SECTION 021000

SITE PREPARATION AND CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions, see Section B1 of the Contract, apply to the work of this Section and are hereby made a part of this Section.

B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK

A. The work of this Section includes, but is not limited to, the following:
   1. Protection of existing improvements to remain.
   2. Protection of existing trees to remain.
   3. Removal for salvage and/or relocation of existing items including transportation, protection and placement of salvaged materials in Owner designated storage areas including:
      1. Signs of various types.
      2. Trash and recycling bins and enclosures.
      3. Concrete, granite and other curbing.
   4. Stripping and removal of topsoil.
   5. Cutting of existing grade to establish construction grade.
   6. Clearing, grubbing, removal and disposal of vegetation.
   7. Remove items of existing site elements, foundations and appurtances, and structure to the extent indicated, including demolition and excavation if required for removal.
   8. Coordination of disconnection and capping of utilities as needed.
   9. Complete controlled, selective demolition and removal from the site of all existing construction, materials, and systems as needed to properly complete the work of the Contract Documents.
   10. Disposal of removed items and materials not otherwise indicated to be salvaged and delivered to Owner.
   11. Coordination with associated construction contracts.
   12. Post construction cleanup.

B. All work shall also include the protection from injury or defacement of all vegetation and objects designated to remain, as shown on the Drawings or as directed by the Landscape Architect or Construction Manager.

1.03 RELATED SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:
   1. Section 023000 – Earthwork.

2. Section 029000 – Planting and Fine Grading.
3. Section 029500 – Planting Soils.
4. Section 029510 – Structural Planting Soils.

1.04 DEFINITIONS

A. The following related items are included herein and shall mean:
   1. ANLA: American Nursery & Landscape Association.
   2. ASTM: American Society of Testing Materials.

B. Debris and/or Obstructions: Existing materials including but not limited to concrete slabs and foundations; pilings; paving materials; abandoned utilities pipes, duct banks, and structures; rubble material including bricks, ashes, wood, cinders, debris, aggregate, and masonry; catch basins and manholes; miscellaneous metal items; boulders; and any other below grade debris and obstructions of any size encountered within the required excavations regardless of the nature of the materials encountered, their geological definitions, the water contents thereof, and the means of excavation required.

C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

D. Remove, removal, and like terms: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.

E. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse. Store items indicated for removal and salvage to a location as approved by Construction Manager.

F. Structures: Footings, foundations, retaining walls, slabs, curbs, utility and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Excavation and other related terms: See Section 023000 “Earthwork”.

1.05 PROJECT CONDITIONS AND EXAMINIATION OF CONDITIONS

A. General: The Contractor shall visit and accept the site as he finds it, and shall inform himself of the character and the type of site items to be removed. The Owner assumes no responsibility for the actual condition or structural adequacy of any existing construction to be demolished.
   1. Damage or loss to site improvements shall be at the risk of the Contractor from and after the date of Contract execution, and no such damage or loss shall relieve the Contractor from any obligation under the Contract.
   2. The Contractor shall walk the site with the Landscape Architect and Construction Manager prior to commencing work to determine the full scope of demolition and items to remain.

B. The Contractor shall fully inform himself of existing conditions of the site before submitting his bid, and shall be fully responsible for carrying out all site work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed.

C. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best of the Landscape Architect's and Owner's knowledge, but the Contractor shall have examined them for himself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found therein.

D. Disposal: Dispose of cleared, grubbed, and removed material off the site. Burning of materials on the job site will not be permitted. Stockpile salvaged material in a secured location, designated by the Landscape Architect or Construction Manager. Traffic: Adjacent areas and streets will continue to be used throughout the construction process. Conduct operations and removal of debris to ensure minimum interference with the normal use of corridors, public ways and other adjacent facilities. Do not close or obstruct traffic ways, corridors, streets, walks or other used facilities without the written permission of the Owner and authorities having jurisdiction.

E. Proposed site entry and exit points for construction traffic shall be submitted and approved prior to the start of Construction.

F. Related Construction Contracts: The contractor is required to provide complete cooperation and coordination for construction of the landscape improvements in tandem with associated construction projects and/or maintenance operations that may be occurring on adjacent building sites and roads. Coordination shall be planned so that there is no delay to the construction contract.

G. Protection: The buildings and the adjacent parking areas and streets will be occupied and operational during construction. The Contractor shall provide access for pedestrians and service vehicles as per the General Conditions. The Contractor shall take all necessary precautions, including but not limited to, traffic control and construction of temporary ramps, access routes or enclosures, to ensure the safe passage of pedestrians and the normal functioning of the buildings, site areas, and service areas. Ensure the safe passage of persons in and around the work areas during and after demolition. Prevent injury to persons and damage to property. Immediately repair damaged property to its condition before being damaged.

H. Dust and Noise Control: Take effective measures to prevent windblown dust and to control noise to avoid creating a nuisance. Obtain approval of means, methods and techniques used to control dust and noise from Landscape Architect and Construction Manager. Chemicals deleterious to plant growth may not be used on subgrades of areas that will be seeded or planted. Avoid creating ice hazards in freezing weather.

I. Utilities:

1. Maintain all utilities except those requiring removal or relocation. Keep utilities in service and protect from damage.
2. Do not interrupt utilities serving used areas without first obtaining permission from the utility company and the Construction Manager.
3. Provide temporary services as required and review interim utility service plan with the Construction Manager prior to interruption of service.
4. Verify that utilities have been disconnected and capped as approved by the Construction Manager before proceeding with Work.

J. Materials Ownership:

1. General: Except for materials indicated to be salvaged, indicated for reuse on the Project, or subsequently designated to remain Owner's property, all

excavated, demolished, and cleared materials shall become the property of the Contractor and shall be removed from the site in a legal manner.

K. Sale of or storage of removed items or materials on site is not permitted.

1.06 SCHEDULING

A. The Contractor shall submit, for approval by the Landscape Architect and Construction Manager, a schedule of how the job will progress in accordance with the General Conditions.

B. The Contractor must verify the location of all utilities in the limit of work before starting work, including but not limited to gas, electric, telephone, storm drainage, sanitary drainage, fiber optic, telecommunication, cable, and water services.

1.07 EXAMINATION OF SITE AND DOCUMENTS

A. The Contractor shall carefully study the Contract Documents and shall fully inform himself of existing conditions of the site before submitting his bid and before starting work. The Contractor shall at once report to the Landscape Architect any errors, inconsistencies or omissions he may discover. The Contractor shall be fully liable to the Owner for any damage resulting from such errors, inconsistencies or omissions in the Contract Documents.

B. The Contractor shall be fully responsible for carrying out all site work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in actual work. Plans, surveys, measurements and dimensions under which the work is performed are believed to be correct to the best of the Owner’s knowledge, but the Contractor shall have examined them for himself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found therein.

C. The Contractor shall review available information and make an independent interpretation of the surface and subsurface conditions that may affect the work of the Contract.

D. On all Project Drawings, figures take precedence over measurements by scale. The Landscape Architect shall decide on questions that may arise regarding the meaning and intent of the Project Drawings and Project Specifications. If any Project Drawings or figures that are necessary to a clear understanding of the Work are omitted, or if any error appears in either Project Drawings or Specifications, or if discrepancies are found between the Project Drawings and Project Specifications, it shall be the duty of the Contractor to notify the Landscape Architect of such omissions, errors or discrepancies, and in no case proceed in uncertainty. If any mistakes arise in consequence of such neglect on the part of the Contractor to notify the Landscape Architect, the Contractor must correct the work at his own expense.

E. The Contractor shall perform no portion of the Work at any time without the Contract Documents or, where required, approved Shop Drawings, Product Data or Samples for such portion of the Work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the General Conditions.

1.08 BENCHMARKS, SURVEY MARKS, AND LAYOUT OF WORK

A. The Contractor shall maintain and/or re-establish benchmarks, survey monuments, property corners, and reference points shown on the Drawings, found on the site, or to provide a base reference for the construction. The Contractor shall replace any benchmark, survey monument, property corner, or reference point which may become destroyed or disturbed during construction to the satisfaction of the Landscape Architect, Construction Manager, or parties having jurisdiction and at no cost to the Owner.

B. The Contractor shall employ and pay for all costs for a surveyor registered in the state of New York to lay out all lines and grades in accordance with the Drawings and specifications and as may be necessary or required for construction. The registered surveyor shall be skilled in reading architectural and engineering drawings, the use of a transit and level, and the use of measuring tapes and devices. The selection of the registered surveyor shall be subject to the approval of the Landscape Architect and the Construction Manager.

C. All measuring devices shall be calibrated to accurately layout all site improvements indicated on the Drawings.

1.09 EXISTING UTILITIES

A. The Contractor shall locate and mark underground utilities to remain in service before beginning work. Markings shall remain throughout the length of the project.

B. Protect all existing utilities to remain during operations. When working on or around the utilities, follow all rules and regulations of the respective utility. Do not interrupt existing utilities except where and when necessary, and as authorized by authorities having jurisdiction.

C. Active utilities and drains shall be adequately protected from damage and removed or relocated only as indicated on Drawings or as directed by the Landscape Architect. Where active utilities are encountered but not shown on the Drawings, the Contractor shall notify the Construction Manager immediately in writing. The Contractor shall protect and maintain these utilities until written instructions are received from the Construction Manager or Landscape Architect. The Contractor shall provide strawbales on all sides of existing drain inlets and maintain these measures throughout construction, or until instructed by the Construction Manager or the Landscape Architect.

D. Inactive and abandoned utilities and drains encountered in excavating and site preparation operations shall be reported to the Construction Manager immediately. They shall be removed, plugged or capped as directed by the Construction Manager or Landscape Architect. Utilities that were not identified by the survey and the Contractor’s examination of Owner’s and utility company records, but which are discovered through excavation will be considered extra work, to be approved by the Landscape Architect.

1.10 PROTECTION

A. The Contractor in executing all work under this section shall observe all local rules and regulations governing the works.

B. All work shall be executed in a manner to prevent any damage to existing buildings, streets, paving, service utility lines, structures, existing improvements, adjoining

property and existing improvements on adjoining property. Protect from damage all utilities that are to remain.

C. Items to remain and existing improvements that are damaged shall be restored to their original condition that is acceptable to the Landscape Architect, Construction Manager, and parties having jurisdiction. Restoration work shall be at no cost to the Owner and parties having jurisdiction.

