DIVISION 2

SECTION 02140

DEWATERING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for designing, furnishing, installing, maintaining, operating and removal of temporary dewatering systems required to lower and control water levels and hydrostatic pressures during construction.
2. Requirements for disposing of pumped water.

B. Related Sections

1. Section 02200 – Earth Excavation, Backfill and Grading

1.02 DEFINITIONS

A. Dewatering: Lowering the zone of saturation and intercepting groundwater seepage which would otherwise emerge from the slopes or bottom of the excavations. The purposes of dewatering are to increase the stability of excavated slopes; prevent loss of material from beneath the slopes or bottom of the excavation; improve the excavating and hauling characteristics of on site soil; prevent rupture or heaving of the bottom of an excavation; and dispose of pumped water. In addition, dewatering is required to place and compact structural fill.

1.03 DESIGN REQUIREMENTS

A. The Contractor is responsible for the adequacy of the dewatering system.

B. Design dewatering systems to:

1. Effectively reduce the hydrostatic pressure and lower the groundwater levels to a minimum of 2 feet below excavation in soil;
2. Develop a substantially dry and stable subgrade for the protection of subsequent operations;
3. Result in no damage to adjacent buildings, structures, utilities and other work, included in this contract.
4. Depressurize stratified layers of sand that may be confined by silt layers so that a stable excavation bottom is maintained.

C. Methods may include sump pumping, single or multiple stage well point or jet eductor well point systems, deep wells, or combinations thereof.

D. Locate dewatering facilities where they will not interfere with existing utilities, facilities and/or construction work to be done under this Contract.

E. Contractor is responsible to obtain all necessary permits from state and local authorities regarding the operation and discharge of the dewatering system, and to conduct all necessary sampling and testing that may be required by those authorities.

1.04 SUBMITTALS

A. Shop Drawings

1. In accordance with Section 01300 submit the following prior to dewatering system installation:

   a. Proposed system components.
   b. Operational plan to include locations and depth of components.
   c. Method of disposal of pumped water, including method of insuring proper sediment removal should upset in dewatering system occur.

2. Provide test pit data.

   a. Depth
   b. Soil material encountered
   c. Depth to groundwater
   d. Depth to sewer

B. Quality Assurance/Control Submittals

1. In accordance with Section 01300 submit the following:

   a. Dewatering systems to be designed under the direct supervision of a professional Civil Engineer registered in the state which the work is to be done.
   b. Complete Certificate of Design at the end of this section.
   c. Provide documentation demonstrating ability and experience of installing contractor for the type of conditions under this contract.
   d. Names, addresses and telephone numbers of supervisory personnel actively involved in at least five successful projects requiring dewatering.

1.05 PROJECT/SITE CONDITIONS

A. Environmental Requirements

1. Dispose of all pumped water in accordance with all U.S. Environmental Protection Agency, Rhode Island Department of Environmental Management (RIDEM), and Town of Bristol requirements.

B. Existing Conditions

1. Groundwater surface is subject to fluctuations during periods of heavy precipitation.
2. Conduct test pits during the initial phases of work to determine soil conditions.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 SITE PREPARATION

A. Surface Drainage

1. Construct dikes, ditches, pipe lines, sumps or other means to intercept and divert precipitation and surface water away from excavations.

B. Drainage of Excavated Areas

1. Construct dikes, ditches, pipe lines, sumps or other means to collect surface and seepage water which may enter the excavation.
2. Discharge water through settling basins or method approved by Engineer when water is to be deposited into an existing watercourse.

3.02 INSTALLATION

A. Advise Engineer of changes made to Operation Plan as submitted under article 1.05 of this section, made to accommodate field conditions.

3.03 MONITORING

A. Observe and record daily the elevation of the groundwater during the length of the dewatering operation and provide data to Engineer on daily basis.

3.04 OPERATION

A. Operate dewatering systems to lower the groundwater level in excavations allowing all subsequent work to be done on a stable dry subgrade.

B. Modify dewatering procedures which cause, or threaten to cause, damage to new or existing facilities, to prevent further damage. Modifications made at no additional expense to the Owner.

C. Maintain the water level a minimum of two (2) feet below subgrade or at lower elevation to eliminate hydrostatic pressure on structures.

D. Prevent disturbance of foundation soils and loss of ground as water is removed.

E. Notify the Engineer of disturbance to the foundation soils caused by an interruption or inadequacy of the dewatering system.

F. Maintain on site, auxiliary equipment to operate the dewatering system continuously while excavations are opened below elevation of final grade.

3.05 DISPOSAL OF WATER

A. Discharge water in a manner that will not cause erosion, flooding, damage to existing facilities, completed Work or adjacent property, improved or otherwise.

3.06 REMOVAL

A. Remove all material and equipment from the site upon completion of dewatering operations.

B. Seal all dewatering wells upon completion of the dewatering by pressure injecting a grout capable of sealing the wells and preventing leakage.

END OF SECTION

CERTIFICATE OF DESIGN

Re: Contract Between

OWNER: _____
(Name)
and
CONTRACTOR: _____
(Name)
on
CONTRACT: _____
(Title)

_____ Dated:_____
(Number)

Contractor hereby certifies that_____
(Designer)

1. Is licensed or registered to perform professional engineering work in the state of

_____
(Location of Project)

2. Is qualified to design the_____
(Item)
specified in Section_____ of the subject contract;

3. Has designed_____before;

4. Has prepared the design in full compliance with the applications and requirements of Section_____ of subject contract including all applicable laws, regulations, rules and codes; and

5. The work has been signed and sealed pursuant to the applicable state law.

FOR: _____
(Contractor)

BY: _____
(Signature)

_____ Dated:_____
(Name and Title)

SECTION 02160

EXCAVATION SUPPORT

PART 1 GENERAL

1.01 DESCRIPTION

A. The Contractor shall properly design and furnish all labor and materials necessary and shall construct complete, all sheeting, bracing supports, and appurtenances required to perform the Work including sheet piling for construction of structures and buildings, trench support and cofferdams, permanent and temporary alike, as indicated on the Drawings and specified or as otherwise directed by the Engineer or required by agencies having jurisdiction over the Work.

B. Wood timber or steel sheeting shall be used except where otherwise indicated, specified or directed by the Engineer and agencies having jurisdiction over the work.

1.02 DESIGN RESPONSIBILITY

A. The Contractor shall be fully responsible for providing complete and adequately designed sheeting as required and/or directed by the Engineer in accordance with the provisions set forth herein. The sheeting shall be designed to resist hydrostatic pressures in accordance with the Contractor’s dewatering design.

B. The Contractor shall engage, at his own expense, the services of a fully competent and qualified Professional Engineer, hereinafter referred to as the "Contractor's Engineer", registered in the State in which the Work is being constructed, for the design of all sheeting requirements to accomplish the Work specified, and for supervising the proper on-site installation associated therewith. The Contractor's Engineer shall be acceptable to the Engineer and demonstrate a minimum of ten (10) years documented experience in the field of sheeting design and implementation. Prior to the actual employment of the Contractor's Engineer, the Contractor shall submit to the Engineer, to the full extent deemed necessary, a detailed resume stating the Contractor's Engineer's professional qualifications, related experience and references, and if requested, examples of work similar to that required for the Work specified, for a general review by the Engineer and a means of documenting the requisite experience hereinbefore specified. Only after a satisfactory review of the Contractor's Engineer's overall qualifications by the Engineer in fulfillment of the requisite experience hereinbefore specified shall the Contractor finalize such employment and begin the design aspects of the Work.

C. The Contractor's attention is directed to the fact the acceptance of the Contractor's Engineer and/or his/her qualifications by the Owner and/or Engineer shall not be an overall approval of the Contractor's Engineer nor the sheeting designs and methods of installation employed during the Work. It being understood that all sheeting requirements necessary to accomplish the Work specified and/or indicated on the Drawings shall be designed by and installed under the direct supervision of the Contractor's Engineer who shall ultimately and fully bear the responsibility for that Work.

1.03 QUALITY ASSURANCE

A. The Contractor's Engineer shall provide and maintain throughout the sheeting installation and/or Work sufficient supervision and technical guidance to the Contractor for proper sheeting materials, equipment, operations and methods to the extent necessary to assure strict compliance with the Contractor's Engineer's design, all safety procedures and standard requirements for such Work, and the successful completion of the Work. Failure to provide and/or maintain such supervision and/or technical guidance during the Work shall in no way relieve the Contractor's Engineer and/or the Contractor from their overall responsibilities and obligations under the Contract, nor shall it be a basis for any claim by either against the Owner and/or Engineer.

B. The Contractor and Contractor's Engineer shall fully indemnify and save harmless the Owner and Engineer and their agents, employees and representatives, from and against any and all claims as stipulated under the Agreement, whether directly or indirectly arising out of, relating to or in connection with the Work.

C. Quality assurances and proper safety procedures must be maintained at all times and be in strict accordance with the Contractor's Engineer's requirements and consistent with all federal, state and local regulatory agencies having jurisdiction over the Work. Should any conflict in requirements, regulations, restrictions or codes exist between that which is specified by the Contractor's Engineer and any federal, state or local agency, the more stringent application shall prevail.

1.04 PRODUCTS AND DESIGN CRITERIA

A. The overall sheeting design, quality of materials and methods of installation for all sheeting applications necessary to accomplish the Work specified shall be consistent with the established standards of the construction industry and must, as a minimum, comply with the requirements for earth support systems for excavations as defined by current US Department of Labor, Occupational Safety and Health Act (OSHA) regulation applicable thereto, and any other federal, state and local agencies having jurisdiction and/or requirements pertaining thereto including Building Code requirements for the State in which the work is being performed. The design and implementation thereof shall be in accordance with sound engineering practice and modern accepted principles of soil mechanics, and shall include the effects of hydrostatic forces and all surcharge loads which may be reasonable anticipated. The methods employed shall be to the extent necessary to permit the proper and satisfactory installation and construction of the Work specified; to withstand all loads and forces encountered; to provide soil restraint and control of water as required; to insure the safety of the workers and all other personnel on or near the site; to prevent injurious caving or erosion, or loss of ground; to maintain at all times proper and safe pedestrian, vehicular traffic on public and private streets, property and rights-of-way; and to stabilize unforeseen areas of work encountered during the execution of the Work as deemed necessary by the Owner and/or Engineer.

B. The Contractor and Contractor's Engineer's attention is directed to the fact that should any additional investigations, subsurface explorations and/or other appurtenant information be required to fulfill the needs of this design, as determined by the Contractor's Engineer above and beyond that which is already provided under these Contract Documents, the Contractor shall obtain all such information and data required at his own expense.

1.05 SHOP DRAWINGS AND/OR DESCRIPTIVE LITERATURE

A. Prior to the installation of any sheeting, the Contractor shall submit to the Engineer for documentation ONLY, complete sheeting layout and detail drawings and sheeting descriptions bearing the Contractor's Engineer's State of Rhode Island Professional Seal and signature. Said submission shall be for informational purposes only as a means of documenting the work to be performed and will not be considered an approval or disapproval of the design and/or the implementation thereof. This submission will not relieve the Contractor of the sole responsibility for the adequacy of the system nor shall it be construed as an approval or guarantee that the Contractor's proposed equipment, materials and methods for the sheeting, bracing or appurtenances will be adequate for the work required at the locations of and for the Work required by this Contract.

B. Included as part of this submission, the Contractor's Engineer must provide a complete listing of all references, codes and specifications used by the Contractor's Engineer and required by any federal, state or local agency having jurisdiction, and to which the sheeting design conforms.

C. Specific design calculations are not to be submitted to the Engineer. In the event design calculations are submitted to the Engineer, they shall be returned to the Contractor without review or checking by the Engineer.

1.06 CERTIFICATE OF DESIGN

A. The Contractor's special attention is directed to the required "Certificate of Design", the form of which is provided at the end of this Section. The Contractor and Contractor's Engineer shall complete this "Certificate" in its entirety for each location of work to be done, and any revisions associated there with, and submit it simultaneously with, as an integral part thereof, the sheeting submission. Any submission made without the completed "Certificate", appropriately signed and sealed, shall be returned to the Contractor. The Owner and/or Engineer hereby reserves the right to delay sheeting work and/or any work associated with, or dependent upon, the proper implementation of sheeting, without cause for claim against the Owner or Engineer, until a complete and appropriate submission is rendered. This Certification shall indicate that the sheeting, bracing and all appurtenances related thereto are designed to withstand the required loads, forces to be encountered, and to provide soil and water control, and are in compliance with these specifications and all federal, state or local agencies having jurisdiction over the Work to be performed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Timber sheeting and bracing:

1. Timber sheeting and bracing may be of any species of wood which will satisfactorily withstand all driving and construction stresses and the loads to which the members will be subjected. Sheeting shall not be less than 3 inches nominal thickness and shall be provided with continuous interlocks. All timber sheeting and bracing shall be free from

worm-holes, windshakes, loose knots, decayed or unsound portions or other defects which might impair its strength or tightness.

