory and utilized to evaluate soil required amendments for the mixed soils.

## 2.2 PLANTING SOIL MIXES

- A. Uniformly mix ingredients by windrowing/tilling on an approved hard surface area. Organic matter shall be maintained moist, not wet, during mixing. Amendments shall not be added unless directed by a Testing Laboratory to extent and quantity of amendments required. Percentages of components, unless otherwise noted, will be established upon completion of individual test results for components of the various mixes.
- B. After component percentages are determined by the Testing Laboratory, each planting soil mix shall be tested for physical and chemical analysis as specified in Paragraph 1.6 of this Section.

## 2.3 GENERAL PLANTING SOIL

### A. General Planting Soil

- 1. General Planting Soil shall consist of a blend of approximately equal parts by volume of Sand, Base Loam and Compost (1S:1L:1C). Blending of the components shall be carried out with earth moving equipment prior to placement. The components shall be blended to create a uniform mixture with an organic content between 5.0 and 10.0 percent by weight and pH value between 5.5 and 7.0. Final mix shall conform to the following gradation requirements for material passing a Number 10 sieve.

U.S. Sieve Size No.	Percent Passing	
	Minimum	Maximum

10	100	
18	85	95
35	60	85
60	42	65
140	21	44
270	18	24
0.002 mm	2	4

2. Maximum size shall be one half-inch largest dimension. The maximum retained on the #4 sieve shall be 10% by weight of the total sample. The ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 6 or less (D80/D30 <6). The final mix shall have an organic content between 5 and 7 percent by weight. The final mix shall have a hydraulic conductivity of not less than 1.5 inches per hour according to test procedure ASTM D5856-95 (2000) when compacted to a minimum of 86 percent Standard Proctor ASTM D 698. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

2.4 PRE-PLANT FERTILIZER

- A. Complete, fertilizer made from all-natural ingredients complying with State and Federal fertilizer laws. Fertilizer shall contain the following available plant food by weight, unless soils test indicates a need for different composition:

	Nitrogen	Phosphorous	Potash
Deciduous Trees and Shrubs	2%	3%	3%
Evergreen Trees and Shrubs	2%	3%	3%

- B. Fertilizer: Pro Start 2-3-3 manufactured by North Country Organics, Bradford, Vermont 05033, ph# 802.222.4277 or approved equal.
- D. Fertilizer to be delivered in original unopened standard size bags showing weight, analysis ingredients and manufacturer's name.

2.5 SOIL AMENDMENTS

- A. Follow soil test report recommendations for soil additives for planting soils.
- B. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes, and containing not less than 20% available phosphoric acid. The superphosphate shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed analysis. Any superphosphate which becomes caked or otherwise damaged making it unsuitable for use, will be rejected.
- C. Limestone shall be an approved agricultural limestone containing no less than 50% of total carbonates, and 25% total magnesium with a neutralizing value of at least 100%. The material shall be ground to such a fineness that 40% will pass through a No. 100 U.S. Standard Sieve, and 98% will pass through a No. 20 U.S. Standard Sieve. The lime shall be uniform in composition, dry and free flowing, and shall be delivered to the site in the



original unopened containers, each bearing the manufacturer's guaranteed analysis. Any lime which becomes caked or otherwise damaged making it unsuitable for use, will be rejected.

- D. Commercial fertilizer shall be a product complying with the State and United States fertilizer laws. Deliver fertilizer to the site in the original unopened containers bearing the manufacturer's certificate of compliance covering analysis and which shall be furnished to the Owner's Representative. Fertilizer shall contain not less than the percentages of weight of ingredients as recommended by the soil analysis.
  - 1. Fertilizer for planting shall be formulated for top-dressing, soil surface application to plants. Fertilizer shall be designed and certified by the manufacturer to provide controlled release of fertilizer continuously for not less than 9 months. One hundred percent of the nitrogen content shall be derived from organic materials. Nitrogen source shall be coated to ensure slow release. Fertilizer percentages of weight of ingredients shall be as recommended by the soil testing and analysis specified, performed, and paid for under this Division 2 Section, PLANTING SOILS.
- E. Aluminum Sulfate: Commercial grade, unadulterated.