D. Authority for performing removal and alteration work on property adjoining the Owner's shall be obtained by the Construction Manager prior to beginning work.

E. All work shall be executed in a manner that takes every and all precautions to assure safe work operations.

F. All protective fencing shall be in place prior to start of work.

1.11 SOIL EROSION AND SEDIMENT CONTROL

A. Erosion control measures shall be, at a minimum, in conformance with The New York State Department of Environmental Conservation Standards and Specifications for Erosion and Sediment Control (Blue Book), dated November, 2016.

B. The Contractor shall furnish a schedule of anticipated starting and completion dates for each sequence of land disturbing activity.

C. Prior to any other construction, a stabilized construction entrance shall be constructed at the point of entry/exit to and from the site.

D. The construction exit shall be maintained in a condition that will prevent tracking or flow of mud onto public right of way. This may require periodic top dressing with stone, as conditions demand, and repair and/or clean out of any structures used to trap sediment. All materials spilled, dropped, washed, or tracked from vehicle or site onto public right of way or into storm drain must be removed immediately.

E. Immediately after the establishment of construction entrances/exits and prior to any other construction, all work limit fencing and stormwater management devices must be installed.

F. The phasing and sequencing of major grading activities shall conform to plans and specifications.

G. The construction of the site will initiate with the installation of measures sufficient to control sediment deposits and erosion. All sediment control measures will be maintained until all upstream ground within the construction area has been completely stabilized with permanent vegetation and all roads/driveways and walks have been paved.

H. The Contractor is responsible for controlling erosion in all drainage patterns created during construction. Any difficulty in controlling erosion during any phase of the construction shall be reported immediately to the Landscape Architect by the Contractor.

I. The Contractor shall remove accumulated sediments when they reach half the capacity of the erosion control devices. Sediment/erosion control devices must be checked after each storm event.

J. Failure to install, operate, or maintain all erosion control measures will result in the cessation of all construction until such measures are corrected to the local jurisdiction or city standards.

K. Any additional construction other than shown in the Drawings will require separate and additional erosion and sediment control measures and approval.

L. The contractor is responsible for cleaning any and all sediment leaving the site. The contractor shall be responsible for repairing all damages caused by the accumulation of sediment.

1.12 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

A. Subsoil shall be provided by the Contractor from on-site material that has been stockpiled from site excavation for re-use. Off-site borrow should only be used when on-site sources are exhausted.

B. Provide on-site locations for as much excavated rock, soil, and vegetation as possible.

C. Remove all existing topsoil from the site.

D. Separate organic and inorganic material from site clearing.

E. All pesticides (e.g. herbicides, insecticides, etc.) must be EPA approved and applied per manufacturer's instructions. All pesticide use must be approved by Owner, Construction Manager, and Landscape Architect. Pesticide use must follow local, state, and federal regulations.

F. Collect and transport all salvageable and recyclable scrap material in accordance with requirements of the General Conditions "Construction Waste Management" Section.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide all materials, equipment and supplies as required to completely perform the demolition work specified herein and as shown on the Drawings.

2.02 LAYOUT EQUIPMENT

A. Stakes and batter-boards shall be of size and quality necessary to execute work. The Contractor shall use wire, non-stretching cord, or laser equipment to establish reference lines.

2.03 MATERIALS

A. Protection of Drainage / Sedimentation Control.
   1. Anti-Erosion Mulch or Straw Bales: Provide clean, weed-free, seed-free straw approved by the Landscape Architect.
   2. Contractor shall confirm that materials conform to all applicable regulations of all agencies having jurisdiction over drainage systems.

3. Maintenance of the sediment/erosion control devices is the responsibility of the Contractor and the cost for this maintenance should be included in the Base Bid, including the use of installing and removing silt fencing as required.

B. Protective Fences and Gates

1. Protective fences and gates shall be chain link fence components including posts, rails, fabric, and miscellaneous accessories. Limits shall be as shown on the Drawings or as determined by the Landscape Architect and Construction Manager. All fence components shall be galvanized. Fence and gate components may be used (second hand) if in good shape.
2. Contractor shall obtain Owner's approval of all fence components before obtaining fence system.
3. Protective fences shall include the Construction Perimeter Fence (temporary and long term) and the Tree Protection Fence..
4. Protective fence and gate components shall include 2.5"Ø posts, 1.5"Ø top and bottom rails, and 9 gage 2" x 2" chain link fence fabric. Posts shall be driven into the ground at a minimum depth of 3.0' or to a depth necessary to provide a secure and stable fence system. Posts shall be located at a maximum distance of 10'-0" on center. Minimum height shall be 8.0 feet. Contractor shall examine the site preparation plan to determine extent of posts required to accommodate the fence layout. Gates shall be lockable and shall be located as shown on the drawings.
5. All fences and gates shall have green windscreen fabric securely tied to the interior surface of the chain link fabric. Netting shall extend entire height of the fence fabric. Periodically inspect and maintain fabric.
    a. Netting shall be 100% polypropylene fabric, 28 x 14 Lathe-Leno weave. Color shall be black. Height is 8.0 feet. Acceptable manufacturer: Aalaco Manufacturing Company, St. Louis, MO, Tel: 800.537.1259, Fax: 314.544.2386, WEB: www.aalcomfg.com, or approved equivalent.
6. The Contractor shall submit proposed layout of the site protective fence; approval by the Owner must be received prior to commencement of construction activities. The contractor shall be responsible for providing sufficient fences and gates to secure the site throughout the construction process.
    a. Review and obtain approval for the fence layout with the Landscape Architect and Construction manager. Do not erect the fence until approval has been obtained.

C. Storage Materials

1. Provide wood cribbing for heavy and bulky items.
2. Furnish wood pallets of standard type and size for handling salvaged items.
3. Tagging Materials: Inventory identification tagging shall be used for all stored materials and shall include ink writing resistant to long term weather exposure.

PART 3 - EXECUTION

3.01 PROTECTION OF EXISTING IMPROVEMENTS

A. Protective measures shall include temporary construction in addition to protection provisions specified in the General Conditions.
1. Protect adjacent existing buildings and structures from damage.

2. Protect adjacent trees and plants to remain from injury or damage. Do not stockpile soil or other material within drip line of trees.
3. Protect sidewalk paving and street curbs in addition to crossing traffic locations.
4. Protect existing drainage systems from intrusion of debris and clogging.
5. Protect adjacent surfaces and finishes including existing fences.
6. When permitted by the Construction Manager, certain Existing To Remain but interfering items may be removed to a suitable, protected, storage location during work. These items shall be cleaned and reinstalled in their original locations after clearing, demolition, and excavation operations are complete.

B. Take precautions to guard against movement, settlement, or collapse of any adjacent conditions, sidewalks or street passages, adjoining property, and adjacent structures. Be liable for any such movement, settlement, or collapse. If such damage does accidentally occur, safeguard the public and repair promptly.

C. Protection of Persons:

1. Provide temporary facilities including barricades and fencing to prevent entry to demolition areas by unauthorized persons. Access to demolition areas shall be prevented by temporary facilities such that the facilities cannot be circumvented or thwarted.
2. The necessary temporary closures, guardrails, barricades, and other devices shall be provided so as to adequately protect workmen and employees, visitors, and inhabitants from possible injury.

D. The Contractor shall provide protections necessary to prevent damage to existing improvements indicated to remain in place and newly constructed improvements on Owner’s property.

E. The Contractor shall protect existing improvements on adjoining properties from any damage.

F. The Contractor shall restore damaged improvements to their original condition, as acceptable to the Landscape Architect, Construction Manager, and parties having jurisdiction, at no cost to the Owner and parties having jurisdiction.

3.02 TREE PROTECTION REQUIREMENTS

A. Tree and Site Related Disturbances

1. Individual trees or stands of trees designated to be saved shall be protected from the following damages which may occur during all phases of land disturbance and construction processes.
    1. Direct physical root damage,
    2. Indirect root damage, and
    3. Trunk and crown disturbances.
2. Direct physical root damage most frequently occurs during site clearing and grading operations, where transport or feeder roots are cut, torn, or removed.
    1. Transport and feeder roots tend to tangle and fuse among the roots of adjacent trees. The removal of trees with heavy machinery along the outer periphery of a tree save area can result in considerable damage within the tree save area.
    2. The most substantial form of root damage for all root types occurs in the form of cut roots. Roots are cut in grade reduction, or from

trenching for underground utilities sanitary sewer, or storm sewer lines.

3. A more subtle form of root damage is the loss of feeder roots. Feeder roots normally occur within the organic layer, and the surface four inches of top soil, subsequently, these roots can easily be damaged by the track action from a single bulldozer pass. The stripping of topsoil within a trees critical root zone can totally eliminate its feeder root system.

3. Indirect root damage through site modification can result from positive grade changes, temporary storage of fill material, the sedimentation of erosion materials, soil compaction, and soil chemical changes.
   1. Positive grade changes from fill and sedimentation causes a decrease in soil oxygen levels. An increase in soil carbon dioxide and other toxic gases can also occur, leading to large areas of anaerobic conditions. Anaerobic soil conditions cause a decrease in the root respiration process which is essential for the uptake and transport of minerals and nutrients.
   2. Anaerobic soil conditions are also produced by soil compaction, the increase in soil bulk density with a decrease in soil pore space. Compacted soil is also impervious to root penetration, and inhibits root development. Soil compaction is generally caused by the weight and vibrations of heavy machinery, vehicle parking, and the storage of fill and/or construction materials within the critical root zones of trees.
   3. Changes in soil chemistry will adversely affect tree survival. The most frequent occurrence is the decrease in soil acidity by concrete washout. The leakage and spoilage of toxic materials such as fuels or paints can be fatal for trees.

4. Trunk and crown disturbances are generally mechanical in nature and are either caused directly by grading machinery, or indirectly by debris being cleared and falling into trees marked for protection.
   1. Common forms of damages include stripped bark and cadmium, split trunks, and broken limbs.
   2. Damage also occurs from the posting of signs, such as building permits, or survey markers on trees.

B. Methods of Tree Protection
   1. The root system within the dripline region is generally considered to be the critical root zone. Disturbance within this zone can directly affect a tree's chances for survival. To protect these critical root zones the following standards shall apply:
   2. The use of tree save islands is encouraged rather than the protection of individual trees scattered throughout the site. This will facilitate ease in overall site organization as related to tree protection.
   2. The protective zone of individual trees or stands of trees or otherwise designated tree save areas shall include no less than the total area beneath the tree(s) canopy as defined by the farthest canopy dripline of the tree.
   3. Layout of the project site utility and grading plans shall accommodate the required tree protection zones. Utilities must be placed along corridors between the tree protection zones.
   4. Construction site activities such as parking, material storage, concrete washout, etc., shall be arranged so as to prevent disturbances within tree protective zones.
   5. No disturbance shall occur within the protective zone of individual trees or stands of trees without prior approval of the Owner.