B. Steel sheeting:

1. The shapes, sizes, and lengths of steel sheeting to be utilized are optional with the Contractor, providing they are satisfactory to withstand all driving and construction stresses and provided with continuous interlocks.

C. Bracing, Hardware and Fastenings:

1. Bracing and other supports whether of steel or of timber, shall be of the strength and dimensions necessary to satisfactorily withstand the loads to which they will be subjected. All bracing and other supports shall be free from any defects which might impair this strength. The Contractor shall provide all necessary hardware and fastenings necessary in connections with satisfactory installation of all sheeting and bracing.

PART 3 EXECUTION

3.01 INSTALLATION

A. The Contractor shall be fully responsible for ensuring adequate safety measures are provided at all times and shall comply with all safety requirements of federal, state and local agencies having jurisdiction over the Work. Installation of the sheeting including all bracing, supports and appurtenances, shall be adequate to permit the performance of the Work and be in accordance with the requirements of the Contractor's Engineer and the sheeting design associated therewith.

B. Any movements of sheeting and/or appurtenances which prevent the proper completion of the work shall be corrected at the expense of the Contractor.

C. Sheeting shall be installed in a manner which will prevent the disturbance of the surrounding surface, subsurface conditions and/or structures. Any such disturbances shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

3.02 REMOVAL

A. All sheeting shall be removed except as shown on the Contract Drawings or directed by the Engineer.

B. All sheeting approved for removal by the Engineer shall become the property of the Contractor.

C. All restoration and clean up shall be as indicated and as specified.

CERTIFICATE OF DESIGN

_____(Owner)

Contract Reference: _____

_____, dated _____.

In accordance with the provisions of the above referenced Contract, as the designated Contractor,

_____

_____
(Contractor's Name and Address)

hereby certifies that _____

_____
(Contractor's Engineer's Name and Address)

(1) Is properly licensed and currently registered as a Professional Engineer in the State (or Commonwealth) of _____;

(2) Is fully qualified to design and supervise the _____

_____
(Item of work and location)

In accordance with the provision specified under the appropriate Section and/or Subsections of the Contract Documents:

(3) Has successfully designed and supervised _____

_____
(Item of work)

before and demonstrates a minimum of ten (10) documented years of proven experience in such field;

(4) Has personally examined the type(s) and locations(s) of the Work required under this Contract, and the overall conditions associated therewith, to the extent necessary to fully satisfy his or her professional responsibilities for designing and supervising the above referenced work;

(5) Has prepared the attached design in full compliance with the applications and requirements of the Contract Documents, sound engineering practice, modern accepted principles of construction, and all applicable federal, state and local laws, regulations, rules and codes having jurisdiction over the Work;

(6) Will provide sufficient supervision and technical guidance to the Contractor throughout the Work to ensure compliance with the design and all quality assurances necessary to successfully complete the Work;

(7) Hereby indemnifies and holds harmless the_____

_____and BETA Group, Inc.,
(name of owner)

and their agents, employees and representatives, from and against any and all claims, whether directly or indirectly, arising out of, relating to or in connection with the Work; and

(8) This "Certificate of Design" together with all applicable designs, drawings, details, specifications on other related documents necessary to complete the Work as specified, have been signed and sealed pursuant to applicable state law.

In recognition and observance of the above referenced statements, the undersigned parties hereby acknowledge and accept the responsibilities and obligations associated therewith.

CONTRACTOR:	CONTRACTOR'S ENGINEER:
_____	_____
(Contractor's Name)	(Engineer's Name)
_____	_____
By: _____	By: _____
_____	_____
(Name and Title)	(Name and Title)
Date: _____	Date: _____
(SEAL)	(P.E. STAMP)

(Note: Contractor to fully reference all attachments below)

_____

_____

_____

_____

_____

_____

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END OF SECTION

SECTION 02200

EARTH EXCAVATION, BACKFILL, FILL AND GRADING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for; excavating in earth for trenches and structures; backfilling excavations; furnishing necessary material; compaction; constructing embankments and fills; miscellaneous earth excavations and miscellaneous grading.

B. Related Sections

1. Section 01025 - Measurement and Payment
2. Section 01410 - Testing Laboratory Services
3. Section 02140 – Dewatering
4. Section 02149 – Maintaining Existing Flow
5. Section 02160 – Excavation Support
6. Section 02215 - Aggregate Materials
7. Section 03300 - Cast-In-Place Concrete

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

1. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

1.03 MEASUREMENT AND PAYMENT PROCEDURES

A. Test Pits

1. Where determination of the exact location of pipe or other underground structure is necessary for doing the work properly, the Contractor may be required to excavate test pits to determine such locations. When such test pits may be properly considered as incidental to other excavation, the Contractor shall receive no additional compensation, the work being understood to be included as part of the excavation. When the Engineer orders test pits beyond the limits of excavation he considers a part of the work, such test pits shall be paid for as specified in SECTION 01025.

1.04 QUALITY ASSURANCE

A. Field Samples

1. Provide samples of materials as requested by the Engineer, to the Quality Control Engineer hired by the Owner, prior to delivery of materials on site, in order to facilitate field testing of compaction operations and material properties.

1.05 PROJECT/SITE CONDITIONS

A. Existing Conditions

1. There are pipes, drains, and other utilities in locations not indicated on drawings, no attempt has been made to show all services, and completeness or accuracy of information given is not guaranteed.

1.06 MAINTENANCE

A. Maintain all work in accordance with SECTION 01800.

PART 2 PRODUCTS

2.01 MATERIALS

A. Suitable Aggregate

1. The nature of materials will govern both acceptability for backfill and methods best suited for placement and compaction.
2. All material whether from excavations or from borrow pits, after being placed and properly compact, will make a dense stable fill and containing no vegetation, masses of roots, individual roots more than 18 inches long, or more than 1/2 inch in diameter, stones over 6 inches in diameter, or porous matter.
3. Organic matter to be well distributed and not to exceed minor quantities.

B. Trench and Excavation Backfill

1. In general, and unless other material is indicated on drawings or specified, material used for backfilling trenches and excavations shall be suitable material which was removed in the course of making the construction excavations. If sufficient suitable material is not available from the excavations, the backfill material shall be crushed stone, gravel borrow or select borrow as directed by the Engineer, in according to respective Specification Sections.

C. Structure Backfill

1. Unless otherwise indicated or specified, all fill and backfill under structures and pavement adjacent to structures shall be compacted gravel borrow containing not more than 10 percent material passing a 200 sieve. When coarse aggregate and fine aggregate are indicated or specified for use under structures, they shall conform to the requirements for coarse and fine aggregate specified in SECTION 03300.

D. Filling and Embankment Backfill

1. Suitable selected materials available from the excavations and not required for backfill around pipes or against structures may be used for filling and building embankments, except as otherwise specified. Material needed in addition to that available from construction operations shall be obtained from suitable gravel banks or other suitable deposits. The Contractor shall furnish, at his own expense, all borrow material needed on the work.

E. Additional materials

1. Concrete: In accordance with SECTION 03300.
2. Crushed stone: In accordance with SECTION 02215.
3. Gravel borrow: In accordance with SECTION 02215.
4. Selected borrow: In accordance with SECTION 02215.

2.02 EQUIPMENT

A. Well Points

1. Designed to drain soil and prevent saturated soil from flowing into excavation.

B. Pumping Units

1. Designed for use with the wellpoints, capable of maintaining a high vacuum and, handling large volumes of air and water at the same time.

C. Underdrain Pipe

1. HDPE pipe enclosed in crushed stone encased in filter fabric.
2. Sewer pipe of quality known as "seconds".

2.03 SOURCE QUALITY CONTROL

A. Provide Engineer with access to location of off site sources of materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify all existing utilities and facilities prior to excavation.

3.02 PROTECTION

A. Utilities

1. Support and protect from damage existing pipes, poles, wires, fences, curbing, property line markers, and other structures, which the Engineer decides must be preserved in place without being temporarily or permanently relocated.
2. Restore items damaged during construction without compensation, to a condition at least equal prior to construction.

B. Trees

1. Enclose the trunks of trees adjacent to work with substantial wooden boxes of height necessary to protect trees from injury from piled material, equipment, operations or otherwise.
2. Employ excavating machinery and cranes of suitable type and size and operate with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.
3. When trimming is required, make all cuts smooth and neat without splitting or crushing.
4. Cover cut areas with an application of grafting wax or tree healing paint.
5. Branches, limbs, and roots shall not be cut except by permission of the Engineer.

C. Plantings

1. Protect by suitable means or temporarily replant and maintain cultivated hedges, shrubs, and plants which may be injured by the Contractor's operations
2. Replant in their original positions and care for until growth is re-established, once the construction operations have been substantially completed.
3. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of kind and quality at least equal to which existed prior to the start of the Work.

D. Paved surfaces

1. Do not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels shaped as to cut or injure paved surfaces.
2. All surfaces which have been injured by the Contractor's operations shall be restored to a condition at least equal to which existed prior to start of the Work.
3. Suitable materials and methods shall be used for such restoration.

3.03 PREPARATION

A. Pavement Removal

1. Remove only existing pavement as necessary for the prosecution of the work.
2. Engineer may require that pavement be cut with pneumatic tools or saws without extra compensation to Contractor, where in the opinion of the Engineer it is necessary to prevent damage to the remaining road surface.
3. Dispose of large pieces of broken pavement before proceeding with excavation.

B. Top Soil Removal

1. Unless otherwise noted, from areas which excavations are to be made, loam and topsoil shall be carefully removed and separately stored to be used again as directed; or, if the Contractor prefers not to separate surface materials, he shall furnish, as directed, loam and topsoil at least equal in quantity and quality to that excavated, at no cost to the owner.

C. Subgrade

1. Remove loam and topsoil, loose vegetable matter, stumps, large roots, etc., from areas where embankments will be built or material will be placed for grading.
2. Shape as indicated on the drawings and prepare by forking, furrowing, or plowing to bond first layer of the new material placed.

3.04 RELOCATION AND REPLACEMENT OF EXISTING STRUCTURES

A. The structures to which the provisions of this article apply include pipes, wires, and other structures which meet all of the following:

1. Are not indicated on the drawings or otherwise provided for.
2. Encroach upon or are encountered near and substantially parallel to the edge of the excavation.
3. In the opinion of the Engineer will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.

B. In removing existing pipes or other structures, the Contractor should use care to avoid damage to materials, and the Engineer shall include for payment only those new

materials which, in his judgment, are necessary to replace those unavoidably damaged.

C. Whenever the Contractor encounters certain existing structures as described above and is so ordered in writing, he shall do the whole or such portions of the work as he may be directed to change the location of, remove and later restore, or replace such structures, or to assist the Owner thereof in so doing. For all such work, the Contractor shall be paid under such items of work as may be applicable, otherwise as Extra Work.

D. When fences interfere with the Contractor's operations, he shall remove and (unless otherwise specified) later restore them to a condition which existed prior to the start of the Work, all without additional compensation. The restoration of fences shall be done as promptly as possible and not left until the end of the construction period.

3.05 SHEETING AND BRACING

A. Provide in accordance with specification Section 02160.

3.06 DEWATERING

A. Provide in accordance with specification Section 02140.

3.07 EXCAVATION

A. Execute operation of dewatering, sheeting and bracing without undermining or disturbing foundations of existing structures or of work previously completed under this contract.

B. Excavate to widths that provide suitable room for:

1. Building structures or laying and jointing piping.
2. Placing all sheeting, bracing, and supports.
3. Cofferdamming, pumping and draining.

C. Render bottom of excavations firm, dry and acceptable in all respects.

D. Do not plow, scrap or dig by machinery, earth at finished subgrade which results in disturbance of material below subgrade, unless indicated or specified, and remove with pick and shovel, last of material to be excavated, just before placing pipe, masonry or other structure.

E. Make all excavations in open, except as otherwise specified or permitted.

F. Excavation Near Existing Facilities

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

G. Unauthorized Excavation

1. If the bottom of any excavation is taken out beyond the limits indicated or prescribed, the resulting void shall be backfilled at the Contractor's expense with thoroughly compacted gravel borrow, if the excavation was for a pipeline, or with Class B concrete, if the excavation was for a masonry structure.