## 2.6 WATER

- A. Water: furnished by Contractor, unless otherwise specified, and suitable for irrigation and free from ingredients harmful to plant life. Hose and other watering equipment furnished by Contractor.

## PART 3 EXECUTION

### 3.1 COORDINATION

- A. Refer to Section 02210, EARTHWORK, BACKFILL AND GRADING, and Section 02920, LAWN AND SEEDING.
- B. Coordinate activities with other contractors so that there is no soil disturbance from traffic or other construction activities subsequent to placement of planting soil mixes. Report disturbances to Soil Scientist and Owner's Representative and implement corrective measures as necessary.
- C. Pre-Installation Examination Required: The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and shall notify Owner's Representative in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Contractor accepts substrates, previous work, and conditions. The Contractor shall not place any planting soil until all work in adjacent areas is complete and approved by the Owner's Representative and Soil Scientist.
- D. Examination of Subgrade: The subgrade shall be examined by the Contractor prior to the start of soil placement and planting. Any deficiencies shall be noted and related to the Owner's Representative in writing prior to acceptance of the subgrade by the Landscape Contractor. Deficiencies include, but shall not be limited to the following:

1. Construction debris present within the planting areas.
2. The subgrade is at incorrect depths for installing the designed soil profile
3. Incomplete irrigation installation.
4. Subgrade not compacted as specified.

### 3.2 DECOMPACTION OF PLANTING AREAS

- A. After subgrade levels have been reached and immediately prior to placing Planting Soils the entire subgrade area shall be loosened to a minimum depth of six inches utilizing the bucket of a backhoe or equivalent equipment.
- B. Any subgrade areas which have become heavily compacted (defined as exceeding 86% - 88% compaction ASTM 698 Standard Proctor) including, but not limited to, temporary parking areas, material stockpile areas, temporary roadways, construction areas and areas around the building, other construction areas, areas shown on the plans, or areas identified by the Owner's Representative shall be deep-scarified. Immediately prior to placing planting soils, heavily compacted areas shall be loosened to a minimum depth of 18 inches using the teeth of a backhoe or other suitable equipment. Frequency of compaction tests shall be one per 200 square feet.
- C. Using a wide-track bulldozer size D-5 or smaller, or other approved equipment, compact the scarified subgrade to 86% - 88% compaction ASTM 698 Standard Proctor. The Contractor shall provide shovel dug test pits to the full depth of the mitigation, where located per the direction of the Owner's Representative, in order for the Owner's Representative to review whether the work has been done as required. Backfill the pits after the review(s).
- D. Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Provide a written report to the Owner's Representative that the subgrade has been placed to the required elevations, has been de-compacted according to the contract documents and is ready for inspection at least 3 days prior to placing planting soil. Perform no work of placing and spreading planting mixes until elevations have been confirmed and written report has been accepted by the Owner's Representative.
- E. No planting soils shall be handled, planted, or seeded in any way if it is in a wet or frozen condition. A moist planting soil is desirable. Perform field test as specified under the work of this Section 1.9A.2. to determine if planting soils may be worked.
- F. After the soils have been loosened and inspected, planting soil may be spread by using a wide-track bulldozer size D-5 or smaller or may be dumped and spread with the bucket of a backhoe from the edge of the loosened area. No rubber-tired equipment or heavy equipment except for a small bulldozer shall pass over the subsoils (subgrade) after they have been loosened. If the Contractor plans to utilize such areas for any use of heavy equipment, this work should be carried out prior to beginning the process of loosening soils or filling in that area, or it will have to be re-scarified and meet this specification requirement.