C. Protective Barriers
1. Active protective tree fencing shall be installed along the outer edge of and completely surrounding the critical root zones of all specimen trees or stands of trees or otherwise designated tree protective zones, prior to any land disturbance or construction.
2. These fences shall be a minimum 4 feet high range fence or approved equal.
3. Passive forms of tree protection shall be utilized to delineate tree save areas which are remote from the areas of construction. These areas must be completely surrounded with continuous rope or flagging (heavy mill, minimum 4 wide). All passive tree protection must be accompanied by KEEP OUT or TREE SAVE signage.
4. All tree protection zones shall be designated as such with tree save area signs posted visibly on all sides of the fenced in area. These signs shall be intended to inform subcontractors of the tree protection process. Signs requesting subcontractor cooperation and compliance with tree protection standards are recommended for site entrances.
5. All individual trees or stands of trees, or otherwise tree protection zones shall be protected from the sedimentation of erosion materials. Erosion control materials must be placed along the outer uphill edge of tree protective zones at the land disturbance interface. All erosion control must comply with standards promulgated by the jurisdiction of the work, coordinate with Section 023000 for material requirements and labor restrictions.
6. All tree fencing and erosion control barriers shall be installed prior to and maintained throughout land disturbance and construction process and shall not be removed until landscaping is completed.

D. Encroachment - Most trees can tolerate only a small percentage of critical root zone loss. If encroachment is anticipated within the critical root zones of individual trees, stands of trees, or otherwise designated tree protective zones, the following preventive measures shall be employed:
1. Excavation and grading activities: The removal of impervious surfaces (concrete, asphalt, etc.), existing turf and topsoil adjacent to tree save areas can cause inadvertent damage to the protected trees. Wherever impervious surfaces occur, it shall be advisable to use a pneumatic hammer or facsimile rather than a backhoe or bull dozer to break up and remove these materials. Also, wherever possible, it shall be required to cut minimum 2 foot trenches (e.g. with a ditch-witch) along the limits of land disturbance, so as to cut, rather than tear roots. Trenching shall be required for the protection of all trees.
2. Soil compaction: Where compaction might occur due to traffic or materials storage, the tree protective zone shall first be mulched with a minimum 4 inch layer of processed pine bark or wood chips, or a 6 inch layer of straw.
3. Trenching: The installation of utilities through a protective zone shall occur by way of tunneling rather than trenching. If roots shall be cut, proper root pruning procedures shall be employed.

3.03 PRUNING

A. Types of Pruning Cuts
1. Thinning cut: a thinning cut shall be employed to remove a branch at its point of origin or shorten a branch or leader by cutting to a lateral large enough to assume the terminal role. Thinning cuts shall be the preferred method of tree pruning under this project where trees are designated to receive the following treatments: Sanitation Pruning (SP), High Priority Pruning (HPP), and Structural Pruning (StrP).

2. Heading cut: a heading cut is pruning to a stub, a small lateral or a bud. It shall only be used under this project to cut back or eliminate branches from mature trees that are interfering with buildings, pedestrian and vehicle clearance, or other physical objects found within project limits. A heading cut as a preferred method of tree pruning shall be acceptable only in those instances where trees are designated to receive High Priority Pruning (HPP) and Structural Pruning (StrP).

B. Making the Cut

1. When removing a live branch, pruning cuts shall be made just outside the branch bark ridge and collar. If no collar is visible the angle of the cut should approximate the angle formed by the branch bark ridge and the trunk.

2. When removing a dead branch, the final cut shall be made outside the branch bark ridge and the collar of live callus or woundwood tissue. If the collar has grown out along the branch stub, only the dead stub should be removed; the live collar should remain intact.

3. When reducing the length of a branch or the height of a leader, the final cut shall be made just beyond the branch bark ridge of the branch being cut to the remaining branch shall be no less than one-third the diameter of the branch being removed, and with enough foliage to assume the terminal role.

4. Pruning cuts shall be clean and smooth, leaving the bark at the edge of the cut firmly attached to the wood. A three cut process shall be used to reduce chance of injury when removing large limbs.

C. Climbing Practices

1. Climbing and pruning practices, except for pruning cuts, shall not injure the tree.
2. Climbing spurs or gaffs shall not be used when pruning a tree. Spurs may be used to reach an injured worker or when climbing to remove a tree.
3. Rope injury to thin barked trees from loading out heavy limbs shall be avoided by installing a block in the tree to carry the load. A block or rope guard shall also be used to reduce injury to the bark from the climbers line.

D. Pruning Treatments

1. Structural Pruning (StrP): Thinning and/or heading cuts shall be used to correct, or eliminate weak, interfering or objectionable limbs in order to improve and promote strong branch development and structure. A goal of structural pruning is to maintain the size of permanent lateral branches to less than 2 (one half) the diameter of the parent branch or stem. Specific problem areas to be addressed shall consist of the elimination of co-dominant leaders, poorly tapered perimeter branches, and V-shaped crotches. Also, on evergreens, except for whorl-branching conifers, branches that are more than 1/3 the diameter of the trunk should be spaced along the trunk at least 18 inches apart, on center. Crowded laterals shall be removed when applicable to approximate this spatial distribution requirement. Finally, any dead, dying, diseased branches, watersprouts, and basal suckers equal or greater than 2 inches in diameter shall be removed from a tree designated to receive this type of pruning treatment.
2. High Priority Pruning (HPP): Thinning and/or heading cuts shall be used to perform either crown cleaning or minimum vegetation clearance requirements

in trees designated to receive this type of pruning treatment. Crown cleaning shall consist of the removal of dead, dying, diseased, crowded, weakly attached limbs that inhibit the distribution of sunlight and air movement within the tree canopy. Only limbs fitting this description that are 1 inch in diameter and greater shall be subject to removal under this treatment. Tree branches in proximity to building, other appurtenances, and over pedestrian walkways and roads used by motor vehicles shall be eliminated or reduced in length to maintain and/or create minimum vegetation clearance zones. The minimum vegetation clearance zone for buildings and other physical structures shall be 8 feet as measured horizontally from the start of the inanimate object to the tree part(s). The minimum vegetation clearance zone over walkways and roads shall be 12 feet as measured vertically from the ground surface to the first limb. The selected contractor shall take precaution not to impair the natural shape of a tree in satisfying these minimum clearance requirements.

3. Sanitation Pruning (SP): Thinning cuts shall be used under this treatment to eliminate any dead, dying, diseased, or broken branches found throughout the tree. The object behind this treatment shall be to remove as much deadwood to sanitize the mature tree while being as careful as possible not to cut live wood. Only limbs fitting this description that are 2 inches in diameter and greater shall be subject to removal under this treatment. The exception shall be species of American elm. All dead, dying, diseased, or broken branches, regardless of diameter size, shall be eliminated from American elm designated to receive this treatment.

3.04 STRIPPING AND REMOVAL OF TOPSOIL

A. Prior to starting general excavation, all topsoil shall be stripped from areas to be regraded and resurfaced. Topsoil shall be friable topsoil surface soil found in depths of not less than 2”. Topsoil shall be reasonably free of subsoil, clay lumps, weeds, roots, trash, brush, stones and other objects over two inches (2”) in diameter, and other extraneous matter. Do not strip without a clear understanding of existing soil, planting and site conditions to be preserved.

B. Remove heavy growths of grass and vegetation from areas prior to stripping.

C. Strip topsoil to full depths encountered in a manner to prevent intermingling with the underlying subsoil or other objectionable material.

D. All topsoil shall be removed from the site. No existing topsoil may be used in the construction process. Cover temporary storage piles if required to prevent windblown dust and protect against erosion.

3.05 ESTABLISHMENT OF CONSTRUCTION GRADE

A. Establish construction grade by cutting to the grades indicated on the Drawings. Strip topsoil completely before excavation of subsoils.

B. Completely dispose of cut subsoils off site before beginning construction.

3.06 CLEARING, GRUBBING, REMOVAL AND DISPOSAL OF VEGETATION

A. Clear materials specified herein to the limits shown and completely remove from the site in a legal manner. Clear and grub to remove all surface vegetation in areas indicated to be improved.

B. Remove and dispose of all trees and plants indicated on the Drawings. Remove stumps and roots completely by grinding or extraction.

3.07 GENERAL DEMOLITION AND REMOVAL

A. General conditions of demolition and removal:

1. Demolish and remove existing improvements and obstructions above-grade and below-grade to permit construction and other work as indicated on the Drawings and specified herein.
2. All items demolished and removed shall be legally disposed of off site unless otherwise shown on the Drawings or specified otherwise.
3. Review extent of demolition and removal with the Construction Manager, Owner and Landscape Architect before beginning work. Do not proceed in uncertainty.

B. Coordinate removals at areas of existing surface finishes with the General Conditions requirements for Cutting and Patching.

C. Garbage, debris, and other refuse in areas of earthwork and new construction and, in other areas as directed by the Construction Manager, shall be completely removed prior to beginning the construction and legally disposed off site. Material shall be removed in a manner that does not damage vegetation to remain. Remove organic or recyclable materials in accordance with Division 1 and this Section.

D. Sign Removal: Contractor shall remove signs, signposts, and concrete foundations as indicated on the Drawings. Contractor shall salvage signs, sign components, and signposts and return to Owner for re-use or stockpile for re-use. At the Owner's request, the Contractor shall store the signs until re-use. Contractor shall take extreme care not to damage any signs or sign posts during demolition and the storage period.

E. Light Poles: Remove and stockpile existing street pole lights that are identified as being reused under this contract. Stockpile pole lights in a secure location and in a manner that does not cause damage to the housings or equipment.

F. Granite Curb: Remove and stockpile existing granite cobblestones and curbing that is identified as being reused under this contract. Stockpile granite curb in a secure location approved by the Construction Manager and in a manner that does not cause damage to the curb.

G. Permit the Owner, Construction Manager and Landscape Architect to view stockpiled items at any time during construction.

H. Temporary Finished Grade: Remove soil and borrow used for temporary finished grade adjacent existing pavements and other improvements, as indicated on the Drawings. Remove to a flush condition with surrounding existing grade.