H. Unsuitable Material

1. If material unsuitable for foundation (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, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted, crushed stone, gravel borrow, fine aggregate or concrete as directed.

3.08 TRENCHING

A. Trench Excavation

1. Where pipe is to be laid in specified bedding material or concrete cradle, the trench may be excavated by machinery to, or to just below, the designated subgrade, provided that the material remaining at the bottom of the trench is no more than slightly disturbed, as approved by the Engineer.

2. Where pipe is to be laid directly on the trench bottom, the lower part of trenches in earth shall not be excavated to subgrade by machinery, but, just before the pipe is to be placed, the last of the material to be excavated shall be removed by means of hand tools to form a flat or shaped bottom, true to grade, so that the pipe will have a uniform and continuous bearing and support on firm and undisturbed material between joints except for limited areas where the use of pipe slings may have disturbed the bottom.

B. Depth Of Trench

1. Excavate trench to depths permitting the pipe to be laid at the elevations, slopes, or depths of cover indicated on the drawings, and at uniform slopes between indicated elevations.

C. Width Of Trench

1. Excavate trench as narrow as practicable and do not widen by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.
2. Excavate trenches with approximately vertical sides between the elevation of the center of the pipe and an elevation 1 ft. above the top of the pipe.

D. Trench Excavation In Fill

1. If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to a height of at least 1 ft. above the top of the pipe, whichever is the lesser. Particular care shall be taken to ensure maximum consolidation of material under the pipe location. The pipe trench shall then be excavated as though in undisturbed material.

E. Length of trench open at any one time will be controlled by conditions, subject to any limits that may be prescribed by Engineer.

3.09 BACKFILLING

A. General

1. Frozen material shall not be placed in the backfill nor shall backfill be placed upon frozen material. Previously frozen material shall be removed or shall be otherwise treated as required, before new backfill is placed.

B. Fill And Backfill Under Structures

1. The fill and backfill materials shall be placed in layers not exceeding 6 in. in thickness. Unless otherwise indicated or specified, each layer shall be compacted to 95 percent in accordance with ASTM D1557.

C. Backfilling Around Structures

1. 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. As soon as practicable after the structures are structurally adequate and other necessary work has been done, special leakage tests, if required, shall be made. Promptly after the completion of such tests, the backfilling shall be started and then shall proceed until its completion. The best of the excavated materials shall be used in backfilling within 2 ft. of the structure. Unequal soil pressures shall be avoided by depositing the material evenly around the structure.
2. The material shall be placed and compacted to 90 percent in accordance with ASTM D1557 unless otherwise indicated or specified.

D. Backfilling Pipe Trenches

1. As soon as practicable after the pipes have been laid and the joints have acquired a suitable degree of hardness, if applicable, or the structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected, the backfilling shall be started and thereafter it shall proceed until its completion.

2. With the exception mentioned below in this paragraph, trenches shall not be backfilled at pipe joints until after that section of the pipeline has successfully passed any specified tests required. Should the Contractor wish to minimize the maintenance of lights and barricades and the obstruction of traffic, he may, at his own risk backfill the entire trench, omitting or including backfill at joints as soon as practicable after the joints have acquired a suitable degree of hardness, if applicable, and the related structures have acquired a suitable degree of strength. He shall, however, be responsible for removing and later replacing such backfill, at his own expense, should he be ordered to do so in order to locate and repair or replace leaking or defective joints or pipe.

3. No stone or rock fragment larger than 12 in. in greatest dimension shall be placed in the backfill nor shall large masses of backfill material be dropped into the trench in such a manner as to endanger the pipeline. If necessary, a timber grillage shall be used to break the fall of material dropped from a height of more than 5 ft. Pieces of bituminous pavement shall be excluded from the backfill unless their use is expressly permitted, in which case they shall be broken up as directed.

4. Zone Around Pipe

   a. Backfilled with the materials and to the limits indicated on the drawings.
   b. Material shall be compacted to 90 percent by tamping.

5. Remainder of Trench

   a. Compact by water-jetting, or tamping, in accordance with the nature of the material to 95 percent in accordance with ASTM D1557. Water-jetting may be used wherever the material does not contain so much clay or loam as to delay or prevent satisfactory drainage. However, tamping shall be used if water-jetting does not compact the material to the density required.

6. Excavated material which is acceptable to the Engineer for surfacing or pavement subbase shall be placed at the top of the backfill to such depths as may be specified elsewhere or as directed. The surface shall be brought to the required grade and stones raked out and removed.

E. Placing And Compacting Embankment Material

1. After the subgrade has been prepared as hereinbefore specified, the material shall be placed thereon and built up in successive layers until it has reached the required elevation.

2. Layers shall not exceed 12 in. in thickness before compaction. In embankments at structures, the layers shall have a slight downward slope away from the structure; in other embankments the layers shall have a slight downward slope away from the center. In general, the finer and less pervious materials shall be placed against the structures or in the center, and the coarser and more pervious materials, upon the outer parts of embankments.

3. Each layer of material shall be compacted by the use of approved rollers or other approved means so as to secure a dense, stable, and thoroughly compacted mass. At such points as cannot be reached by mobile mechanical equipment, the materials shall be thoroughly compacted by the use of suitable power-driven tampers.

4. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction. No compacting shall be done when the material is too wet, from either rain or too great an application of water, to compact it properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions shall be taken as may be necessary to obtain proper compaction.

5. The portion of embankments constructed below proposed structures shall be compacted to 95 percent in accordance with ASTM D1557. The top 2 ft. of an embankment below a pavement base shall be compacted to 95 percent. All other embankments shall be compacted to 90 percent in accordance with ASTM D1557.

3.10 METHODS OF COMPACTION

A. Water-Jetting

1. Saturate backfill material throughout its full depth and at frequent intervals across and along the trench until all slumping ceases.

2. Furnish one or more jet pipes, each of sufficient length to reach the specified depth and of sufficient diameter (not less than 1-1/4 in.) to supply an adequate flow of water to compact the material.

3. Equip jet pipe with a quick-acting valve, supply water through a fire hose from a hydrant or a pump having adequate pressure and capacity to achieve the required results.

B. Tamping and Rolling

1. Deposit backfill material and spread in uniform, parallel layers not exceeding 8 in. thick before compaction. Before the next layer is placed, each layer shall be tamped to obtain a thoroughly compacted mass. Care shall be taken that the material close to the bank, as well as in all other portions of the trench, is thoroughly compacted. When the trench width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively

and without damage to the pipe, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar power equipment instead of by tamping. For compaction by tamping (or rolling), the rate at which backfilling material is deposited in the trench shall not exceed that permitted by the facilities for its spreading, leveling, and compacting.

2. If necessary to ensure proper compaction by tamping (or rolling), the backfill material shall first be wet by sprinkling. However, no compaction by tamping (or rolling) shall be done when the material is too wet either from rain or too great an application of water to be compacted properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compacting, or such other precautions shall be taken as may be necessary to obtain proper compaction.

C. Miscellaneous Requirements.

1. Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. Only suitable quantities of stones and rock fragments shall be used in the backfill; the Contractor shall, as part of the work done under the items involving earth excavation and rock excavation as appropriate, furnish and place all other necessary backfill material.

2. All voids left by the removal of sheeting shall be completely backfilled with suitable materials, and thoroughly compacted.

3.11 DISPOSAL OF SURPLUS EXCAVATED MATERIALS

A. No excavated materials shall be removed from the site of the work or disposed of by the Contractor except as directed or permitted by the Engineer.

B. Surplus excavated materials suitable for backfill shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill; shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes within a haul of 1 mile from the point of excavation; all as directed or permitted and without additional compensation. Prior to re-use of in-situ material, the material shall be tested to determine if the material meets the requirements of applicable Specification Section for crushed stone, gravel borrow, or select borrow.

C. Surplus excavated materials not needed as specified above shall be hauled away and dumped by the Contractor, at his expense, at appropriate locations, and in accordance with arrangements made by him.

3.12 DUST CONTROL

A. During the progress of the Work, maintain the area of activities, by sweeping and sprinkling of streets to minimize the creation and dispersion of dust. If the Engineer

decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed.

3.13 BRIDGING TRENCHES

A. Provide suitable and safe bridges and other crossings where required for the accommodation of travel, and to provide access to private property during construction. Remove once bridges and crossings are no longer needed.

3.14 FIELD QUALITY CONTROL

A. Site Tests

1. In accordance with SECTION 01410

3.15 CARE AND RESTORATION OF PROPERTY

A. Restoration of existing property or structures shall be completed within 5 business days of completing the work within the property. and not left until the end of the construction period.

END OF SECTION

SECTION 02210

ROCK EXCAVATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for removal and disposal of rock.

B. Related Sections

1. Section 00500-Agreement
2. Section 00800- Supplementary Conditions
3. Section 02200-Earth Excavation, Backfill, Fill and Grading

1.02 DEFINITIONS

A. Rock-as defined in SECTION 00500.

1.03 REQUIREMENTS

A. Excavate rock if encountered, to the lines and grades indicated on the drawings or as directed, dispose of the excavated material, and furnish acceptable material for backfill in place of the excavated rock.

B. Excavate rock in pipe trenches to a limit which provides 6-inches clearance minimum from the pipe after it has been laid. Before the pipe is laid, the trench shall be backfilled to the correct subgrade with thoroughly compacted, suitable material or, when so specified or indicated on the drawings, with the same material as that required for bedding the pipe, furnished and placed at the expense of the Contractor.

C. The use of explosives will not be allowed.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXCESS ROCK EXCAVATION

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

B. In pipe trenches, excess excavation below the elevation of the top of the bedding, cradle, or envelope shall be filled with material of the same type, placed and compacted in the same manner, as specified for the bedding, cradle, or envelope. Excess excavation above said elevation shall be filled with earth as specified in the article titled "Backfilling Pipe Trenches" in SECTION 02200.

C. In excavations for structures, excess excavation in the rock beneath foundations shall be filled with 3000 psi concrete. Other excess excavation shall be filled with earth as specified in the article titled "Backfilling Around Structures" in SECTION 02200.

3.02 SHATTERED ROCK

A. If the rock below normal depth is shattered, and the Engineer considers such shattered rock to be unfit for foundations, the shattered rock shall be removed and the excavation shall be backfilled with concrete as required, except that in pipe trenches screened gravel shall be used for backfill. All such removal and backfilling shall be done by and at the expense of the Contractor.

3.03 PREPARATION OF ROCK SURFACES

A. Whenever so directed during the progress of the work, remove all dirt and loose rock from designated areas and shall clean the surface of the rock thoroughly, using steam to melt snow and ice, if necessary. Water in depressions shall then be removed as required so that the whole surface of the designated area can be inspected to determine whether seams or other defects exist.

B. The surfaces of rock foundations shall be left sufficiently rough to bond well with the masonry and embankments to be built thereon, and if required, shall be cut to rough benches or steps.

C. Before any masonry or embankment is built on or against the rock, the rock shall be scrupulously freed from all vegetation, dirt, sand, clay, boulders, scale, excessively cracked rock, loose fragments, ice, snow, and other objectionable substances. Picking, barring, wedging, streams of water under sufficient pressure, stiff brushes, hammers, steam jets, and other effective means shall be used to accomplish this cleaning. Remove free water left on the surface of the rock.

3.04 REMOVAL OF BOULDERS

A. Remove piles of boulders and loose rock encountered within the limits of earth embankments and dispose in a suitable place.

3.05 DISPOSAL OF EXCAVATED ROCK

A. All excavated rock shall be handled, transported and disposed of by the Contractor, at his expense, at appropriate locations, and in accordance with arrangements made by him without additional cost to the Owner.

B. Excavated rock may be used in backfilling trenches subject to the following limitations:

1. Pieces of rock larger than permitted under the article titled "Backfilling Pipe Trenches" in SECTION 02200 shall not be used for this purpose.

2. The quantity of rock used as backfill in any location shall not be so great as to result in the formation of voids.

3. Rock backfill shall not be placed within 36 in. of the surface of the finish grade.

C. Surplus excavated rock shall be disposed of as specified for surplus excavated material as specified in SECTION 02200.

3.06 BACKFILLING ROCK EXCAVATIONS

A. Where rock has been excavated and the excavation is to be backfilled, the backfilling above normal depth shall be done as specified in SECTION 02200. If material suitable for backfilling is not available in sufficient quantity from other excavations, the Contractor shall, at his own expense, furnish suitable material from outside sources.