### 3.3 FINE GRADING

- A. Grade Stakes: Sufficient grade stakes shall be set for checking the finished grades. Stakes must be set in the bottom of swales and at the top of slopes. Deviation from indicated elevations that are greater than one-tenth of a foot shall not be permitted. Connect contours and spot elevations with an even slope. Finish grades shall be smooth and continuous with no abrupt changes at the top or bottom of slopes.
- B. Soil additives shall be spread and thoroughly incorporated into the layer of planting soil by harrowing or other methods reviewed by the Owner's Representative. The following soil additives shall be incorporated:
1. Soil amendments as required by soil analysis to achieve the required pH as described in this Section. Spread limestone at the rate required by soil analysis up to a maximum limit of 200 pounds per 1,000 square feet.
  2. In case the soil analysis requires rates of application greater than 200 pounds per 1,000 square feet, a second surface application of limestone not in excess of 50 pounds per 1,000 square feet shall be made to the established lawn during the season after Final Acceptance. This second application of limestone shall be performed and paid for under the work of the Division 2 Section, LAWN AND SEEDING at rates determined under the testing requirements of this Division 2 Section, PLANTING SOILS.
  3. Contractor shall fertilize as recommended by the soil analysis and retest planting soil after amendment is completed, this work shall be specified, spread and paid for under this Division 2 Section, PLANTING SOILS.
  4. After planting soil and required additives have been spread, carefully prepare the planting soil by scarifying, harrowing, or tilling to integrate soil additives into the top 6 inches of the planting soil. Remove all large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Remove from unscreened soils all stones over 1 inch in diameter from the top 6 inches of the planting soil bed.
- C. Pre-blended planting soil shall be sampled and tested as specified, performed and paid for under the work of this Division 2 Section, PLANTING SOILS, to verify the incorporation of required planting soil amendments to meet the specifications.
- D. Soil Compaction:
1. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional planting soil and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.
  2. Percolation Tests: Compact each lift sufficiently to reduce settling but not enough to prevent the movement of water and feeder roots through the soil. The planting soil in each lift should feel firm to the foot in all areas and make only slight heel prints. At completion of the planting soil installation, the soil should offer a firm, even resistance when a soil sampling tube is inserted from lift to lift. After the placement of each lift, perform percolation tests to determine if the planting soil has been over compacted.

Perform the following percolation test procedure:

- a. Dig a hole in the installed planting soil that is a minimum of 4 inches in diameter. Holes in 6-inch lift in turf areas shall be 4 inches deep. Holes in 12-inch lifts in plant beds shall be 8 inches deep. Do not penetrate through the lift being tested.
  - b. Fill the hole with water and let it drain completely. Immediately refill the hole with water and measure the rate of fall in the water level.
  - c. In the event that the water drains at a rate less than one inch per hour, till the planting soil to a depth required to break the over compaction as directed by the Owner's Representative.
  - d. Perform a minimum of one soil percolation test per 10,000 square feet area of turf area and 2,500 square feet of tree and shrub planting area as directed by the Owner's Representative.
3. The Contractor shall install planting soil in successive horizontal lifts no thicker than 6 inches in turf areas and 12 inches in plant bed areas to the desired compaction as described in this Section. The Contractor shall install the planting soil at a higher level to anticipate any reduction of planting soil volume due to settling, erosion, decomposition, and other similar processes during the warranty period. Owner's Representative will ensure that the full 6 inches of planting soil are obtained by digging holes in the planting soil at the same frequency as for compaction testing.
4. Movement of equipment: Select equipment and otherwise phase the installation of the planting soil to ensure that wheeled equipment does not travel over subgrade or already installed planting soil. Movement of tracked equipment over said soils will be reviewed and considered for approval by the Owner's Representative. If it is determined by the Owner's Representative that wheeled equipment must travel over already installed soil, provide a written description of sequencing of work that ensures that compacted soil is loosened and un-compacted as the work progresses or place a one-inch thick steel plate over the length and width of any travel way to cover planting soil to protect it from compaction.
- I. Disturbance outside of limit of work: Disturbed areas outside the limit of work shall be graded smooth and spread with a minimum of six (6) inches of planting soil to the finished grade.
- J. Stockpiles: Upon written approval by the Owner, Contractor shall remove all excess, unused existing on-site topsoil from the site and dispose of it in a legal manner.
- 3.5 ACCEPTANCE
- A. Confirm that the final grade of planting soil is at the proper finish grade elevations. Adjust grade as required to meet the contours and spot elevations noted on the Drawings. Request the presence of the Owner's Representative to inspect final grade. Do not proceed with the remaining work of this Contract until the Owner's Representative and/or Owner has given his/her written approval of the final grade.