3.08 UTILITY DEMOLITION AND REMOVAL

A. Utilities shall be disconnected as required for construction of the site improvements, as approved by Construction Manager and in accordance with Utility Companies. Where disconnection will interrupt the utility services to an area not included in the contract, arrangements for such interruption shall be made with utility company and users 14 working days in advance of the interruption.

B. On-Site Utilities and Services:

1. Verify location and status. Arrange disconnect as applicable.
2. Utility and Service Line Terminations, unless otherwise shown or approved by Architect, shall be as follows:
   a. Close open ends of abandoned underground utilities with sufficiently strong closures to withstand pressures, which may result after closing, and to suit type of utility or service line.

      i. Sewer: Cut and plug at nearest manhole.
      ii. Water: Cut and plug at nearest main. Install thrust blocks at caps and plugs.
      iii. Steam: Cut and plug at nearest main.
      iv. Gas: Comply with utility regulations.
      v. Telephone: Comply with utility regulations.
      vi. Electric: Comply with utility regulations and NEC.

3. Piping: Disconnect piping at unions, flanges, valves, or fittings.
4. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.
5. Close open ends of metallic conduit and pipe with threaded galvanized metal caps, 24” long concrete or plastic plugs, or other suitable method for the type of material and size of pipe. Do not use wood plugs.
6. Close open ends of concrete and masonry utilities with masonry bulkheads, constructed of unit masonry and mortar to completely and solidly fill the opening for a depth/length of 16” minimum.

C. Items abandoned and not removed shall be identified, located, and marked on Project survey documents for inclusion with “As Built” Survey Record Documents.

   1. Record locations shall include invert elevation and location of capping or disconnect related to point of termination.

D. Protect utilities to remain. Include visibly marked location for identification by others subsequently performing work on-site and maintain at least until completion of earthwork.

E. Backfill areas disturbed by utility removal in accordance with requirements for new improvements and in accordance with utility company requirements.

F. Extent of utility removal is shown on the Drawings.

3.09 DEMOLITION, SALVAGE AND STOCKPILE

A. The Contractor shall carefully remove and deliver items to be salvaged to storage or stockpile as directed by the Construction Manager or Landscape Architect.

B. All salvaged items not scheduled for reuse shall become the property of the Owner.

3.10 DISPOSAL OF WASTE MATERIAL

A. Burning will not be permitted on the Owner’s property.

B. The Contractor shall remove waste materials, unsuitable and excess materials from the Owner’s property and legally dispose off-site.

C. The Contractor shall submit the dumpsite owner’s name and location of dumpsite to the Owner for approval prior to waste removal from project site.

D. The use of explosives for disposal will not be permitted.

3.11 POST CONSTRUCTION CLEANUP

A. The Contractor shall completely remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, fencing, or any other vestiges of construction. Disturbed areas shall be graded and filled with approved subsoil to the depths indicated on the Drawings.

B. Clean adjacent structures improvements of dust, dirt and debris caused by demolition and removal operations. Return and maintain adjacent areas to condition that existed before start of clearing, demolition and removal operations.

C. Refer to the General Conditions for project closeout requirements.

END OF SECTION

SECTION 023000

EARTHWORK

PART 1 _ GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions, see Section B1 of the Contract, apply to the work of this Section and are hereby made a part of this Section.

B. Examine all Contract Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK

A. Provide labor, material, equipment, and services as necessary to perform all excavation and backfill as shown on the Contract Drawings and as specified herein. Work of this section shall include but is not limited to the following:

1. Excavation for underground items. Excavation to follow the limits, sequence and staging where shown on the Contract Drawings.

2. Removal of below-grade obstructions.

3. Preparation and grading of subgrades for drainage, utilities, and other underground items.

4. Removal of sidewalks, curbs, and paving where required.

5. Stockpiling or removal of excavated materials, if any, which are suitable for filling and backfilling, at the direction of the Engineer.

6. Furnishing, placing, and compacting backfill.

7. Protection of adjacent existing structures, utilities, and other facilities against any damage from the work. The Contractor shall be responsible for such damages resulting from his operations.

8. Preparing Subgrade for Fill, Foundations, and Pavements.

9. Placing and Compacting Soil and Aggregate Fill, Drainage Course, and Subbase.

10. Backfilling for Structures, Utilities and Appurtenances

1.03 REFERENCES

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

1. D 422 Particle Size Analysis of Soils.

2. D 1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft^3).
3. D 1241 Specification for Soil-Aggregate Subbase Base and Surface Courses
4. D 2216 Moisture Content of Soil and Rock
5. D 2487 Classification of Soils for Engineering Purposes
6. D 2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods
7. D 3017 Water Content of Soil and Rock In Place by Nuclear Methods

B. Occupational Safety & Health Administration (OSHA): Sloping and Benching Standard - #1926.

1.04 RELATED WORK

A. The following Items of related work are specified and included in other Sections of the Specifications:

1. Section 021000 – Site Preparation and Clearing
2. Section 025250 – Curbs
3. Section 027410 – Bituminous Concrete Pavement
4. Section 027600 – Paving Specialties
5. Section 029000 – Planting and Fine Grading
6. Section 029500 – Planting Soils
7. Section 029510 – Structural Planting Soils
8. Section 033000 – Cast-In-Place Concrete

1.05 DEFINITIONS

A. Backfill: General reference for soil materials to be used and the operation to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the compacted sub-grade and structure or paving system.

C. Bedding Course: Layer placed over the excavated sub-grade in a trench before laying pipe.

D. Borrow: Suitable soil or gravel / crushed stone imported from off-site for use as fill or backfill material.

E. Bulk Excavation: Excavation of soils and unclassified or classified materials in any areas not defined as trench or pit excavation.

F. Debris and/or Obstructions: See definition in Division 2, Section 02100 “Site Preparation and Clearing”.

G. Design Bearing Grades or Elevations: The design vertical levels of foundation bottoms indicated by Contract Documents.

H. Excavation: Removal of unclassified or classified material encountered above design sub-grade elevations.

1. Additional Excavation: Excavation below design sub-grade elevations as directed by Landscape Architect or Construction Manager. Additional excavation and replacement material will be paid by Owner according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below design sub-grade elevations or beyond indicated dimensions without direction by Landscape Architect or Construction Manager. Unauthorized excavation, as well as remedial work directed by the Landscape Architect or Construction Manager shall be without additional compensation.

I. Excavation Grades or Elevations: The design vertical levels specified or indicated by Contract Documents or revised during construction by Architect or Construction Manager to accommodate field conditions and to which excavation shall be conducted.

J. Finish(ed) Grade: Elevation of top most surface indicated by Contract Documents for hardscape surfacing such as paving areas, for planting soil including root mat of sod turf grass at lawn areas, and for planting soil surface at planting bed areas.

K. Pit Excavation: Small, local excavations, such as for utility structures, column footings, pile caps, and other item footings where the plan dimensions do not exceed 10 feet in either length or width.

L. Sub-grade: Surface or elevation of subsoil remaining after completing excavation before placing Structural Soil, Drainage Layer, or planting soil layers or top surface of a fill or backfill immediately below a base course or sub-base. Typically a Design Bearing Grade or Excavation Grade.

M. Suitable Fill Materials: Classified as specified for each type and condition of use such as described in Part 2 “Products” of this or other related Section.

N. Transition Layer: A site mixed, non-uniform heterogeneous mixture of Planting Soil material and Drainage Layer Coarse Sand material as further described in this Section. Transition Layer shall be located in designated planting bed areas.

O. Trench Excavation: Excavations where the required depth is greater than twice the width such as required for installation of utilities and pipes.

P. Unclassified Excavation: Removal of materials encountered within the required excavations between the existing ground surface and design excavation grade to the top of suitable sub-grade material, whichever is deeper, regardless of the nature of the materials encountered, their geologic definitions, the water contents thereof, and the means of excavation required. Resultant Unclassified Excavation material will be further classified as "Suitable Fill Material" or "Unsuitable Material". Classification of material(s) shall be approved by the Landscape Architect whose decision shall be final and binding upon Contractor.

Q. Unsuitable Material(s): Whenever the words "Unsuitable Material" or words of similar meaning are used, they are taken to include combustible, organic and frozen materials, vegetation, bricks, ashes, wood, cinders, trash, snow, ice and fill previously placed on the site in an uncontrolled manner or with "uncontrolled material", material with excessive water content, material with an inability to obtain necessary compaction, and material which is not in conformance with approved test results of "Suitable Fill Material". Classification of material(s) shall be approved by the Architect whose decision shall be final and binding upon Contractor.

R. Utilities: Existing and proposed new utilities including on-site underground pipes, conduits, ducts, and cables, wiring, or other underground services on-site or within buildings.

1.06 SITE CONDITIONS

A. The Contractor shall fully inform him/herself of existing conditions of the site. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best knowledge of the Landscape Architect.

B. Existing Utilities: Refer to Section 021000.

C. Use of Explosives: The use of explosives is not permitted.

1.07 QUALITY ASSURANCE

A. Earthwork shall be performed in compliance with the applicable requirements of all laws, codes, ordinances and regulations of authorities having jurisdiction over this work.

B. Protection of Persons and Property: The Contractor shall provide for the protection of persons and property in accordance with the applicable requirements of authorities having jurisdiction over this work.

C. Testing and Inspection Services: The Contractor shall engage an independent soils testing and inspection services for quality control testing during earthwork.

D. Controlled Inspection: Controlled Inspections shall be provided by the Owner. The Contractor shall notify the Landscape Architect and Construction Manager no fewer than 2 business days prior to the proceeding with any work subject to Controlled Inspections as required by the New York State Building Code.

1.08 SUBMITTALS

Submit to the Owner’s Rep., and Landscape Architect for approval at least 30 days prior to the start of excavation work details of all proposed materials, construction methods and equipment including:

A. Excavation, backfill and compaction procedures and equipment,

B. Obstruction removal procedures and equipment,

C. Material test reports including compaction characteristics and samples for each type of material to be used as fill.

1.10 PERMITS

A. The Contractor shall be responsible for obtaining all required permits for the work in this Section.

PART 2 _ PRODUCTS

2.01 GENERAL

A. Refer to the General Conditions for provisions regarding manufacturer's specifications, transportation and handling, installation, product options, and substitutions of materials.