END OF SECTION

SECTION 02215

AGGREGATE MATERIALS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for furnishing and placing materials, which include Crushed Stone, Gravel Borrow and Select Borrow.
2. Location of specified materials as detailed on the Drawings or as directed by the Engineer for excavation below normal depth, utility support, replacement of unsuitable material or elsewhere, as ordered.

B. Related Sections

1. Section 02200 - Earth Excavation, Backfill, Fill and Grading.
2. Section 02500 - Paving

1.02 REFERENCES

A. This specification makes reference to the requirements of additional specifications as listed. The Contractor shall obtain and familiarize himself with all requirements referenced by this specification.

1. Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction, together with all errata addenda additional revisions, and supplemental specifications, (referred to as Standard Specification).

B. American Association of State Highway and Transportation Officials (AASHTO).

1. T11, Amount of Material Finer than 0.075 mm Sieve in Aggregate
2. T27, Sieve Analysis of Fine and Coarse Aggregates.

C. American Society for Testing and Materials (ASTM).

1. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

1.03 DEFINITIONS

A. The term Screened Gravel as used in the Contract Documents shall mean Crushed Stone.

1.04 SUBMITTALS

A. Shop Drawings

1. Provide sieve analysis when gradation requirements are given in the Specification.

B. Samples

1. Furnish representative sample including location of source with Shop Drawing transmittal sheet.

1.05 QUALITY ASSURANCE

A. Field Samples

1. The attention of the Contractor is directed to the fact that under Specification SECTION 00700, 1.03 Materials and Equipment, all materials furnished by the Contractor to be incorporated into the Work shall be subject to the inspection of the Engineer. The Engineer shall be the sole judge as to the acceptability of proposed materials and said judgement shall be final, conclusive, and binding.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection

1. In accordance with Specification SECTION 00700, 1.03 Materials and Equipment.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed Stone

1. For bedding and pipe zone material for pipe larger than 3 inches diameter. Well graded in size from 3/8 inches to 3/4 inches or such other sizes as may be approved.
2. For bedding and pipe zone material for plastic pipe 3 inches diameter and less, maximum particle size shall be 3/8 inches.
3. Clean, hard, and durable particles or fragments, free from dirt, vegetation, or other objectionable matter, and free from an excess of soft, thin elongated, laminated or disintegrated pieces.
4. Screened Stone of similar size and grading to this specification may be used instead of Crushed Stone.

B. Crushed Stone Under Structures

1. Crushed stone material must meet the requirements set forth in the Standard Specifications.

C. Gravel Borrow

1. Shall be in accordance with the RIDOT Standard Specifications, Section M.01.09, Table 1, Column 1b.

D. Selected Borrow

1. Use natural soils and/or rock free of roots, leaves, organics and clay, having not more than eight (8) percent by weight passing the No. 200 sieve and having a maximum stone size no greater than two thirds the loose lift thickness.

2. Use only material well-graded throughout entire size range, free of ice or frost and aggregations of frozen soil particles.
3. Material must meet compaction requirements indicated or as specified.

E. Gravel Base Course

1. In accordance with SECTION 02500.

F. Suitable Material

1. Shall meet RIDOT Standard M.01.01 Common Borrow.

2.02 SOURCE QUALITY CONTROL

A. Test, Inspection

1. Engineer may elect to sample material supplied at the source.
2. Assist the Engineer and/or personnel from the designated testing laboratory in obtaining samples.

PART 3 EXECUTION

3.01 INSTALLATION

A. Crushed Stone

1. Spread in layers of uniform thickness not greater than 6 inches.
2. Compact thoroughly by means of a suitable vibrator or mechanical tamper.

B. Gravel Borrow

1. Spread in layers of uniform thickness not exceeding 12 inches before compaction and moistened or allowed to dry as directed.
2. Compact thoroughly by means of suitable power-driven tampers or other power-driven equipment.
3. Compaction shall conform to 95% of minimum dry density per ASTM D1557.
4. The percolation rate for the compacted bank-run gravel shall not exceed 5 minutes per inch.

C. Select Borrow/Suitable Material

1. Spread in layers of uniform thickness not exceeding 12 in. (loose lift) before compaction and moistened or allowed to dry.
2. Compact thoroughly by means of suitable power-driven tampers or other power-driven equipment unless otherwise directed by the Engineer.

3.02 FIELD QUALITY CONTROL

A. Material and compaction testing

1. In accordance with SECTION 01410.

END OF SECTION

SECTION 02500

PAVING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Requirements for construction of all temporary and permanent pavement on paved areas affected or damaged by his operations, whether inside or outside the normal trench limits, as indicated on the drawings and as herein specified.

B. Related Sections
   1. Section 02200 - Earth Excavation, Backfill, Fill and Grading

1.02 REFERENCES

A. This specification makes reference to the requirements of additional specifications as listed. The Contractor shall obtain and familiarize himself with all requirements referenced by this specification prior to preparation and installation of any pavements.
   1. Rhode Island Department of Transportation, Standard Specifications for Road and Bridge Construction, including all addenda issued prior to March 1, 2018, issued by the State of Rhode Island Department of Transportation, (referred to as the Standard Specification).

B. American Society for Testing and Materials
   1. C117 Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
   2. C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

1.03. PAVEMENT SCHEDULE

A. The Contractors attention is directed to the various pavements required under this contract, and their locations as detailed below.

B. All pavement thickness specified in this specification shall be of the thickness required after compaction.

Pavement:

Description:	Pavement
Requirements:	2” Class 9.5 HMA Base Course
	3” Class 12.5 HMA Surface Course
	8” Gravel Base Course (Minimum)

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt Tack
   1. Tack coat shall consist of emulsified asphalt, grade RS-1 or cutback asphalt grade RC-70 conforming to the requirements of the Rhode Island Standard Specification Section 403 and M.03.01.

B. Bituminous Base
   1. Bituminous Base shall conform to the requirements of the Rhode Island Standard Specification Section 401 and Class 12.5 HMA for Base Course.

C. Bituminous Surface
   1. Bituminous Surface Course shall conform to the requirements of the Rhode Island Standard Specification Section 401 and Class 12.5 HMA for Surface Course.

D. Permanent Trench Patch
   1. Permanent Trench Patch shall be Bituminous Base conforming to the requirements of the State of Rhode Island Standard Specification, Subsection 401, M.03.01 for Base Course, and Class 12.5 HMA for Base Course.

E. Temporary Trench Patch
   1. Temporary Pavement shall be Temporary Patching Material/Trenches conforming to the requirements of the State of Rhode Island Standard Specification, Subsection 410, Class 9.5 HMA, and M.03.04 for High Performance Cold Patching Material.

F. Gravel Base Course
   1. Gravel base course in accordance with State of Rhode Island Standard Specification, Subsection M.01.09, Meeting the gradation requirements of Table 1, Column 1, with 100% passing 3-inch Square Mesh Sieves.

2.02 SOURCE QUALITY CONTROL

A. The paving plant used by the Contractor for preparation of bituminous paving materials shall be acceptable to the Engineer who shall have the right to inspect the plant and the making of the material.

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to placing pavement, all backfill shall have been properly compacted as specified under SECTION 02200 to eliminate settling of backfill. No pavement shall be placed over poorly compacted backfill. Backfill and gravel base course shall be compacted, brought to the proper elevation, and dressed so that new pavement construction shall be at the required grade. The Contractor shall maintain the surfaces of all excavated and disturbed areas until the pavement is placed. If there is a time lapse of more than 24 hours between completion of preparation of subgrade or placing of gravel base course and placing of paving, or if subgrade or gravel base course has been eroded or disturbed by traffic, the subgrade or gravel base course shall be restored before placing pavement.

B. When installing permanent pavement on bituminous concrete roadway the edges of existing pavement shall be cut back 12-inches, or more as required, from the trench excavation wall or damaged area to sound undamaged material, straightened, cleaned, and painted with an accepted asphalt emulsion to ensure a satisfactory bond between it and the newly placed surface courses. Existing surface courses shall be stripped from the bituminous concrete base course for at least a 6-inch width and trimmed square and straight so that new permanent surfacing shall be placed on undisturbed bituminous concrete base course. Existing pavement shall be swept clean prior to placing any asphalt emulsion over it. Existing pavement that will be under new pavement shall be painted with asphalt emulsion to ensure a satisfactory bond.

C. Before permanent pavement is installed, the base shall be brought to the proper grade, and temporary pavement and excess gravel base shall be removed.

D. All manhole covers, catch basin grates, valve and meter boxes, curbs, walks, walls and fences shall be adequately protected and left in a clean condition. Where required, the grades of manhole covers, catch basin grates, valve boxes, and other similar items shall be adjusted to conform to the finished pavement grade.

E. Contractor shall remove and acceptably dispose of all surplus and unsuitable material.

F. The bituminous base course within the trench shall be brought to the surface (total 5-inches of base course installed).

G. Existing pavement shall be swept clean prior to placing any asphalt emulsion over it. Existing pavement that will be under new pavement shall be painted with asphalt emulsion to ensure a satisfactory bond.

H. Temporary trench patch shall be installed at the end of each working day, no open trenches will be allowed overnight unless otherwise approved by the Engineer.

3.02 INSTALLATION

A. General
1. All construction methods and materials shall be satisfactory to the Engineer.
2. Unless indicated otherwise, all permanent bituminous pavements shall be installed in two courses or more. Bituminous base courses shall be carefully spread and raked to a uniform surface and thoroughly rolled before application of the top course.
3. All top courses of permanent paving shall be applied with acceptable mechanical spreaders in widths of at least 9 feet.
4. The rolling for all bituminous and gravel base courses shall conform to the standards listed in the appropriate Subsection of the Standard Specification.
5. Pavement shall be placed so that the entire roadway or paved area shall have a true and uniform surface, and the pavement shall conform to the proper grade and cross section with a smooth transition to existing pavement.

B. Gravel Base Course
1. The gravel base shall be placed to such depth that the furnished compacted gravel base course is the depth as indicated on the drawings and specified herein.
2. The top of the compacted gravel base shall be below the furnish grade a distance required to accommodate the compacted pavement material as indicated on the drawings and specified herein.

C. Bituminous Base
1. Bituminous Base shall be used in city streets and parking areas as listed in Article 1.03 of this specification.
2. Bituminous Base shall be placed to the thickness as indicated in Article 1.03 of this Specification and installed in accordance with the requirements of the Standard Specification and as detailed in the Contract Drawings.

D. Permanent Pavement Patch
1. Permanent pavement patch shall be placed over all trenches in paved areas where directed by the Engineer.
2. The Contractor, shall install the permanent trench patch upon the removal of the temporary trench patch, completing the backfilling and compaction of the trenches in the streets and the placing of the gravel base course.
2. Maximum pavement thickness per course not to exceed 3 inches.

3. Permanent Pavement Patch shall be placed in two courses and shall consist of 4-inch compacted thickness of Class 12.5 HMA Base Course, on a 12-inch compacted thickness gravel base as directed by the Engineer.
4. Contractor to vary pavement thickness to maintain a minimum cross sectional slope equaling 0.02 ft/ft.
5. Cut back distances shall be directed by the Engineer, however under no circumstances less than the minimum indicated in the chart below.

E. Temporary Pavement Patch

1. Temporary pavement shall be placed over all trenches in paved areas where directed by the Engineer.
2. The Contractor, upon completing the backfilling and compaction of the trenches in the streets and the placing of the gravel base course, shall be required to construct temporary pavement at the end of each day.
2. Maximum pavement thickness per course not to exceed 3 inches.
3. Temporary Pavement Patch shall be placed in one course and shall consist of a 3-inch compacted thickness of Class 9.5 HMA Surface Course, on a 12-inch compacted thickness gravel base as directed by the Engineer.
4. Contractor to vary pavement thickness to maintain a minimum cross sectional slope equaling 0.02 ft/ft.
5. Cut back distances shall be directed by the Engineer, however under no circumstances less than the minimum indicated in the chart below.

MAXIMUM PAVEMENT LIMITS				
DIAMETER OF PIPE D IN INCHES	TRENCH WIDTH IN FEET		PERMANENT TRENCH PAVEMENT WIDTH IN FEET*	
	TRENCH DEPTH		TRENCH DEPTH	
	< OR = 10'	> 10' TO 20'	< OR = 10'	> 10' TO 20'
12 AND SMALLER	5.00	6.00	8.00	9.00
15	5.25	6.25	8.25	9.25
18	5.50	6.50	8.50	9.50
21	5.75	6.75	8.75	9.75
24	6.00	7.00	9.00	10.00
27	6.25	7.25	9.25	10.25
30	6.50	7.50	9.50	10.50
36	7.00	8.00	10.00	11.00
42	7.50	8.50	10.50	11.50
48	8.00	9.00	11.00	12.00
54	8.50	9.50	11.50	12.50
60	9.00	10.00	12.00	13.00
66	9.50	10.50	12.50	13.50
72	10.00	11.00	13.00	14.00

Notes

1. Temporary trench pavement includes 1’ cut back of existing pavement along each side of the trench.
2. Trench depth measured from the existing ground surface to 6” below the bottom of the constructed pipe.
3. Quantities for pavement shall be in accordance with the above limits or the actual widths, whichever is less.