#### PART 4 – MEASUREMENT AND PAYMENT

Item 170.10 Fine Grading, Compacting, and Finishing is to be measured for payment per square yard complete in-place as shown on the Drawings and as specified herein to consist of all components, amendments, mixing, spreading, compacting and testing, including all labor, materials, equipment, and all other incidentals.

Item 752.00 Topsoil Rehandled and Spread is to be measured and paid by each cubic yard complete in-place as shown on the Drawings and as specified herein to consist of all components, amendments, mixing, spreading, compacting and testing, including all labor, materials, equipment, and all other incidentals.

END OF SECTION 02910

## SECTION 02920 – LAWN AND SEEDING

### PART 1 - GENERAL

#### 1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.
- B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

#### 1.2 DESCRIPTION OF WORK

- A. Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
  - 1. Grass Seed
  - 2. Maintenance and Protection
- B. Related Sections include the following:
  - 1. Section 02210 Earth Excavation, Backfill and Grading
  - 2. Section 02498 Restoration of Disturbed Areas
  - 3. Section 02910 Planting Soils

#### 1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Turf or Lawn: An area covered with grass

#### 1.4 SUBMITTALS

- A. At least 30 days prior to intended use, the Contractor shall provide the following samples and submittals for approval. Do not order materials until Owner's Representative's approval of samples, certifications or test results has been obtained. Delivered materials shall closely match the approved samples. Acceptance shall not constitute Final Acceptance. The Owner's Representative reserves the right to reject on or after delivery any material that does not meet these Specifications.

1. Material Sampling and Testing of Loam Borrow from Off-Site Sources shall be specified, performed under Section 02910, PLANTING SOILS, of this Specification.
2. Material Sampling and Testing of On-Site Loam/Topsoil: On-site loam shall be sampled and tested for under the work of the Section 02910, PLANTING SOILS, of this Specification.
3. Fertilizer
  - a. Submit product literature of Seeding fertilizer and certificates showing composition and analysis.
  - b. Submit the purchasing receipt showing the total quantity purchased for the project prior to installation.
4. Seed

Submit a manufacturer's Certificate of Compliance to the Specifications with each shipment of each type of seed. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and the net weight and date of shipment. No seed may be sown, until the Contractor has submitted the certificates.
5. Seeding Schedule
  - a. Indicating anticipated planting dates for seeding.

## 1.5 QUALITY ASSURANCE

### A. Qualification of personnel.

1. Qualification of Landscape Contractor: The work of this Section shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years experience. Submit proof that the Landscape Contracting firm meets this requirement.
2. Qualification of Foreman or Crew Leader: All work of unloading, stockpiling, storing, transporting on-site, planting, fertilizing, and maintenance shall be supervised by a Foreman or Crew Leader who is a Certified Landscape Professional or a Certified Horticulturist. Submit proof of certification. Foreman and Crew Leader shall remain on the project on a consistent basis from the beginning of planting through provisional acceptance.

## 1.6 EXAMINATION OF CONDITIONS

- A. All areas to be improved shall be inspected by the Contractor before starting work and any defects such as incorrect grading, or drainage problems shall be reported to the Owner's Representative prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be improved, and he shall assume full responsibility for the work of this Section.

- B. The Contractor shall be solely responsible for judging the full extent of work requirements involved.

## PART 2 - PRODUCTS

### 2.1 LOAM

- A. Loam borrow shall be specified, provided, installed under the work of Section 02910, PLANTING SOILS, of this Specification.

### 2.2 SEED MIX-GENERAL

- A. 1. Seed shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and the weed seed content shall not exceed 1% by weight. The seed shall be furnished and delivered, in the proportion specified, in new, clean, sealed, and properly labeled containers. All seed shall comply with State and Federal seed laws. Submit manufacturer's Certificates of Compliance. Seed which has become wet, moldy or otherwise damaged shall not be acceptable. The Contractor shall take care to handle and store the seed according to grower's recommendations and shall not subject the seed to extremes of heat, cold or moist conditions. Submit seed mixtures to Owner's Representative for acceptance.