2.02 MATERIALS

A. Materials to be excavated include sandy and gravelly materials with possible brick, concrete, boulder, and other miscellaneous materials.

B. The backfill material shall be a well graded combination of gravel, sand, and a limited amount of low plasticity soil. The material shall have at least 30% by weight retained on the No. 4 sieve, and not more than 12% passing the No. 200 sieve (ASTM D422). No gravel or stone shall be larger than 4 inches. The material shall be free from trash, brick, broken concrete, tree roots, sod, ashes, or cinders.

C. Site excavated soils may be utilized for fill material if they are processed in order to comply with the above requirements. If necessary, import well graded backfill material meeting the specified requirements.

C. All materials and accessories shall comply with recovered material content requirements defined in the General Conditions.

D. Acceptable products for Erosion Control include but are not limited to:

1. "Erosion Control Blankets",
   BOOM Environmental Products (regional distributor)
   32 Scotland Blvd., Bridgewater, MA 02324
   800-770-2666
   100% jute, coir, straw, or coconut fiber erosion control blanket
2. "GeoCoir/DeKoWe", Belton Industries
   3613 Roswell Road; Atlanta, GA 30350
   800-225-4099
   100% coir fiber waste woven erosion control fabric
3. "GeoJute", Belton Industries
   3613 Roswell Road; Atlanta, GA 30350
   800-225-4099
   100% virgin jute woven erosion control fabric
4. "Landlok BonTerra C2, CF4, CF7, CF9, CS2, ENS2, or S1",
   Synthetic Industries Inc.
   6025 Lee Highway; Chattanooga, TN 37421
   800-621-0444
   100% coconut, coir, or wheat straw fiber erosion control blanket
5. "Slopetame" , Invisible Structures, Inc
   20100 E. 35th Drive; Aurora, CO 80011-8160
   800-233-1510 or 303-373-1234
   100% recycled HDPE erosion control fabric
6. "Geoweb", Bowman Construction Supply
   2310 South Syracuse Way; Denver, CO 80231
   303-696-8960
   100% post consumer recycled plastic honeycomb soil containment
7. "Wellman Non-Wovens", Bonded Fiber Products, Inc.
   2748 Tanager Avenue; Commerce, CA 90040

323-726-7820
97% post-consumer PET non-woven erosion control fabric

E. Compacted Gravel/Subbase Course: Material for subbase course shall consist of sand and gravel approved furnace slag or stone and shall conform to Standard Specification 304. All materials furnished shall be well graded from coarse to fine and free from organic or other deleterious materials.

1. Gradation: Provide the following Gradation:

Type	**Sieve Size Designation**	**% Passing by Weight**
4	2 inch	100
	¼"	30-65
	No. 40	5-40
	No. 200	0-10

F. Planting Soils: Refer to Section 02950

2.03 EQUIPMENT

A. Compaction Equipment for areas 15 feet or more in width must be operable and on site prior to the initial Earthwork and must:

1. Be of the vibratory smooth steel drum type (for GW or SW soils), vibratory steel pad foot drum type (for GP, GM, SP or SM soils), or vibratory wheel type (for all soils) manufactured for the purpose of compacting soil and aggregate of the type specified in Section 2.02
2. Be of Static weight of at least twenty tons.
3. Be operated at a speed no greater than a slow walk and otherwise in accordance with the manufacturer's recommendations.
4. Be capable of achieving the specified densities at proper moisture content within six passes.

B. Compaction Equipment for areas 15 feet or less in width must be approved by the Engineer. This equipment must be capable of achieving the specified densities at proper moisture contents.

C. Compaction Equipment for areas adjacent to top of slopes shall be hand operated and selected so that it does not cause any slope sloughing or failure. Compaction Equipment for these areas must be approved by the Engineer and must be capable of achieving the specified densities at proper moisture contents.

PART 3 _ EXECUTION

3.01 EXCAVATION

A. Preparation and Layout

1. Establish extent of excavation by area and elevation,
2. Set required lines and levels using project benchmarks and monuments,
3. Maintain benchmarks, monuments and other reference points.

B. Perform the excavation work in accordance with the approved submittals and Contract Documents. Trim bottoms of all excavations to the lines and grades required for the work.

C. Final excavation and trimming for subgrade shall be accomplished by hand or backhoes with smooth bladed buckets. No excavating equipment shall be operated over the subgrade during or after final excavation. Prepare subgrade by proofrolling to provide a firm surface.

D. All existing utilities, pavements, structures and trees shall be protected from settlement, movement, undermining, washout and other hazards of earthwork, as per Section 021000.

E. All clearing of vegetation and excavation of topsoil shall be performed in accordance with Section 021000.

F. Excavation shall follow the sequence shown on the Contract Documents and as described in the submittals approved by the Landscape Architect. If over-excavation occurs it shall immediately be replaced with compacted granular backfill at the direction of the Landscape Architect.

G. All excess excavated materials which will not be used as backfill at the site shall be removed from the site and legally disposed of by the Contractor.

H. No payment shall be made for excess general excavation made inadvertently or for the Contractor's convenience.

I. Disposal of excavated material of all types is the responsibility of the Contractor. Upon leaving the site, all excavated material becomes the property of the Contractor. The Contractor shall follow all regulations for noise, dust, and traffic over streets outside the site.

J. Stockpiling of excavated materials on the site will be allowed only on Owner approved areas.

K. Surface Runoff: Surface water on and around the site shall be collected into local sumps by means of trenches, pipes, etc., and pumped into the storm water system. Use appropriate filtration or sedimentation to prevent pumping of suspended solids into the storm sewers. A permit must be obtained for such pumping.

L. Dewatering of Trenches and Excavations: Trenches and excavations shall be kept free of standing water at all times. Pumping is to begin as soon as water begins to accumulate and is to continue until water is removed.

M. Stability of Excavations: Slope sides of excavations or brace as per OSHA requirements. Shore and brace excavation where sloping is not possible because of space restrictions or stability of material excavated. Maintain excavations in a safe condition.

N. Dust Control: Control of dust is the responsibility of the Contractor.

O. Compacted Gravel/Subbase Course: Install per the Standard Specifications.

3.02 BACKFILL AND COMPACTION

A. All required backfilling shall be performed as soon as the work permits. Materials used for backfill shall meet the requirements of this Section. Backfill shall be placed in uniform horizontal layers of approximately twelve (12) inches in loose thickness, and compacted with mechanical devices, as specified in Section 2.03, to 95% of the

maximum density per ASTM D 1557, unless specified otherwise in other Sections of the Specifications or on the Contract Drawings.

B. A minimum of one compaction test shall be performed for each 5,000 square feet of surface area per lift, or as directed by the Engineer.

C. Preparation of Compacted Base Course and Subbase for paved areas shall be performed as specified under the section for each surface pavement type.

3.03 SPECIAL REQUIREMENTS

A. Excavation and backfilling for storm drainage piping and drainage shall be performed in compliance with this Section and Contract Drawings.

B. Materials, excavation and backfilling procedures, and fine grading for planting operations shall be performed in compliance with Section 029050, Section 029500, and Contract Drawings.

3.04 EROSION AND SEDIMENTATION CONTROL

A. The Contractor shall provide slope erosion and sedimentation protection during construction and until the slopes are stabilized by vegetation or other surface treatments. All materials to be used shall be submitted to the Landscape Architect for approval.

B. If the period of time between the completion of demolition/excavation and the beginning of site construction is to exceed 14 days, the Contractor is to provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways. This shall be done by covering excavated areas of the site with a 3” layer of drainage fill. Areas to receive planting shall be covered with a 2” (minimum) layer of mulch consisting of chipped matter from demolition of existing site trees and shrubs, recycled newsprint mulch, or other similar recycled content organic matter as approved by Architect. Contractor to provide to the Engineer 2 lb. sample of any mulch material that is to be imported for use on the site.

3.05 SITE CLEAN-UP

A. Upon completion of all work of this Section, remove and legally dispose of all excess materials resulting from the work operations.

B. All damaged paving and surfacing outside project limits shall be restored to the original condition.

END OF SECTION

SECTION 027400

BITUMINOUS CONCRETE PAVEMENT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, and applicable General Conditions, see Section B1 of the Contract,, shall be included in and made a part of this Section.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK

A. This Section includes the following:
1. Bituminous concrete paving.
2. Compacted subgrade and aggregate base.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. The work of this Section consist of all improvements and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:
1. Section 022300 – Site Preparation and Clearing.
2. Section 023000 – Earthwork.
3. Section 027600 – Paving Specialties.
4. Section 033000 – CIP Concrete.

1.04 EXAMINATION OF CONDITIONS

A. The Contractor shall fully inform him/herself of existing conditions of the site.

B. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best of the Landscape Architect's knowledge.

1.05 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the following standards:
1. ASTM: American Society for Testing and Materials.
2. ANSI: American National Standards Institute.
3. FS: Federal Specifications.
4. Standard Specifications: New York State Department of Transportation, Standard Specifications Construction and Materials, 2015 Edition, and addenda.

B. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

C. Layout and Grading: After staking out the work, and before beginning final construction, obtain the Landscape Architect’s approval for layout and grades.

1.06 SUBMITTALS

A. Material Certificates: Provide copies of materials certificates signed by the material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

B. Design Mixes.

1.07 PROJECT CONDITIONS

A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50°F (10°C), and when temperature has not been below 35°F (1°C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphaltic concrete base and surface courses when ambient temperature is above 40°F (4°C) and rising.

C. Grade Control: Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Use locally available materials and gradations which exhibit a satisfactory record of previous installations. All materials shall be governed by standards referenced in the applicable portions of the Quality Assurance set forth in the General Conditions above or as may be modified herein.

B. Paving Base Course: Sound, angular crushed natural rock complying with Section 304 of the Standard Specifications.

C. Bituminous Materials: Section 702 of the Standard Specifications.

D. Tack coat: Section 703 of the Standard Specifications.

E. Asphalt Restraint Edging: Refer to Section 027600, Paving Specialties, for materials to be used for Asphalt Restraint Edging.

F. Subgrade and Compacted Aggregate Base: Refer to Section 023000, Earthwork.

PART 3 - EXECUTION

3.01 INSPECTION AND ACCEPTANCE

A. Examine all surfaces and contiguous elements to receive work of this section and correct, as part of the Work of this Contract, any defects affecting installation.