E. Bituminous Leveling Course

1. Bituminous Leveling Course shall be used in the streets as listed in Article 1.03 of this specification.
2. Bituminous Leveling Course may be required on all streets as determined by the Engineer. If required, bituminous leveling course shall be installed in accordance with the requirements of the Standard Specification and as detailed in the Contract Drawings.

F. Bituminous Surface

1. Bituminous Surface shall be used in the streets as listed in Article 1.03 of this specification.
2. Bituminous Surface shall be placed to the thickness as indicated in Article 1.03 of this Specification and installed in accordance with the requirements of the Standard Specification and as detailed in the Contract Drawings.

G. Sidewalks, Driveways, Parking Lots and Curbing

1. Sidewalks, driveways, parking lots and curbing that are removed or damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they are found immediately prior to the start of operations. Materials and methods used for such restoration shall be in conformance with the requirements of the State of Rhode Island Standard Specification.
2. Where the trench location is in a sidewalk, the entire width of the sidewalk shall be replaced with new material. Side forms shall be set so as to obtain and preserve a straight edge along both sides of the walk.
3. Where trench is in a driveway, the driveway shall be repaved across its entire width with even edges.
4. Parking lots shall be repaved in accordance with Article 3.01 of this section.
5. Gravel base course under sidewalks and driveways shall not be less than 12" inch thick.

H. Surface Maintenance

1. During the guarantee period, the Contractor shall maintain the bituminous surface and shall promptly make good all defects such as cracks, depressions, and holes that may occur. At all times, the surfacing shall be kept in a safe and satisfactory condition for traffic. If defects occur in surfacing constructed by the Contractor, the Contractor shall remove all bituminous concrete and base course as is necessary to properly correct the defect. After removing bituminous concrete and

base course, the Contractor shall correct the cause of the defect and replace the base course and bituminous concrete in accordance with these specifications.

END OF SECTION

SECTION 02530

RESTORATION OF CURB, SIDEWALKS AND VEGETATED AREAS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for removal and replacement of granite curb, concrete and bituminous sidewalks including sidewalks at driveways and wheelchair ramps.
2. Requirements for restoration of vegetated areas, plantings and tree beds.
3. Requirements for construction of sidewalks in sensitive tree areas.
4. Restoration to include those areas designated by the Contract Drawings and those affected or damaged by the construction operations, outside the limits of Work.

B. Related Sections

1. Section 01060 – Regulatory Requirements
2. Section 02200 – Earth Excavation, Backfill, Fill and Grading

1.02 REFERENCES

A. This specification makes reference to the requirements of additional specifications as listed. The Contractor shall obtain and familiarize himself with all requirements referenced by this specification.

1. Materials and construction methods shall conform, insofar as applicable, to the requirements of the Rhode Island Department of Transportation, Standard Specifications for Road and Bridge Construction, 2013 Edition, together with all errata addenda additional revisions, and supplemental specifications, (referred to as the Standard Specification).

1.03 SUBMITTALS

A. Submit in accordance with Section 01300,

1. Sieve analysis for aggregates and loams.
2. Mix designs for batched materials.
3. Certifications for landscape material.
4. Samples when requested by the Engineer.

5. Submit with seed, certificates confirming seed mixture, purity, germinating value, and crop year identification.

PART 2 PRODUCTS

2.01 MATERIALS

A. Gravel Borrow

1. In accordance with State of Rhode Island Standard Specification, Subsection M.01.02, Meeting the gradation requirements of Table 1, Column 1, with 100% Passing 3-inch Square Mesh Sieves.

B. Concrete Curb

1. In accordance with the requirements of the State of Rhode Island Standard Specification, Section M.09.

C. Granite Curb

1. In accordance with the requirements of the State of Rhode Island Standard Specification, Section M.09.

D. Cement Concrete

1. In accordance with the requirements of the State of Rhode Island Standard Specification, Section M 02.

E. Bituminous Concrete

1. In accordance with the requirements of the Rhode Island Standard Specification Section 401 for Surface Course, Class 12.5 HMA and the gradation requirements for Class 12.5 HMA or sidewalk in section M.03.01.

F. Loam, Seed, Lime, Fertilizer, Mulch and Water

1. In accordance with Section M.18 of the Rhode Island Standard Specification.

G. Plant Materials

1. In accordance with Section M.18 of the Rhode Island Standard Specification.

2.02 SOURCE QUALITY CONTROL

A. The plants used by the Contractor for preparation of bituminous paving materials and cement concrete shall be acceptable to the Engineer who shall have the right to inspect the plant and the making of the material.

PART 3 EXECUTION

3.01 INSTALLATION/RESTORATION

A. Excavation to be in accordance with Section 02200 unless otherwise noted in the referenced specification below.

B. Granite Curb

1. Installing or Remove, Salvage and Reset granite curb at the locations indicated on the Drawings or as directed by the Engineer shall be in accordance with Section 906 of the State of Rhode Island Standard Specification.

C. Concrete Curb

1. Installation of concrete curb at the locations indicated on the Drawings or as directed by the Engineer shall be in accordance with Section 906 of the State of Rhode Island Standard Specification.

D. Bituminous Concrete Berm or Bituminous Concrete Curb

1. Installation of concrete curb at the locations indicated on the Drawings or as directed by the Engineer shall be in accordance with Section 906 of the State of Rhode Island Standard Specification.
2. Installation of bituminous concrete berm shall conform to Section 906.03.4 Method A of the Rhode Island Standard Specification.

E. Sidewalks

1. Installation of new or replacing existing sidewalks, driveways and wheelchair ramps at the locations shown on the Drawings or as directed by the Engineer to be in accordance with Section 905 of the State of Rhode Island Standard Specification.

F. Vegetated Areas, Plantings and Tree Beds

1. Restore all disturbed areas in accordance with the following Sections of the State of Rhode Island Standard Specification.
    a. Loam in accordance with L.01
    b. Seeding in accordance with L.02
    c. Plantings and Tree Beds in accordance with L.06 and L.08

G. Tree Root Pruning

1. This work shall include both mechanical and manual pruning of existing tree roots in order to allow for the installation of drain lines and/or other work without causing extensive damage to the root system. Pruning work shall be performed at the locations indicated on the Plans or as directed by the Engineer.

2. All work shall be performed under direct on site supervision of the Engineer.
3. All work indicated on the plans or as directed by the Engineer shall be performed under direct on-site supervision of a Rhode Island Licensed Arborist (A copy of the arborist's current license must be given to the Engineer seven days in advance of the work beginning) and shall be retained by the Contractor.
4. Excavation shall proceed in shallow layers that do not exceed 4 inches in depth until the root system is located. The Contractor shall carefully hand dig the soil from the delineated areas taking care not to rip or otherwise damage the roots during excavation process.
5. Remove material taking special care not to damage underlying tree roots. The root system may be located directly existing surface in some areas. The Engineer must be present during work near tree roots.
6. Remove and dispose all debris immediately from the job site. No stockpiling of removed material will be allowed around the root zone of any tree.
7. The tree roots will not be allowed to remain uncovered for more than one (1) hour. Loam borrow will be placed over the tree roots until the final cover is installed. The roots will also be kept moist, and not allowed to dry out. Water shall be provided by the contractor until the actual surface is placed within the sidewalk area. Heavy equipment shall not be permitted to traverse the remaining root system.
8. The roots to be pruned shall be field verified prior to commencement of this item by the Contractor and the Engineer. Roots shall be pruned using hand equipment which must be disinfected, sharp, and approved by the Engineer. Manual root pruning limits may be extended to other areas within the project area at the discretion of the Engineer.

H. Restoration Limits

1. Where the trench location is in a sidewalk, the entire width of the sidewalk shall be replaced with new material. Side forms shall be set so as to obtain and preserve a straight edge along both sides of the walk.
2. Sidewalks shall be cut at existing joints or as directed otherwise by the Engineer.
3. Where trench is in a driveway, the driveway shall be repaved across its entire width with even edges.

I. Restoration Outside Limits of Work

1. Sidewalks, driveways, parking lots and curbing that are or damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they are found immediately prior to the start of operations. Materials and methods used for such restoration shall be in conformance with the requirements of the Standard Specification.
2. There shall be no cost to the Owner for this work.

J. Salvaged Granite Curb

1. All existing granite curb which remains unused at the end of the project shall be returned by the Contractor to the City of East Providence Department of Public Works. Coordinate delivery of unused curb with Department of Public Works personnel.

END OF SECTION

SECTION 02614

REINFORCED-CONCRETE DRAIN PIPE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for furnishing and installing the reinforced-concrete pipe as indicated on the drawings.

B. Related Sections

1. Section 02200 - Earthwork.
2. Section 02215 - Aggregate Materials.

1.02 QUALITY ASSURANCE

A. Reinforced-concrete pipe shall be made by a manufacturer of established good reputation in the industry and in a plant adapted to meet the design requirements of the pipe.

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials.

1. M 170, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

B. American Society for Testing and Materials (ASTM).

1. C76, Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
2. C361, Specification for Reinforced Concrete Low-Head Pressure Pipe.
3. C443, Specification for Joints for Circular Concrete Culvert and Sewer Pipe, Using Rubber Gaskets.
4. C497, Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.

1.04 SUBMITTALS

A. In accordance with SECTION 01300 submit for review drawings showing the pipe dimensions reinforcement, joint, and other details for each type and class of pipe to be furnished for the project. All pipe furnished under the contract shall be manufactured only in accordance with the specifications and the reviewed drawings.

PART 2 PRODUCTS

2.01 PIPE

A. Each unit of pipe shall have an interior surface, which is free from roughness, projections, indentations, offsets, or irregularities of any kind. The pipe units shall be of the classes indicated on the drawings and shall conform to ASTM C76 and AASHTO M170 with the following exceptions and additions:

1. Type II cement shall be used unless otherwise permitted by the Engineer. Admixtures shall not be used except with the prior permission of the Engineer.
2. Aggregates shall conform to the requirements set forth hereinafter.
3. Elliptical reinforcement will not be permitted. Longitudinal reinforcement shall be continuous. Reinforcement shall have a minimum cover of 3/4 in.
4. Absorption shall be as specified under "inspection, Tests and Acceptance."
5. Pipe units have a minimum laying length of 8 ft., except as otherwise indicated or permitted by the Engineer.
6. Pipe units shall be cured in accordance with ASTM C76.
7. No pipe shall be shipped until the pipe has meet strength requirements in accordance with ASTM C76.
8. There shall be no lift holes in the pipe.
9. Mortar used for repairs shall have a minimum compressive strength of 4,000 psi. at the end of 7 days and 5,000 psi. at the end of 28 days, when tested in 3-in. by 6 in. cylinders stored in the standard manner. Only those repairs permitted by the above-mentioned ASTM C76 will be allowed.
10. The date of manufacture, class of pipe unit, size of pipe unit, and trademark of the manufacturer shall be clearly and permanently marked on the inside and the outside at one end of each pipe unit.
11. Certified copies of tests on materials and the pipe units will be required.

B. Specials, if required, shall conform to the specifications for straight pipe insofar as applicable. Special design or construction necessary for specials shall be subject to acceptance by the Engineer.

2.02 JOINTS

A. Pipe joints shall be of the rubber gasket type in which the gaskets are in compression and which will permit both longitudinal and angular movement. Each unit of pipe shall be provided with proper ends made of concrete formed true to size and formed on machined rings to ensure accurate joint surface. Joints and gaskets shall be O-ring or ribbed gasket type and shall conform to the requirements of ASTM C443, and ASTM C361 and to the additional requirements specified.

2.03 INSPECTION, TESTS AND ACCEPTANCE

A. Acceptance will be on the basis of tests of materials, absorption tests, plant load-bearing tests, pressure tests, and inspection of the complete product. The required tests are enumerated hereinafter. The quality of all materials used in the pipe, the process of manufacture, and the finished pipe shall be subject to inspection by the Engineer. Inspection may be made at the place of manufacture, or on the work site after delivery, or both, and the pipe shall be subject to rejection at any time due to failure to meet any of the specification requirements, even though sample pipe units may have been accepted as satisfactory at the place of manufacture. All pipe which is rejected shall be immediately removed from the project site by the Contractor.