Seed mixture shall be composed of the following:

<u>Name</u>	<u>Composition % by Seed Species</u>	<u>Germination min.</u>	<u>Purity min.</u>
Award Kentucky Bluegrass	25%	85%	90%
Avalanche Kentucky Bluegrass	25%	85%	90%
America Kentucky Bluegrass	25 %	85%	90%
Hampton Kentucky Bluegrass	<u>25%</u>	85%	90%
	100%		

### 2.8 LIMESTONE

- A. Ground limestone for adjustment of loam borrow pH shall contain not less than 85 percent of total carbonates and shall be ground to such fineness that 40 percent will pass through a 100 mesh sieve and 95 percent will pass through a 20 mesh sieve. Contractor shall be aware of loam borrow pH and the amount of lime needed to adjust pH to specification in accordance with Testing Lab recommendations.

### 2.9 FERTILIZER

- A. Fertilizer shall be a commercial product complying with the State and Federal fertilizer laws. Deliver to the site in the original unopened containers that shall bear the manufacturer's certificate of compliance covering analysis. Fertilizer shall contain not less than the percentages of weight of ingredients recommended by the Soil Analysis.



- B. Nitrogen fertilizer shall be slowly soluble ureaformaldehyde, methylene urea, or isobutylidenediurea; or slow release sulfur-coated urea.
- C. Phosphorus shall be superphosphate or treble superphosphate.
- D. Potassium shall be sulfate of potash,  $K_2SO_4$ .
- E. Salt indexes per unit of nutrient for nitrogen, phosphorous, and potassium shall be less than 1.0 when compared to sodium nitrate (6.3).

#### 2.10 HERBICIDE, CHEMICALS AND INSECTICIDE

- A. Provide chemicals and insecticides as needed for fungus or pest control. All chemicals and insecticides shall be approved by the Massachusetts Department of Food and Agriculture for the intended uses and application rates.
- B. Provide post emergent crab grass control throughout the maintenance period to ensure a germinated and mown lawn or meadow free of crab grass.

#### 2.11 WATER

The Contractor shall be responsible for furnishing his/her own supply of water to the site at no extra cost. All plant materials or beds injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be potable.

- A. Contractor shall not assume that any existing irrigation system on site will be available or in working order.
- B. Contractor shall obtain any necessary permits and written approvals from the client to use a municipal water source to water the plant material.
- C. Provide water schedule upon completion of planting. Should Contractor deviate from the schedule, he/she shall notify the Owner's Representative 24 hours prior to watering plant material.

### PART 3 - EXECUTION

#### 3.1 FILLING AND COMPACTION

- A. Filling and compaction of loam shall be specified, performed under the work of the Section, PLANTING SOILS of this Specification.

#### 3.2 FINE GRADING

- A. Fine grading shall be specified, performed and paid for under the work of the Section, EARTH EXCAVATION, BACKFILL AND GRADING of this Specification.

1. Contractor shall request and receive a letter from the Owner's Representative stating that all fine grading has been accepted before doing any seeding.
2. Lawn shall be installed immediately after finish grading has been completed.

### 3.3 EXAMINATION

- A. Examine areas to receive lawns for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.4 GENERAL PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other objects.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

### 3.5 MAINTENANCE OF LAWNS

- A. Begin maintenance immediately after each area is seeded for the following time period:
  1. A 90 day active growing period or until Final Acceptance, whichever is longer.
- B. Maintenance shall include re-seeding, mowing, watering, weeding, and fertilizing as specified, and re-setting and straightening of protective barriers. Lawn work maintenance shall also include chemical treatments as required for fungus, weed and/or pest control.
- C. During the maintenance period, any decline in the condition of seeded areas shall require immediate action to identify potential problems and to undertake corrective measures.
- D. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment.
  1. The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary to maintain moist soil to a depth of at least 2 inches for seeded areas. At no time shall a tank truck be allowed on the seeded surface.
  2. The Contractor shall furnish sufficient watering equipment to apply water to the required soil depths each 8-hour period.
- E. Protection
  1. Lawn areas shall be protected by a 6-foot high standard chain link barrier set 18 inches in the ground at 10 foot intervals and connected by No.10 wire or by Snow Fence as directed by the Owner's Representative. Flags of white cloth shall be secured to Snow Fence or the wire at center points between stakes.