B. Commencement of work will be construed was complete acceptability of surfaces and contiguous elements.

3.02 SURFACE PREPARATION

A. Remove loose material from compacted subbase surface immediately before applying prime coat.

B. Proof roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

C. Notify Contractor of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

3.03 COMPACTED GRAVEL BASE COURSE AND SUBGRADE

A. Placement and compaction of Gravel Base Course: Place material in uniform lifts not exceeding 4 (four) inches, compacted measure. The gravel base course shall be shaped and graded parallel to the proposed surface of the walks. After being compacted thoroughly as specified herein, the gravel base course shall be the minimum depths shown on the Drawings.

B. Compact gravel base course to 95 percent of maximum dry density, as determined by the Standard AASHTO Test Designation T99 compaction Method Test C at optimum moisture content and to the following requirements:
1. Any stone with a dimension greater than that permitted for the type of fill specified shall be removed from the subbase before the material is compacted.
2. Compaction shall continue until the surface is even and true to the proposed lines and grades within a tolerance of 3/8 inch above or below the required cross sectional elevations and to a maximum irregularity not exceeding 3/8 inch under a ten foot line longitudinally.
3. Any specific area of gravel subbase, which, after being rolled, does not form a satisfactory stable, solid foundation shall be removed, replaced and re-compacted by the Contractor without consideration for extra compensation.

C. Compacted subgrade shall conform to Section 023000.

D. Asphalt Restraint Edging: Refer to Section 027600 Paving Specialties for installation of Asphalt Restraint Edging.

E. Prime Coat: Apply at rate of 0.20 to 0.50 gallons per square yard, over compacted subbase. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile elements.

F. Tack Coat: Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gallons per square yard of surface. Allow to dry until at proper condition to receive paving.

G. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Clean damaged surfaces.

3.04 PLACING MIX

A. General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225°F (107°C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

1. Place binder course in 2" compacted thickness.
2. Place top course in 1" compacted thickness.

B. Pavement Placing: Place in strips not less than the full width of the path, unless otherwise acceptable to Landscape Architect. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

C. Cutting Existing Paving: Where a definite line of separation between new and existing bituminous paving occurs, cut existing paving with a machine which permits cutting without damaging paving to remain in place, and that will provide clean, sharp joints. Seal cut edges of paving with cut back asphalt and protect until new paving is placed. Cut back any existing paving which becomes damaged, disturbed or settles, due to construction operations, by same method specified above and replace with new bituminous paving, as directed by the Landscape Architect, without additional cost to the Owner.

D. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

E. Setting Utility Frames and Grates: Do not set frames and grates in paved areas to final grades until placement and compaction of the binder course is completed. Set frames in full mortar beds to grades of proposed surrounding surfaces. Place high early strength cement concrete collars around castings to the grades of the binder course.

3.05 ROLLING

A. General: Begin rolling when mixture will bear roller weight without excessive displacement.
1. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

C. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

D. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

E. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
1. Erect barricades to protect paving from traffic until mixture has cooled enough not to become damaged.

3.06 FIELD QUALITY CONTROL

A. General: Test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Landscape Architect.

B. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:
   1. Base course: ±1/2".
   2. Surface course: ±1/4".

C. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10' straightedge applied parallel with, and at right angles to centerline of paved area. Variations exceeding the following tolerances for smoothness will not be acceptable and shall be satisfactorily corrected or the pavement relaid at no additional cost to the Owner:
   1. Base course surface: 1/4".
   2. Wearing course surface: 3/16".
   3. Crowned surfaces: test with crowned template centered and at right angle to crown. Maximum allowable variance from template 1/4".

D. Check surface at intervals as required or directed by Landscape Architect.

3.07 CLEANUP

A. All debris resulting from operations shall be removed daily and site shall be left clean at the completion of the Project.

END OF SECTION

SECTION 027600

PAVING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, and applicable General Conditions, see Section B1 of the Contract, shall be included in and made a part of this Section.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK

A. Paving restraint edging for straight-line and curvilinear borders between planting areas and precast unit pavers and bituminous concrete pavement. Paver restraint edging at tree pits.

B. Detectable Warning For Pedestrian Ramp: Cast-in-Place Replaceable Tactile Warning Surface Tiles with an in-line truncated dome pattern, embedded in all curb ramps and walking surfaces at the locations shown on the Drawings, in accordance with the Contract Documents, and as directed by the Owner's Rep. and Landscape Architect.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:
1. Section 023000 – Earthwork.
2. Section 025250 – Curbs.
3. Section 027400 – Bituminous Concrete Pavement.
4. Section 029000 – Planting and Fine Grading.
5. Section 029500 – Planting Soils.
6. Section 033000 – Cast in Place Concrete.
7. Section 321440 – Precast Concrete Unit Pavers

1.04 REFERENCES

A. ASTM B 221 (ASTM B 221M): Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

B. AAMA: American Architectural Manufacturer's Association for aluminum finishes.

C. Americans with Disabilities Act (ADA) Title 49 CFR Transportation, Part 37.9 Standards for Accessible Transportation Facilities, Appendix A, Section 4.29.2 Detectable Warnings on Walking Surfaces. FHA Memo (5-06-02) titled Truncated Domes. Federal Register Volume 71, No. 209, 49 CFR Part 37 (10-30-06), ADA Standards for Transportation Facilities (11-29-06, DOT): Sections 406, 705, and 810. ADA Standards for Accessible Design – 2010 (9/05/11, DOJ), ADAAG: Sections 705 and 810. Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Rights of Way (7/23/11, Access Board), PROWAG: Sections R208, R304, R305, R308, and R309.

1.05 SUBMITTALS

A. Submit all manufacturer's product data.

B. Submit a minimum 12-inch-long edging sample of StructureEdge- paver restraint.

C. Synthetic grass vendor must submit the following to owner or owner's representative:
1. One (1) copy of the most recent installation reference list for projects of similar scope to this project completed in last five years.
2. One (1) 12"x12" loose sample of proposed synthetic grass product.
3. One (1) of the product warranty for proposed synthetic grass product.
4. One (1) copy of their maintenance instructions. These instructions will include all necessary instructions for the proper care and maintenance of the newly installed synthetic turf system.
5. One (1) copy of edge details of proposed installation and terminations of synthetic grass dog playground system.
6. One (1) copy of a signed letter from synthetic grass vendor certifying that the proposed synthetic grass product is manufactured in the USA.

D. Submit one (2) tactile warning surface tile, minimum 8"x8".

1.06 QUALITY ASSURANCE

A. Provide composite Cast In Place Replaceable Tactile Warning Surface Tiles (REP) as produced by a single manufacturer with a minimum of five years experience in manufacturing Cast In Place Replaceable Tactile Warning Surface Tiles (REP).

B. Installer's Qualifications: Engage an experienced installer certified in writing by the Tactile Warning Surface manufacturer, who has successfully completed Tactile Warning Surface installations similar in material, design, and extent to that indicated for the Contract.

C. Cast In Place Replaceable Tactile Warning Surface Tiles (REP) must be compliant with ADAAG, PROWAG, and CA Title 24 requirements. Division of the State Architect IR 11B-3 (1/26/05) and IR 11B-4 (1/01/11). IR 11B-4 (1/01/11) removed the requirement for a "staggered" pattern and now calls for the "square grid" (in-line) pattern.

D. Cast In Place Replaceable Tactile Warning Surface Tiles (REP) shall meet or exceed the following test criteria using the most current test methods:
1. Compressive Strength: 28,900 psi minimum, when tested in accordance with ASTM D695.
2. Flexural Strength: 29,300 psi minimum, when tested in accordance with ASTM D790.
3. Water Absorption: Not to exceed 0.10%, when tested in accordance with ASTM-D570.
4. Slip Resistance: 1.05 minimum wet and 1.18 dry static coefficient of friction when tested in accordance with ASTM C1028.
5. Flame Spread: 25 maximum, when tested in accordance with ASTM E84.
6. Salt and Spray Performance of Tactile Warning Surface: No deterioration or other defects after 200 hours of exposure, when tested in accordance with ASTM-B117.
7. Chemical Stain Resistance: No reaction to 1% hydrochloric acid, motor oil, calcium chloride, gum, soap solution, bleach, and antifreeze, when tested in accordance with ASTM D543.
8. Abrasion Resistance: 500 minimum, when tested in accordance with ASTM C501.

9. Accelerated Weathering of Tactile Warning Surface when tested by ASTM-G155 or ASTM G151 shall exhibit the following result: ΔE<5.0 at 2,000 hours minimum exposure.
10. Tensile Strength: 11,000 psi minimum, when tested in accordance with ASTM D638.
11. AASHTO-H20 Load Bearing Test: No Damage at 16,000# loading.
12. Freeze/Thaw/Heat: No deterioration when tested in accordance with ASTM C 1026.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver to location as instructed by Contractor in manufacturer's package showing no signs of damage to package or product.

B. Investigate delivered damaged packages and if product is damaged, Contractor to not accept and have product returned and replaced. Store boxed products on flat surface and protect from water exposure.

C. Cast In Place Replaceable Tactile Warning Surface Tiles (REP) shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy wrappings.

D. Storage Facility
1. Store REP Tiles in an area that is within an acceptable temperature range (40-90 degrees). In particular, protect sealants from freezing.
2. Maintain Storage Facility in a clean dry condition to prevent contamination or damage to REP Tiles and incidentals.

1.08 WARRANTY

A. Paving Restraint Edge: 15-year limited material warranty from manufacturing defects in workmanship or material.

B. Cast in Place Replaceable Tactile Warning Surface Tiles: REP Tiles shall be guaranteed in writing for a period of five (5) years from date of Contract's final completion. The guarantee includes manufacturing defects, breakage, and deformation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Paving Restraint Edge: PermaLoc Corporation, 13505 Barry St, Holland, MI 49424, USA, telephone: (800) 356-9660, (616) 399-9600, fax (616) 399-9770, e-mail - info@permaloc.com, web site: www.permaloc.com, or approved equal.

B. Tactile Warning Surface Tiles: 'Detectable Warning Paver" as manufactured by Hanover Architectural Products, Hanover, PA., www.hanoverpavers.com, or approved equal.

2.02 MANUFACTURED UNITS

A. StructureEdge- Paver Restraint by Permaloc Corp.; Bituminous Concrete Restraint Edging shall be PermaLoc AsphaltEdge or approved equal.
1. Description: PermaLoc AsphaltEdge extruded aluminum in L-shaped profile. Horizontal base to have upward facing angle profile designed to integrate

restraint and asphalt surfaces for straight-line and curvilinear applications. Section shall have holes in base spaced 4 inches (102 mm) apart along its length to receive spike anchors.