B. Tests and certified copies in triplicate of test results will be required for the materials and the finished pipe units as described herein. If less than 100 units of a given size and class of pipe are required, the Contractor may submit certified copies of tests made on identical pipe units made by the same manufacturer within the past year. If more than 100 units of a given size and class of pipe are required, the Contractor shall, at his own expense, engage the services of an acceptable independent testing laboratory to perform or witness all tests, other than mill

tests on reinforcing steel and cement, and certify the results. In addition, the Owner reserves the right to have any or all pipe units inspected or tested, or both, by an independent testing laboratory at either the manufacturer's plant or elsewhere. Such additional inspection and/or tests shall be at the Owner's expense and shall be the test results of record.

C. All pipe units to be tested shall be selected at random by the Engineer. Unless otherwise permitted, all load-bearing tests on pipe units shall be made in the presence of the Engineer.

D. All tests shall be made in accordance with the latest applicable ASTM specifications.

1. Reinforcing Steel--Mill test reports, or reports on samples taken from each shipment to the pipe manufacturer, shall be submitted for reinforcing steel to be used on this project stating that the reinforcing meets the specified requirements.
2. Cement--Mill test reports shall be submitted for each shipment to the pipe manufacturer of cement to be used on this project stating that the cement meets the specified requirements. All cement accepted for this project shall be kept segregated from other cement.
3. Aggregates--Tests reports shall be submitted stating that the aggregates to be used on this project meet the requirements for concrete aggregates as specified "Fine Aggregate" and "Coarse Aggregate" under SECTION 03300. The first report shall be submitted prior to the manufacturer of any pipe for this project. Additional tests and reports shall be made monthly thereafter during the production of the pipe.
4. Absorption Tests--Three cores shall be taken from each pipe unit that is to be load tested. The cores shall be taken before the load-bearing tests are performed. All cores shall be tested for absorption by the boiling absorption test. Average absorption shall not exceed 8 percent of the dry weight and no single test shall exceed 9 percent.
5. Pipe Unit Load-Bearing Tests (ASTM C497)--A load-bearing test shall be made on one pipe unit of each size and class and the report of the test submitted before delivery to the project of that size and class of pipe unit. An additional test will be required for each 200 units of each size and class of pipe. The load-bearing test shall be performed after the cores for the absorption tests have been taken. Each load-bearing test shall be carried to the specified load to produce the 0.01 in. crack. If the 0.01 in. crack is not formed, the pipe unit may be used in the project. Cored holes shall be plugged with the mortar specified above for repairs.
6. Pressure Test (ASTM C497)--A pressure test shall be made on two pipe units of each size and class to be used. Each pipe unit shall be bulkheaded independently and then joined together in a normal manner with the joint to be used in the work. The pipe units shall be held in place in such manner that no external compression force is exerted on the joint during the test. The test pressure shall be an average internal hydrostatic pressure of 12 psi and shall be maintained for at least 10 minutes without visible leakage from the joint. A description of the bulk-heading and pipe holding arrangement shall be submitted to the Engineer for review prior to performing the test. All pressure tests shall be made in the presence of the Engineer.
7. Concrete Cylinders--Compression tests shall be made on standard concrete cylinders for the first or test pipe unit and then for every 100 cubic yards of concrete used in pipe manufacture, or for each additional 200 units of pipe, whichever represents the lesser amount of concrete. Four cylinder shall be made for each test and they shall be broken at 7, 14, and 28 days with one cylinder as a spare to be used in the event of an unsatisfactory break. The reports shall be submitted within three days after each of the compression tests.

PART 3 EXECUTION

3.01 HANDLING PIPE

A. Each pipe unit shall be handled into its position in the trench only in such manner and by such means as is acceptable to the Engineer.

B. The Contractor will be required to furnish suitable devices to permit satisfactory support of all parts of the pipe unit when it is lifted.

3.02 INSTALLATION

A. Each pipe unit shall be inspected before being installed. Any pipe discovered to be defective either before or after installation shall be removed and replaced with a sound pipe.

B. Except as otherwise indicated on the drawings, the pipe shall be supported by compacted crushed stone. No pipe or fitting shall be permanently supported on saddles, blocking, or stones. Crushed stone shall be as specified under SECTION 02215.

C. Suitable bell holes shall be provided, so that after placement only the barrel of the pipe receives bearing pressure from the supporting material.

D. All pipe units shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.

E. Pipe and fittings shall be installed to the lines and grades indicated on the drawings or as required by the Engineer. Care shall be taken to ensure true alignments.

F. Before any joint is made. the unit shall be checked to assure that a close joint with the next adjoining unit has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber, or other unyielding object.

G. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe unit together so that they will fit with a minimum open recess inside and outside and have tightly seated joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends. Joints shall not be pulled or cramped without the permission of the Engineer.

H. Immediately after the pipe joint is completed, the position of the gasket in the joint shall be inspected using a suitable feeler gage furnished by the Contractor, to be sure it is properly put together and is tight. Joints in which the gasket is damaged or not properly positioned shall be pulled apart and remade using a new gasket.

I. Where any two pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units and new gaskets.

J. Details of gasket installation and joint assembly shall follow the directions of the manufacturer of the joint materials and of the pipe, all subject to acceptance by the Engineer. The resulting joints shall be watertight and flexible.

K. After each pipe to be supported on screened gravel has been properly bedded, enough gravel shall be placed between the pipe and the sides of the trench, and thoroughly compacted, to hold the pipe in correct alignment. Bell holes provided for jointing shall be filled with screened gravel and compacted, and then screened gravel shall be placed and compacted to complete the pipe bedding, as indicated on the drawings.

L. The Contractor shall take all necessary precautions to prevent floatation of the pipe in the trench.

M. At all times when pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs or by other suitable means. If water is in the trench when work is to be resumed, the plug shall not be removed until all conditions are suitable to prevent water, earth, or other material from entering the pipe.

N. Pipelines shall not be used as conductors for trench drainage during construction.

3.03 CLEANING

A. Care shall be taken to prevent earth, water, and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out pipelines and manholes, being careful to prevent soil, water, and debris from entering any existing pipe.

END OF SECTION

SECTION 02720

CATCH BASINS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Requirements to construct, adjust abandon, or rebuild all catch basins as indicated on the drawing and as specified.

1.02 REFERENCES

A. This specification makes reference to the requirements of additional specifications as listed. The Contractor shall obtain and familiarize himself with all requirements referenced by this specification.

   1. Materials and construction methods shall conform, insofar as applicable, to the requirements of the Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction, together with all errata addenda additional revisions, and supplemental specifications, (referred to as the Standard Specification).

B. American Society for Testing and Materials (ASTM).

1. A48, Specification for Gray Iron Castings.
2. C32, Specification for Sewer and Manhole Brick (Made from Clay or Shale).
3. C139, Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
4. C150, Specification for Portland Cement.
5. C207, Specification for Hydrated Lime for Masonry Purposes.
6. C478, Specification for Precast Reinforced Concrete Manhole Sections.

1.03 DESIGN REQUIREMENTS

A. Catch basins shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the drawings or bound in the specifications or as ordered by the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Catch basin walls shall be precast concrete masonry units. The top of the cone (not to exceed 6 inches.) shall be built of brickwork to permit adjustment of the frame to meet the finished surface.

B. Catch basin sumps shall be one piece precast concrete or concrete masonry units on cast-in-place or precast concrete bases.

C. The cast-iron frames and grates shall be the standard as indicated on the drawings.

D. All cast-in-place concrete shall be 4,000 psi and shall conform to the requirements specified under SECTION 03300.

2.02 PRECAST CONCRETE MASONRY UNITS

A. Precast concrete masonry units shall be machine-made solid segments, conforming to ASTM C139 with the following exceptions and additional requirements:
   1. Type II cement shall be used except as otherwise permitted.
   2. The width of the units shall be as indicated on the drawings.
   3. The inside and outside surfaces of the units shall be curved to the necessary radius and so designed that the interior surfaces of the structures shall be cylindrical, except the top batter courses shall be designed to reduce uniformly the inside section of the structure to the required size and shape at the top.
   4. Units shall be designed such that only full-length units are required to lay any one course.
   5. Acceptance of the units will be on the basis of material tests and inspection of the completed product.

2.03 PRECAST CONCRETE SUMPS

A. Precast concrete sumps shall conform to the ASTM C478, with the following exceptions and additional requirements:
   1. The wall section shall be not less than 6-inch thick.
   2. Type II cement shall be used except as otherwise permitted.
   3. Sumps shall be cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 130 degrees. F. for a period of not less than 12 hours or, when necessary, for such additional time as may be needed to enable the sections to meet the strength requirements.
   4. No more than two lift holes may be cast or drilled in each sump.
   5. Acceptance of the sumps will be on the basis of material tests and inspection of the completed product.

B. All holes in sumps used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar. The mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

2.04 BRICKS

A. The brick shall be sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer. Brick shall

conform to ASTM C32 for Grade SS, hard brick, except that the mean of five tests for absorption shall not exceed 8 percent by weight.

B. Rejected brick shall be immediately removed from the work.

2.05 MORTAR FOR BRICKWORK

A. The mortar shall be composed of Portland cement, hydrated lime, and sand, in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as directed and may vary from 1:1/4 for dense, hard-burned brick to 1:3/4 for softer brick. In general, mortar for Grade SS Brick shall be mixed in the proportions of 1-1/2:4-1/2.

B. Cement shall be Type II Portland cement conforming to the ASTM C150.

C. Hydrated lime shall be Type S conforming to the ASTM C207.

D. The sand shall comply with the specifications for fine aggregate, specified in Section 03300, except that all of the sand shall pass a No. 8 sieve.

2.06 MORTAR FOR MASONRY UNITS

A. Mortar shall be composed of one part portland cement and two parts of sand by volume with sufficient water to form a workable mixture. Cement and sand shall be as specified for mortar for brickwork.

2.07 CATCH BASIN FRAMES AND GRATES

A. Furnish and install all cast-iron catch basin frames and grates conforming to the details indicated on the drawings and as specified.

B. Castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sand holes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of grates and frame seats shall be machined to prevent cocking of grates.

C. All castings shall be thoroughly cleaned and subject to a careful hammer inspection.

D. Castings shall be at least Class 25 conforming to the ASTM A48.

E. Unless otherwise specified or indicated on the drawings, castings in paved areas shall be capable of withstanding AASHTO H-20 loading and shall meet the requirements of the municipality in which they are installed.

F. All grates to be pedestrian and bicycle safe.

2.08 CURB INLETS

A. Granite for curb inlets shall have a horizontal bed. The stone shall be sawn or peen hammered on top, and the front and back edges shall be pitched true to line. The back face for a distance of 3-inches down from the top shall have no projection greater than 1 inch. The front face shall be straight split, free from drill holes, and it shall have no projection greater than 1-inch or depression greater than 1/2 inch for a distance of 10-inch down from the top, and for the remaining distance there shall be no depression or projection greater than 1 inch. The ends shall be squared with the top for the depth of the face finish and so cut that the curb inlet can be set with joints of not more than 1/2 inch.

B. Granite curb inlet shall be 3 ft. minimum in length, plus or minus 1/2 inch, from 17 to 19 inches in depth, 7 inch wide at the top and at least 7 inches wide at the bottom.

C. A gutter mouth at least 3 inches in depth and at least 2 feet in length shall be cut in the front face of the stone as shown on the plans.

D. Where curb inlets are used to replace a section of existing curbing, the width of the curb inlet shall be the same as the adjoining existing curbing.

PART 3 EXECUTION

3.01 LAYING BRICKWORK AND GRADING RINGS

A. Only clean bricks and grading rings shall be used. Bricks shall be moistened by suitable means, as directed, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.

B. Each brick shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded as directed.

C. Each grading ring shall be laid in a full bed of mortar and shall be thoroughly bonded.

3.02 PLASTERING AND CURING BRICK MASONRY

A. Outside faces of brick masonry shall be plastered with mortar from 1/4 in. to 3/8 in thick. If required, the masonry shall be properly moistened prior to application of the mortar. The plaster shall be carefully spread and troweled. After hardening, the plaster shall be carefully checked by tapping for bond and soundness. Unbounded or unsound plaster shall be removed and replaced.

B. Brick masonry and plaster shall be protected from too rapid drying by the use of burlaps kept moist, or by other acceptable means, and shall be protected from the weather and frost, all as required.