2. Barriers must be raised immediately after lawn construction and shall be maintained until Acceptance. Barriers shall be removed and discarded as directed by the ownership.

F. Establishment:

1. All seed shall become established. Dead portions of seed shall be removed and replaced.

G. Mowing

1. The Contractor shall keep lawn areas mowed as specified below until Acceptance of the Contract by the Owner's Representative
2. At each mowing, all edges of walks, drives, plant beds and other border conditions shall be edge trimmed by hand or machine to produce straight and uniform edge conditions.
3. Remove and discard from paved areas only clippings and debris generated by each mowing and edging operation legally off-site. The Owner may allow sweeping (not blowing) clippings back into grass. Mowers shall be equipped with mulching blades. Do not remove from grass areas any clippings that have been generated by mowing operations. Do not mow grass when wet.

H. Fertilizing:

A. SEEDED AREA: The first application of fertilizer is specified, provided, performed under the Section 02910, PLANTING SOILS. A second application of nitrogen fertilizer shall be applied to seeded area approximately two months after seed is installed and shall be performed under this Section 02920, LAWN AND SEEDING. Phosphorus and potassium shall be applied proportionally in accordance with the recommendations of the soil tests and the quantities previously integrated into the soil during the first application. Use a 50 percent slow release nitrogen fertilizer. This second application shall correspond to the following application rates dependent upon the month of application.

May 1-15	1.0 pound of nitrogen per 1,000 square feet.
June 15-30	1.0 pound of nitrogen per 1,000 square feet.
August 15 through September 15	1.0 pound of nitrogen per 1,000 square feet.
November 1-15	1.5 pounds of nitrogen per 1,000 square feet.

A third application of nitrogen fertilizer shall be applied to seeded areas approximately two months after the second application. This third application shall correspond to the application rates shown above.

3.6 ACCEPTANCE

- A. Following the minimum required maintenance periods for lawns, the Contractor shall request the Owner's Representative in writing for a formal inspection of completed work. Request for inspection shall be received by the Owner's Representative at least 10 Days before anticipated date of inspection.

B. Acceptance Requirements

1. At the end of the maintenance period, seeded areas shall have a close stand of grass as defined with no weeds present and no bare spots greater than 3 inches in diameter or greater than 5 percent of the overall seeded area. At least 90 percent of the grass established shall be permanent grass species. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded areas shall be extended until deficiencies are corrected. Areas to be corrected shall be prepared and re-seeded in accordance with the requirements of this Section.
2. At the time of acceptance, the Contractor shall remove temporary barriers used to protect lawn areas.

C. Furnish full and complete written instructions for maintenance of the lawns to the Owner at the time of acceptance in conformance with Submittals requirements.

D. Owner's Representative's inspection shall determine whether maintenance shall continue.

3.7 CLEANUP AND PROTECTION

- A. Absolutely no debris may be left on the site. Excavated material shall be removed as directed. Repair any damage to site or structures to restore them to their original condition, as directed by the Owner's Representative, at no cost to the Owner.
- B. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- C. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

PART 4 – MEASUREMENT AND PAYMENT

When a satisfactory stand of grass has not been established at the time of acceptance, no payment for seeding shall be allowed at the time of acceptance. At the time the final estimate is ready to be forwarded to the Contractor the seeded areas will again be inspected by the Owner's Representative and if a satisfactory stand of grass has been established, the seeded areas with a satisfactory stand of grass will be included for Payment is to be measured and paid by each square yard furnished and installed per the Construction Documents.

END OF SECTION