2. Size:
   a. 4" (102 mm) high by 3" (76 mm) base.
3. Thickness: 0.210 inch (5.33 mm) thick exposed top lip.
4. Length: 8 feet (2.44 meters).
5. Connection Method: Section ends shall splice together with horizontal 0.060 inch (1.52 mm) thick x 1 inch (25 mm) wide x 4 inches (102 mm) long aluminum sliding connector. The 1 inch (25 mm) high landscape edging shall use a 0.530 inch (13.5 mm) wide x 4 inches (102 mm) long aluminum sliding connector.
6. Finish:
   a. Black DuraFlex Painted: Electrostatically baked on acrylic paint, AAMA 2603, color #PPG UC88182.

B. Cast in Place Replaceable Tactile Warning Surface Tiles

1. Provide composite Cast In Place Replaceable Tactile Warning Surface Tiles (REP) as produced by a single manufacturer with a minimum of five years' experience in manufacturing Cast In Place Replaceable Tactile Warning Surface Tiles (REP).
2. Composition: REP Tiles shall be manufactured using a matte finish exterior grade homogeneous (uniform color throughout thickness of product) glass and carbon Cast In Place Replaceable Tactile 4 reinforced polyester based Sheet Molding Compound (SMC) composite material. Truncated domes must contain fiberglass reinforcement within the truncated dome for superior structural integrity and impact resistance. A matte finish will be required on the Tactile Warning Surface for superior slip resistance performance superior to that offered by a gloss finish. Use of Tactile Warning Surface Products employing coatings or featuring layers of material with differing composition, performance, or color properties is expressly prohibited under this Section.
3. Color: Color shall be homogeneous throughout REP Tile.
   a. Red or Dark Gray (G) per Federal Standard 595B Table IV, Color No. 36118. (must be a contrasting color to the surrounding pavement in accordance with ADAAG.
4. Domes: Square grid pattern of raised truncated domes of 0.2" nominal height, base diameter of 0.9" and top diameter of 0.45". The Federal Code of Regulations permits a truncated dome spacing range of 1.6"-2.4". For superior wheelchair, walker and shopping cart mobility, the preferred truncated dome spacing shall have a center-to-center (horizontal and vertical) spacing of 2.35", measured between the most adjacent comes on the square grid.
5. Configuration: REP Tile sizes shall be as indicated on the Contract Drawings. The REP Tiles shall feature a minimum of eight (8) embedded corrosion resistant 1 ½" corrosion resistant concrete inserts with ½" x 1 ½" heavy duty steel bolts and washers. Bolts must be covered with a structural water tight cap. Bolts must be located BETWEEN the truncated domes (in the field) for maximum protection of the Bolt integrity. Bolts are NOT to be located in the truncated dome.
   a. The field area shall consist of a non-slip textured surface with a minimum static coefficient of friction of 0.80, wet and dry.
   b. At a minimum, REP Tile thickness shall measure ¼" nominal exclusive of the perimeter minimum 3/8" thick (nominal) by 1" wide flange. The body of the Tactile Warning Surface Tile must consist of a SOLID body for maximum strength and to eliminate the possibility of air entrapment and cracking.
6. Truncated Dome Surface of REP Tile shall be protected with factory installed plastic sheeting for cleanliness during the installation process. Basic Installation

Guidelines shall be printed on the plastic sheeting in both English and Spanish for customer convenience.

7. Dimensions: REP Tiles shall be held within the following dimensions and tolerances: Specifiers Note: Edit section below by selecting desired length and width. Delete nonrelevant dimensions.
   a. Length and Width: Rectangular REP Tile: 2.35” Dome Spacing: 36”x60”
8. Cleaning materials used on site shall have code acceptable low VOC solvent content and low flammability.
   a. The Specifications of the concrete, sealants and related materials shall be in accordance with the Contract Documents and the guidelines set by their respective manufacturers.

2.03 PAVING RESTRAINT EDGE – ANCHORS

A. Anchor Types:
   1. Spikes: 3/8 inch x 10 inches (9.5 mm x 254 mm) bright spiral steel spike. Use 3/8" (9.5 mm) plastic washers.

2.04 CAST IN PLACE REPLACEABLE TACTILE WARNING SURFACE TILES – TOOLS

A. Contractor shall provide all tools, equipment and services required for satisfactory installation per manufacturer’s instruction as Incidental Work. Equipment, which may be required include typical mason’s tools, a 2-foot long level with electronic slope readout, (2) 25-pound weights, and a rubber mallet with a piece of wood for tamping down the Tactile Warning Units.

PART 3 - EXECUTION

3.01 SITE PREPARATION

A. Ensure that all underground utility lines are located and will not interfere with the proposed edging installation before beginning work.

B. Locate border line of edging with string or other means to assure border straightness and curves as designed.

C. During all concrete pouring and REP Tile Installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.

D. The physical characteristics of the concrete shall be consistent with the Contract Specifications while maintaining a slump range of 4 - 7 to permit solid placement of the REP Tile. An overly wet mix will cause the REP Tile to float. Under these conditions suitable weights such as 2 concrete blocks or sandbags (25 pounds) shall be placed on each REP Tile.

E. The concrete shall be poured and finished, true and smooth to the required dimensions and slope prior to REP Tile placement.

3.02 ASPHALT RESTRAINT EDGING INSTALLATION

A. Preparation of Base:
   1. AsphaltEdge: As specified in Section 02740 Bituminous Pavement.
   2. StructurEdge: Per Product Manufacturers installation guidelines and methods.

B. Base Installation:
   1. AsphaltEdge:
      a. Install aggregate base as specified in Section 02740 Asphalt Pavement specification.
      b. Extend base at least 6 inches (152 mm) beyond edge of restraint edging.
      c. Base shall be consistently level immediately beneath restraint edging.
   2. StructurEdge:
      a. Per Product Manufacturers installation guidelines and methods

C. Edging Installation:
   1. AsphaltEdge:
      a. Securely connect sections in accordance with manufacturer's instructions leaving 3/8" (9.5 mm) between sections for expansion of hot asphalt.
      b. Drive spikes through holes in base of restraint edging at spaces (or drive nails through aluminum base when using powder actuated fastening system) for following applications:
         1) Aggregate Base: Spiral steel spikes at 12 inches (305 mm) on center for each straight section or 4 inches (102 mm) for each curved section.
      c. Securely connect sections in accordance with manufacturer's instructions. Provide additional anchors at closer spacing as necessary to firmly secure edging for permanent intended use.
   2. StructurEdge:
      a. Install edging with base resting on aggregate and facing towards and under paver.
      b. Drive spikes through holes in base of paver restraint edging at spaces 4 inches on center.
      c. Securely connect sections in accordance with manufacturer's instructions. Provide additional spikes at closer spacing as necessary to firmly secure edging for permanent intended use.

D. Pavement Installation:
   1. Bituminous Concrete Pavement:
      a. If bituminous concrete installation is over restraint edging, avoid excessive asphalt temperatures to minimize aluminum expansion.
      b. Lay bituminous concrete pavement adjacent to and approximately ½ inch (12.7 mm) over top of restraint edging, depending on expected compaction results. Then, compact first pass with desired equipment within 6 inches (152 mm) of restraint edging. "Pinch roll" to create a hard joint. Subsequent passes may be directly against or over top of edging to ensure complete compaction of bituminous concrete pavement.
      c. Finish pavement shall be compacted and level with, but not to exceed 1/4 inch (6.4 mm) above top of restraint edging.

3.03 CAST IN PLACE REPLACEABLE SURFACE WARNING TILE INSTALLATION

A. Contractor will not be allowed to install Tactile Warning Surface Tiles until all submittals have been reviewed and approved by the Owner's Rep., and Landscape Architect.

B. REP Tile shall be installed per manufacturer's instructions.

C. To the maximum extent possible, the REP Tiles shall be oriented such that the rows of in-line truncated domes are parallel with the direction of the ramp. When multiple REP Tiles regardless of size are used, the truncated domes shall be aligned between the tactile warning surface tiles and throughout the entire tactile warning surface installation.

D. In accordance with the Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Rights of Way (7/23/11, Access Board): Sections 304 + 305), Tactile Warning Surface Tile shall be located relative to the curb line as shown within Sections 304+305 of the Guidelines.

E. The REP Tiles shall be tamped or vibrated into the fresh concrete to ensure that there are no voids or air pockets, and the field level of the Tactile Warning Surface Tile is flush to the adjacent concrete surface or as the Drawings indicate to permit proper water drainage and eliminate tripping hazards between adjacent finishes.

F. On Continuous Runs: The Installer shall leave a 1/8” nominal gap between successive Tactile Warning Surface Tiles. As part of the concrete finishing operation, the Installer shall apply ¼” edge treatment around the perimeter of the Tactile Warning Surface Tiles Cast In Place Replaceable Tactile 7 to facilitate future replacement of the Tactile Warning Surface Tile. A Urethane Sealant such as Sikaflex 1a or BASF NP1 shall be applied to the edge treatment for a watertight Tactile Warning Surface Tile installation.

3.04 BACKFILLING AND CLEANUP

A. Backfill side of edging on planting side and compact backfill or soil material along edging to provide top of edging at 1/2 inch (12.7 mm) above finish grade on turf side.

B. Remove excess material from site.

C. Protect REP Tiles against damage during construction period to comply with REP Tiles manufacturer’s Specifications.

D. During and after the REP Tile installation and the concrete curing stage, it is imperative that there are no walking, leaning or external forces placed on the REP Tile to rock the REP Tile, causing a void between the underside of the REP Tile and the concrete substrate.

E. Remove Protective Plastic Sheeting from REP Tile within 24 hours of installation of the REP Tile. Particularly under hot weather conditions (80 degrees or higher), plastic sheeting will adhere strongly (resulting in difficult removal of same) to Tactile Warning Surface Tile when not removed quickly.

F. If requested by the Landscape Architect or Construction Manager, clean REP Tiles not more than four (4) days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean REP Tile by method specified by Tactile Warning Surface Products manufacturer.

END OF SECTION

SECTION 029000

PLANTING AND FINE GRADING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, see Section B1 of the Contract, shall be included and made a part of this Section.

B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK

A. The work of this section consists of all planting, lawns, and fine grading and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:
1. Providing and installing plants indicated and scheduled.
2. Fine Grading.
3. Protecting and maintaining the drainage system and completed work.
4. Short-term maintenance.
5. Warranty review and reporting.
6. Maintenance manuals.
7. Testing.
8. Clean-up.