3.03 SETTING CASTINGS

A. Curb inlets and frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the drawings or directed. Circular frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.

B. Grates shall be left in place in the frames on completion of other work at the manholes.

3.04 CATCH BASINS ADJUSTED TO GRADE

A. Existing catch basin tops shall be adjusted to line and grade as indicated on the drawings or as directed by the Engineer.

B. All catch basins adjusted to grade shall be provided with concrete grading rings of brick as specified for new drain manholes.

3.05 REBUILDING OF EXISTING CATCH BASIN

A. Cut suitable openings in existing structures to make connections to drains as indicated on the drawings and as specified or directed. In doing so, confine the cutting to the smallest amount possible consistent with the work to be done.

B. After the drains are installed, carefully fit around, close up, and repair the structures watertight, all as acceptable to the Engineer.

C. Prior to starting work, assembled all tools, materials, and construction equipment required to complete the work in the shortest possible time.

END OF SECTION

SECTION 02881

PLAY EQUIPMENT INSTALLATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements to furnish and install the play structures, equipment and amenities, as shown on the plans and as specified within and engineered wood fiber safety surface and/or mats if directed.

B. Play structures and equipment are manufactured by Landscape Structures. Local representative is M.E. O'Brien and Sons, Inc., Medfield, MA.

1.02 RELATED SECTIONS

A. Section 02100 – Site Preparation

B. Section 02220 – Earth Excavation, Backfill, Fill and Grading

C. Section 03300 - Cast-In-Place Concrete

1.03 SUBMITTALS

A. Shop Drawings, submit in accordance with SECTION 01300.

1. Include catalogue cuts for all play structures and engineered wood fiber safety surface.
2. Submit drawings of equipment layout and foundations.
3. Include detailed information, specifications, sizes and dimensions for all materials, accessories, and finishes.

B. Quality Control Submittals

1. Manufacturer's recommended installation instructions.
2. Provide documented experience of at least three (3) Landscape Structures playgrounds with equipment valued at or over $100,000.00 or provide documentation of being a certified Landscape Structures installer.

1.04 GUARANTEE/WARRANTY

A. Any defective components, hardware or other manufacturer-supplied materials shall be reported to the Engineer and the Owner and shall be replaced by the Manufacturer under the Owner's Warranty. Contractor shall coordinate the ordering and receipt of replacement parts with the Engineer and the Owner.

B. The Contractor and the manufacturer shall hold the Owner and Engineer harmless from any damages or liability resulting from negligent acts or omissions on the part of the Contractor or manufacturer, or resulting from defective parts, or improperly assembled equipment.

C. The General Contractor shall secure guidance of play equipment supplier in the correct installation practice for each particular equipment item including delivery to site of owner provided equipment.

PART 2 PRODUCTS

2.01 GENERAL

A. The Contractor shall arrange for the delivery of the play equipment from Landscape Structures and shall install it as shown on the drawings and per the manufacturer's recommendations. The local representative for Landscape Structures is M.E. O'Brien & Sons, Inc.

B. The Contractor shall have a Certified Playground Safety Inspector (CPSI) onsite during the installation of the playground equipment.

2.02 CONCRETE FOUNDATIONS

A. 4000 PSI, ¾ IN., 585 Cement Concrete, conforming to the relevant provisions of Subsection 901, shall be used for the construction of the cement concrete foundations.

2.03 ENGINEERED WOOD FIBER SAFTEY SURFACE

A. Engineered wood fiber safety surface shall conform to ASTM F1951 for Accessibility, ASTM F1292 for Impact attenuation, and ASTM F2075 for Engineered wood fiber.

B. Product is manufactured of a ground wood fiber comprised of softwoods and/or hardwoods, consisting of randomly sized wood fibers the majority of which do not exceed 2" in length and no more than 15% fines to aid in compaction. Product to have minimal bark and to be free of twigs, leaf debris and other organic material.

PART 3 EXECUTION

3.01 GENERAL

A. Installation shall be as recommended by the manufacturer and as shown on the drawings and as noted below.

3.02 ENGINEERED WOOD FIBER SAFETY SURFACE

A. A (1) percent grade is recommended for proper drainage. GT Impax engineered wood fiber systems should not be installed on grades exceeding 10 percent. Substrate (for both in-ground and above-ground systems) must be firmly compacted, especially when additional fill material has been provided. The substrate should be free of stones, roots and other vegetation.

B. Install the GT Impax engineered wood fiber to the proper depth, mounding in the center of the play areas of the playground. Extra materials will be provided to allow for compaction. Use a small front-end loader to spread surfacing. Operator should be careful not to travel on the

fabric or turn sharply on the GT Impax engineered wood fiber. It will also be necessary to spread manually. Install all the material delivered and please note that the surfacing will be several inches above grade until it compacts. GT Impax engineered wood fiber needs to be compacted in order to be considered handicapped accessible. This can be achieved over time and usage, or with a mechanical compactor. Saturating the initial load with water will help with compaction.

C. Install GT Impax wear mats in excessive wear areas, such as slide exits, under swings, and sliding poles.

3.03 PLAYGROUND EQUIPMENT

A. The Contractor shall install the foundations and structures to the lines and grades specified in the equipment manufacturer's drawings and these Specifications. Adjust all equipment to suit site gradients; no sloping platforms, track, or members intended to be horizontal shall be accepted.

B. The excavation for the footings shall be done as specified in Item of the Standard Specifications and according to the contract drawings details.

C. The equipment shall be located and brought to the heights as shown in the manufacturer's drawings and as recommended by the manufacturer with vertical and horizontal members set plumb and then braced to be held in place.

D. The concrete shall be poured and cured according Item of the Standard Specifications. The concrete shall be poured around the supporting pieces of the equipment to the proposed finished grades and as directed. Slope tops of footings to drain; set bottom of vertical members into gravel base to ensure drainage; do not encase bottom in concrete.

E. After the specified cure period of the concrete has passed, the bracing may be removed. The fills and surfaces shall then be placed and brought to the grades shown in the contract drawings and in accordance with the Standard Specifications.

F. Distance of equipment from any obstructions and discharge at end of slides shall conform to current CPSC guidelines and ASTM standards.

END OF SECTION

SECTION 02930

LOAMING AND SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for loaming, fertilizing, seeding, and related work in areas disturbed in the process of performing the Work under this contract.

1.02 SUBMITTALS

A. In accordance with SECTION 01300 submit the following:

1. Submit with seed, certificates confirming seed mixture, purity, germinating value, and crop year identification.
2. Submit test samples of loam.

1.03 DELIVERY, STORAGE AND HANDLING

A. Fertilizer:

1. Delivered mixed as specified in standard size, unopened containers showing weight, analysis, and name of manufacturer.
2. Store in weather proof place.

B. Seed:

1. Delivered in original unopened containers with mixture listed.

1.04 REFERENCES

A. This specification makes reference to the requirements of additional specifications as listed. The Contractor shall familiarize themselves with all requirements reference by this specification.

1. State of Rhode Island Department of Transportation (RIDOT) Standard Specifications, 2004 Edition with latest addenda.

PART 2 PRODUCTS

2.01 LOAM

A. Fertile, natural topsoil, typical of locality, without admixture of subsoil, refuse or other foreign materials, and obtained from well-drained arable site. Mixture of sand, silt and clay particles in approximately equal proportions. Free of stumps, roots, heavy or stiff clay, stones large than 1 inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other deleterious matter.

B. Not less than 5 percent nor more than 20 percent organic matter as determined by loss on ignition of oven-dried samples.

C. Loam test samples dried to constant weight at temperature of 230 degrees. F., plus or minus nine degrees.

D. Use loam, having prior vegetative growth that did not contain toxic amounts of either acid or alkaline elements.

2.02 LIME, FERTILIZER AND SEED

A. Ground agricultural limestone containing not less than 85 percent of total carbonates.

B. Complete fertilizer, at least 50 percent of nitrogen derived from natural organic sources of ureaform and containing following percentages by weight:

Nitrogen 10% Phosphorus 10% Potash 10%

C. Turf grass seed, clean, high in germinating value and latest year's crop mixture as follows:

Name	Minimum Proportion by Weight	Percent Purity	Percent Germination
Kentucky bluegrass	20%	87%	85%
Merion Kentucky bluegrass	20%	87%	85%
Red Chewings fescue	45%	98%	85%
Italian rye	15%	98%	90%

PART 3 EXECUTION

3.01 GENERAL

A. Supply suitable quantities of water, hose, and appurtenances.

3.02 LOAM

A. Spread loam on areas to 6-inch depth after compaction, fine grade and compact.

3.03 LIME, FERTILIZER AND SEEDING

A. Apply lime by mechanical means at rate of 3000 pounds per acre.

B. Apply fertilizer at rate of 1200 pounds per acre.

C. Remove weeds or replace loam and reestablish finish grades, if any delays in seeding lawn areas and weeds grow on surface or loam is washed out prior to sowing seed and without additional compensation. Sow seed at rate of 175 pounds per acre on calm day, by mechanical means. "Hydro-Seeding" not permitted unless otherwise permitted or required by the Owner or Owner’s Representative. Sow one-half of seed in one direction, and other half at right angles to original direction. Rake seed lightly into loam, to depth of not more than 1/4 inch and compact by means of an acceptable lawn roller weighing 100 to 150 pounds per linear foot of width.

D. Water lawn areas adequately at time of sowing and daily thereafter, initially with fine spray, and continue throughout maintenance and protection period.

E. Seed during approximate time periods of April 1 to May 15 and August 15 to October 1, and only when weather and soil conditions are suitable for such work, unless otherwise permitted.

3.04 MAINTENANCE OF SEEDED AREAS

A. Maintain lawn areas and other seed areas at maximum height of 2-1/2 inches by mowing at least three times. Weed thoroughly once and maintained until time of final acceptance. Reseed and re-fertilize with original mixtures, watering or whatever is necessary to establish over entire area of lawn and other seeded areas a close stand of grasses specified, and reasonably free of weeds and undesirable coarse native grasses.

B. Begin maintenance immediately after each portion of lawn is seeded and continue for minimum of 45 days.

C. Repair or replace all seeded areas which, in judgment of Owner or Owner's Representative, have not survived and grown in satisfactory manner, for a period of one year after acceptance.

D. Seeding replacement, same seed mixture as specified and furnished and installed as specified.

3.05 TEMPORARY COVER CROP

A. Sow a temporary cover crop of buckwheat, domestic rye grass or other acceptable seed if there is insufficient time in the planting season to complete seeding, fertilizing, and permanent seeding at the option of Contractor or order of Owner or Owner's Representative. Cut and water cover crop as necessary until the beginning of the following planting season, at which time it shall be plowed or harrowed into soil, the areas shall be fertilized and permanent seed crop sown as specified.

END OF SECTION

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SECTION 02950

LANDSCAPE PLANTINGS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Work under this Item consists of furnishing new plant material: planting, watering, mulching, staking and guying trees of the type and sizes indicated on the Plans, in accordance with these Specifications and/or as directed by the Owner's Representative or Owner.

B. The principal work of this section includes, but may not be limited to, the following:

1. Transplanting Operations
2. Layout and Excavation of Plant Holes
3. Planting and Backfilling
4. Watering
5. Pre-emergent Weed Control
6. Mulching
7. Fertilizing
8. Tags and Labels
9. Maintenance of trees and shrubs
10. Plant Replacement Guarantee

1.02 REFERENCES

ANSI Z-60.1 - Nursery Stock, latest edition (American Association of Nurserymen, Inc.).

SPN: "Standardized Plant Names," latest edition, by the American Joint Committee on Horticultural Nomenclature.

AOAC: Association of Official Agricultural Chemist."

Pruning Standards: ANSI A300 Practices for Trees, Shrubs &Other Woody Plant Maintenance: Secretariat, National Arborist Association, P. O. Box 1094 Amherst, MA.

1.03 QUALITY ASSURANCE

A. The Contractor shall Sub-contract planting work to a firm specializing in such work unless the Contractor is fully experienced and qualified. The Landscape Contractor shall have five years continuous experience and expertise in management, handling, and installation of ornamental plant material in large scale landscape construction projects. Site foreman shall have at least five years' experience and shall be on-site during all times of transplanting and plant installation.

B. The Landscape Contractor shall be responsible to coordinate with plant material suppliers in sufficient time to ensure that all of the plants as specified in the contract plant list are available in sufficient quantity for installation.

C. Do not make substitutions without written approval. If specified landscape material is not available, obtain approval for substitution from the Owner or Owner's Representative.

D. The Owner's Representative reserves the right to inspect all plant materials for compliance with specifications, and to reject unsatisfactory or defective work at any time during progress of work.

1.04 SUBMITTALS

A. Certified clean analysis and source of off-site loam, used to backfill to be provided. Certification shall list soil additives to topsoil, rates and type.
B. Ce

C. Certifications and/or labels of proposed plant materials or substitutions, listing common, scientific names and sizes of each.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect all products from weather or other damaging or deteriorating conditions.

B. Plants which have been damaged or have deteriorated in transit or storage are not acceptable.

C. Keep plants moist, fresh, and protected against exposure to sun, wind, and freezing temperatures whether in the receiving yard, in transit, while being handled, or at the job site awaiting planting.

D. Planting Dates: The Landscape Contractor should provide a proposed planting schedule. Schedule dates for landscape work during normal seasons for such work. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.

Planting Window:	Spring – April 30 to June 30 Fall - August 15 to October 15

E. Those species known to be fall digging hazards shall be dug during the spring season only. Fall planting of these species shall be permitted only with certification, from the nursery, of the time of digging and at the discretion of the Owner's Representative.

F. Correlate planting schedule with specified maintenance periods to provide maintenance to date of acceptance.

G. Coordination with Lawns: Plant shrubs, and groundcover after final grades are established and prior to planting of lawns, unless otherwise acceptable to Owner's Representative. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

1.06 SPECIAL CONDITIONS

A. Should discrepancies exist between plant quantities or plant sizes as shown in the Planting Schedule and on the Planting Plan, quantities and sizes shown on the Planting Plan shall govern. Contractor shall install all plants as shown on the plan at no additional cost to the Owner.

1.07 WARRANTY

A. Provide a warranty for plant material for a minimum of one year including one continuous growing season. Commence warranty on date identified in the Certificate of Final Acceptance.

B. Warranty: Include coverage of plants from death or unhealthy conditions.

C. Replacements: Plants of same size and species as specified, planted as soon as possible in the next growing season, with a new warranty and an extended maintenance service commencing on date of replacement.

1.08 MAINTENANCE

A. Maintenance of all plant material to be performed by installer includes:
- Replacing of dead plant material
- Resetting plants to proper grades, or to upright position

PART 2 - PRODUCTS

2.01 LOAM:

A. Certified Clean, the Loam shall contain not less than 5 1/2 percent nor more than 10 percent organic matter as determined by the loss on ignition of oven-dried samples. The loam shall have an acidity range of 5.5 pH to 7.6 pH.

B. Loam shall be free of debris and other extraneous matter. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 milliohms/cm. (Test minus sieve #10 material). Soils shall not have levels of extractable aluminum greater than 200 parts per million.

C. No loam shall be delivered to the site until the review and approval of loam test results by the Owner or Owner’s Representative, but such approval shall not constitute final acceptance. The Owner or Owner’s Representative will reject any material delivered to the site which, after on-site, post-delivery testing, does not meet these specifications.

2.02 ANTIDESSICANT

A. Anti-desiccant shall be an emulsion which permits transpiration while retarding excessive loss of moisture from plants.

B. Deliver in manufacturer's fully identified containers and mix according to manufacturer's direction. Use "Wiltproof" or approved equal.

2.03 FERTILIZER:

A. Complete fertilizer in granular form, from commercial sources bearing manufacturer’s analysis; 10-10-10 ratio of N-P-K.

B. Significant quantities of trace elements such as iron, boron, etc. shall be contained in the fertilizer.

C. Fifty percent (50%) of available nitrogen shall be in a slow release form as found in certain urea form products or natural organic forms or a combination of both.

D. Salt index shall not exceed 35.

2.04 PRE-EMERGENT WEED CONTROL:

A. Pre-Emergent weed control for application in mulch areas shall be granular and have the active ingredient "Trifluralin 5.0%". All application rates and product use shall be in accordance with manufactures guidelines.

2.05 MULCH:

A. Pine Bark Mulch shall be derived from evergreen tree bark aged to a minimum of six months and no more than eighteen months. The bark shall be shredded so that the resulting pieces are no more than 1/2 inch thick and no longer than 3 inches. The mulch shall be ninety-eight percent (98%) organic matter with a pH of 3.5 to 4.5. The mulch shall be free of stringy material and shall not contain an excess of fine particles. The mulch shall be brown in color, free of leaves, twigs, sod, weeds, shavings and other foreign materials which are injurious to health plant growth.

2.06 WATER:

A. Clean, fresh potable water free from injurious chemicals and other toxic substances harmful to plant life. No brackish water will be permitted.

B. The Owner's Representative may reject any water delivered to the site which, after on-site, post-delivery testing, does not meet these specifications.

2.07 PLANT MATERIALS:

A. Plant materials shall conform in size, grade and quality to the "American Association of Nurserymen Standards for Nursery Stock." As approved by the United States of America standards institute, in effect at the time of bidding.

B. Plants of other kinds than those named in the Plant Schedule on the Drawings shall not be accepted without written approval of the Owner's Representative.

C. Unless otherwise approved by Owner's Representative, all plants shall be nursery-grown in accordance with good horticultural practices and shall have been grown under climatic conditions similar to those in the locality of the project for at least two years. They shall have been transplanted or root pruned at least nine months previous to moving to the site.

D. Plants shall be dug, handled and transported so as to prevent damage of any sort including but not limited to breakage of branches or limbs, scraped or bruised trunk or broken root ball. Plants shall be protected from desiccation during digging, storage and transportation by watering, covering and application of anti-desiccants as necessary to ensure their continued health and viability.

E. All plant material shall comply with the state and federal law with respect to inspection for plant disease and insect infestation.

F. Replacement plants larger in size than existing may be used if approved by the Owner's Representative provided use of larger plants does not increase Contract price.

G. If use of larger plants is approved, increase ball of earth of spread of roots in proportion to size of plant.

PART 3 - EXECUTION

3.01 TRANSPLANTING OPERATIONS

A Transplanting: The Landscape Contractor shall coordinate with the Owner and work with the Owner's Representative to review locations and determine how best to transplant the two trees indicated to maximize plant health and minimize stress to the plants. Apply anti-desiccant. Provide adequate staking and guying. Mulch in place. Establish regular watering schedule.

3.02 PLANTING OPERATIONS

A. Layout: Determine location of underground utilities and layout plants so as to avoid possible damage to such structures. Plant shown graphically and/or verbally on plans, shall be staked on ground by contractor and approved by the Owner's Representative prior to excavation. Should discrepancies exist between plant quantities in Planting Schedule and Planting Plan, quantities shown on the Planting Plan shall govern. Adjustments in locations and outline shall be made as directed in field. Labor, equipment, and new smooth stakes are to be furnished by the Contractor for this purpose.

B. Excavation: Planting locations shall conform to the approved staked locations and outlines. Holes dug for plantings shall in all cases be large enough to include the complete root system of the plant (tree, shrub, and groundcover) to be received and also sufficient amounts of approved backfill around the periphery of the root ball. All sod, weeds, roots, cobbles, and stones and other objectionable materials excavated from the plant holes, which is unsuitable for backfill shall be removed from the site immediately and legally disposed of.

C. Plant Hole Size: The minimum plant hole size, unless otherwise specified, shown on the plans or directed by the Owner or Owner's Representative shall be as follows:

1. Trees - The planting hole shall be twice the diameter of the root ball in width and no deeper than 2 inches less than the distance from the bottom of the root ball to the root collar (i.e. a 12 inch tall ball will require a 10 inch deep hole). Any excavation in excess of that required shall be replaced and compacted to eighty-five percent (85%) of maximum density.

D. Any rocks or underground obstructions shall be removed to a depth necessary for planting as specified, unless alternate locations for the planting are approved by the Owner or Owner's Representative. If removal of obstructions results in a deeper hole than specified for planting, backfill material shall be added and compacted to eighty-five percent (85%) of maximum density to the correct depth.

E. Backfill Mix: Add loam to suitable soil excavated from the planting hole to create mix for planting pits. Backfill mix shall be at least thirty-three percent (33%) loam.

3.03 SETTING PLANTS

A. Plants shall be handled in such a manner that the soil of the root ball will not be loosened from the roots. Carefully place plant into the prepared hole. Set plants plumb and fill in around the root ball to one-half the depth of the hole with backfill mix. Thoroughly tamp the backfill mix to eighty-five percent (85%) of maximum density.

B. Fill remaining area of planting hole with water. Once the water has completely drained loosen burlap and peel down at least the top one-third. If required wire baskets to be cut off and removed. Roots that have been wrapped around the ball within the burlap shall be made to lay in as natural a manner as possible. Cut broken or frayed roots cleanly.

C. Fill remaining area of hole with backfill mix and thoroughly tamp to eighty-five percent (85%) of maximum density. Form a saucer around the edge of through backfill hole by constructing a berm. The finish height of the compacted berm shall be 4 inches higher than the surrounding grade. No excess soil shall be allowed to remain within the plant saucer. Fill saucer with water.

3.04 PRUNING OF NEW PLANT MATERIAL

A. After planting, prune only dead, broken or deformed branches and in such manner as to preserve natural character of plant.

B. Perform all pruning with sharp tools, with cuts flush and clean. Do not apply paint or asphalt emulsion tree wound compound on cut area.

C. Trees which have had their leaders cut, or so damaged that cutting is necessary, will not be accepted. There shall be no abrasion of bark, nor fresh cuts of limbs over ½ inch.

3.05 WATERING

A. The plants shall be watered immediately following planting.

B. Soak the plants thoroughly again within a twenty-four hour period after the initial planting.

C. Additional watering shall be made at least once every three weeks, or as directed by the Owner or Owner's Representative based on weather conditions, until final acceptance of the plant material.

3.06 FERTILIZING

A. During backfill operations, place fertilizer in upper foot of back fill around perimeters at a rate of two ounces per foot of diameter of plant pit, or as recommended by manufacturer.

3.07 MULCHING PLANTS

A. Application of mulch should only occur after planting operations have been completed and initial watering has taken place. Mulch shall be applied no later than forty-eight hours after planting.

B. Prior to the placement of mulch, the contractor shall apply a pre-emergent weed control with the entire area to be mulched. Pre-emergent weed control shall be applied by a commercial applicator, licensed by the State of Rhode Island at a rate in accordance with the manufacturer's instructions.

C. Mulch shall be applied a minimum of 3 inches in depth for all individual trees and planting beds, as indicated graphically or verbally on the drawings.

D. Where mulch abuts seeded lawn areas or other finish grade materials, edge of planting bed shall be cut smooth and cleanly. Mulch shall be placed carefully so as not to spill into adjacent areas. Any excess or spilled mulch shall be promptly removed from the project area. The cost of the mulch is incidental to new plantings.

3.10 ANTIDESSICANT SPRAYING

A. Spray anti-desiccants as directed by the manufacturer's recommendations if so directed by the Owner's Representative and or Owner.

3.11 TAGS AND LABELS

A. Leave all tree tag and label seals unbroken and visible on plant material until final inspection. Remove all seals immediately after final inspection.

3.12 MAINTENANCE

A. Contractor is responsible for protection and maintenance of all work prior to final acceptance. No plants will be accepted unless they show a healthy growth and satisfactory condition.

3.13 PLANT REPLACEMENT GUARANTEE

A. Guarantee that, upon completion and final acceptance tree, shrub and groundcover planting conforms to requirements of contract documents and that all plants except transplant materials are healthy and will remain so for a period of one year. Such period shall commence with date of final acceptance.

B. At any time within period of guarantee, Contractor shall replace any planting which for any reason, other than vandalism, has died or is in a dying condition, or which has failed to flourish in such a manner or to such a degree that its usefulness or appearance has been impaired.

C. The Owner or Owner's Representative will not maintain plantings until after guarantee period. Contractor shall not have any claim that materials have failed to flourish as a result of Owner's Representative's maintenance operations, or lack of maintenance, and shall abide by terms stated herein for guarantee and replacement of plant materials.

D. Decision of Owner's Representative as to necessity to replace any plant materials or repair any defects on workmanship, or cause of any destruction or loss, impairment or failure to flourish, shall be conclusive and binding upon Contractor. Replacements shall be of same species and size as specified on Plant List. All plant replacements shall be inspected, sealed, furnished, planted and mulched as specified herein at Contractor's expense.

E. "Vandalism," is intended to mean any acts, whether intentional or accidental, by other persons occurring following final acceptance, which clearly result in breakage or other damage to individual plants or plant beds, and which may reasonable be considered to be beyond Contractor's reasonable control, as determined by the Owner's Representative.

END OF SECTION