B. Extent of Landscaping Work: In addition to the work indicated, Landscaping work includes restoring all areas disturbed by work of the Contractor and coordinating his/ her work with other subcontractors.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Carefully examine all the Contract Documents for requirements that affect the work of this section. Other specifications sections which directly relate to the work of this section include, but are not limited to, the following:
1. Section 021000 – Site Preparation and Clearing.
2. Section 023000 – Earthwork.
3. Section 029500 – Planting Soils.

1.04 QUALITY ASSURANCE/ DEFINITIONS

A. Analysis of Materials: For each type of packaged material required for the work of this Section, provide manufacturer's certified analysis. For all other materials, provide complete analysis by a recognized laboratory made in strict compliance with the standards of the Association of Official Agricultural Chemists.

B. Plant Materials: Provide only healthy, vigorous stock, grown in a recognized nursery and/ or collection site acceptable to the Landscape Architect and free from disease, insects, eggs, larvae, and other defects. Provide plants in strict compliance with the recommendations of the following:
1. ANSI Z60.1, American Standard for Nursery Stock, latest edition.
2. American Association of Nurserymen, *Horticultural Standards*.

3. American Joint Committee on Horticultural Nomenclature, *Standardized Plant Names*, 1942 edition.
4. International Society of Arboriculture.

C. Labeling: Label at least one specimen of each plant type with waterproof tag showing botanical and common name in compliance with the recommendations of the American Association of Nurserymen.

D. Inspection: Permit the Landscape Architect to inspect plant materials at the place of growth. The Landscape Architect reserves the right to re-inspect plant materials at any time and to reject unsatisfactory materials at any time during the progress of the work even if previously inspected and approved. The Contractor shall replace rejected materials at no change in Contract Amount.
1. Tagging: All plants shall be tagged in the nursery by the Landscape Architect or the Landscape Architect's representative prior to digging of plants. The Landscape Architect shall place his /her seals on selected trees at the nursery or collection site. Seals shall remain on the tree until the acceptance of the work. At least three weeks prior to expected planting date, request, in writing, the Landscape Architect's inspection of plant material at the nursery or collection site. The Landscape Architect or his/her representative shall make his/her own travel arrangements.
2. At the Landscape Architect's option and/ or request, the Contractor shall supply the Landscape Architect with photographs of plants for the project. The photographs shall be taken at the nursery source. Photographs shall include images showing the full range of characteristics of each plant including detailed photographs of the bark, the base (rootball crown) of the tree, leaves, branching structure, form, and habit. Images shall include a scale figure or measuring device to indicate true size.
3. The Landscape Architect shall have the right to reject any nursery source if he/ she determines, before, during or after inspecting or receipt of plants, any of the following:
    a. The nursery stock does not meet quality standards set forth herein.
    b. The nursery stock does not meet the intended visual characteristics of the plants as determined by the Landscape Architect.
    c. The nursery cannot supply the specified plant(s) or if an acceptable substitute cultivar or species cannot be supplied.
    d. The nursery's cultural practices or maintenance procedures do not meet specified standards.
4. The Landscape Architect has endeavored to locate sources for the plant material indicated to determine if materials are available. However, the Landscape Architect makes no claim that the materials will be available at the sources researched. The Contractor shall submit to the Landscape Architect any questions regarding the source of any plant.

E. Pruning: All pruning of new and existing trees and plants shall be done only by an insured, certified arborist in compliance with American Association of Nurserymen, *Horticultural Standards*. Pruning shall be done in a manner to preserve the natural character of the tree or plant. Pruning shall only be done at the direction of the Landscape Architect.

F. Reference Standard: Comply with ANSI Z133.1 for tree pruning, tree removal, and other tree care operations.

G. ASTM: American Society for Testing Materials.

H. AOAC: Association of Official Agricultural Chemists.

I. AAN: American Association of Nurserymen.

J. International Society of Arboriculture.

1.05 SUBMITTALS

A. Plant List: Provide plant list showing plant name (botanical and common names), size, form, rootball, limb height (if applicable), and nursery source. Plant list shall clearly indicate deviations from the specified plant list and any proposed substitutions.

B. Certificates: Submit inspection certificates required by authorities having jurisdiction. Provide certifications stating that materials comply with requirements. Provide certified analysis of soil amendments and fertilizers.

C. Maintenance Instructions: Provide clear, concise typewritten maintenance instructions and recommendations for year-round care of all work provided under this Section.
   1. Maintenance Instructions shall include the following information plus any special instructions deemed necessary by the Contractor and Landscape Architect, and Owner:
      a. Title and location of project; date of project; name, address, and telephone/ fax number of Landscape Contractor, Owner, and Landscape Architect.
      b. Botanical and common names of plants and lawn covered by the maintenance instructions.
      c. Identify by calendar month the maintenance requirements for pruning, fertilizing, irrigation, mulch, pest/ disease control, staking, mowing, and general maintenance. Indicate type and quantity of fertilizer to be used, which pests/ diseases can be anticipated for each plant type, and quantity of water needed.
      d. Indicate the type and source of mulch used on the project.
      e. Include a copy of the staking detail shown on the Drawings.
      f. Identify the mixes, location where mixes were used, and supplier for the planting soil mix.

D. Test Reports: Submit certified reports for tests required.

E. Samples: Prior to ordering the below listed materials, submit representative samples to Landscape Architect for selection and approval as follows. Do not order materials until Landscape Architect approval has been obtained. Delivered materials shall closely match the approved samples. Submit duplicate samples of each type listed below showing full range of color variation, finish and texture that can be expected in the permanent work:
   1. Mulch: At least three pounds of mulch of the type to be used on this project.
   2. Staking Materials
   3. Tree Wrap
   4. Guying Materials

F. Product Information: Provide manufacturer’s data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation, certifying that each material item complies with, or exceeds, specific requirements. Work includes but is not limited to:
   1. Photographs of plant material, as indicated herein.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store and handle all packaged plants and materials in strict compliance with manufacturer's instructions and recommendations. Protect all materials from damage, injury and theft. Plants that are to be stored prior to planting on or off site shall be closely monitored for sufficient root moisture and shall be protected from sun and wind. Balled and burlapped plant material shall be hilled in with wood chips or straw mulch to maintain proper root zone moisture. Stored balled and burlapped and container grown plant material shall be watered and misted several times a day if necessary to maintain proper root ball moisture and to reduce transpiration in sunny or windy locations. No plant shall be stored more than four weeks without written acceptance by the Landscape Architect.
   1. For plants stored on site more than 12 hours, the Contractor must keep a maintenance log. The log shall include information on the watering, misting, and protection of plants. The date, time, type of maintenance and name of maintenance personnel shall be included in the log.

B. Sequence deliveries to avoid delay. On-site storage space is extremely limited and is restricted to a 24-hour period for any one material, plant, or group of plants. On site storage is permissible only with written notice from the Owner’s Representative and Landscape Architect. Deliver materials and trees only after preparations for planting have been completed and accepted, including but not limited to: rough grading, utilities, decompaction or remediation of soils, spreading of topsoil and fine grading. The Landscape Architect shall determine if the site is acceptable for planting. If planting is delayed by more than six hours, protect trees from sunlight and completely cover roots with mulch. Water as necessary to keep roots moist during transportation. Do not remove container from container grown stock until planting time.

C. Prohibit vehicular and pedestrian traffic on or around stockpiled planting soil mixture.

D. Vehicular access to the site is restricted. Prior to construction the Contractor shall submit for approval to the Landscape architect and Construction Manger a plan showing proposed routing for deliveries and access to the site.

1.07 PROJECT CONDITIONS

A. Utilities: Determine and mark the location of below grade utilities before project staking. The Contractor shall field locate all utilities before starting work. Hand excavate as necessary to avoid damage. Repair all damage and restore items to their original condition as approved by the Landscape Architect and Owner and authorities having jurisdiction at no change in Contract Amount.

B. Stakes: If present, protect and maintain grade stakes and location stakes until removal is acceptable to Landscape Architect and all parties involved in this project.

C. Concealed Conditions: Notify Landscape Architect before planting when below grade conditions detrimental to proper plant growth are encountered. Do not proceed with planting without specific written instructions from the Landscape Architect.

D. Sequence of Planting: Install trees and plants before lawn areas and groundcover, unless otherwise approved by the Landscape Architect. Restore damaged lawn areas and groundcover if tree and shrub planting is delayed. Complete planting work as quickly as possible on portions of the site as they become available for planting.

E. Planting Seasons: Work only within seasonal limitations for proper planting as follows:

Plant Material	Spring Season	Fall Season
Lawn, sod	Apr 15 to June 15	Sept 15 to Oct 30
Deciduous [balled and burlapped]	Mar 1 to Jun 1	Sep 1 to Nov 15
Deciduous [container grown]	Mar 15 through	Nov 15
Evergreens	March 15 to June 15	Aug 15 to Nov 15

F. Water: On-site water is available for the Contractor's use. Contractor shall meter and pay for the water used. The Contractor shall immediately notify in writing the Owner if water is insufficient for work and maintenance operations. Provide as needed water from sources free from impurities injurious to vegetation. Provide all hoses and equipment as needed to distribute water to area of landscape work and areas needing watering. Provide water tank trucks as needed if water supply is unavailable.

G. Painting: Do not paint vegetation for any reason.

1.08 ACCEPTANCE AND MAINTENANCE

A. Request for Acceptance: In writing, request Landscape Architect's inspection for acceptance at least 10 days in advance of preferred inspection date. Do not request inspection for acceptance until work is 100% complete (not including maintenance) and in compliance with the Contract requirements.
   1. Partial Acceptance: Acceptance of partial areas or portions of the total work may be granted, at the Owner's Representative's and Landscape Architect's option, if the area to be inspected for acceptance is large, well defined, and easily described. The Owner's Representative and Landscape Architect are not obligated to provide partial acceptance of the work.

B. Plant and Tree Maintenance: Begin maintenance immediately after planting. Provide complete maintenance and service as required to promote and maintain healthy growth including, without limitation, watering, fertilizing, pruning, trimming, cultivating, weeding, fallen leaf removal, treating for insects and disease, resetting plants to proper grade and upright position, and other operations and maintenance work. Throughout the maintenance period, restore planting saucers and mulch, and keep mulch beds weed free. Tighten and adjust guy wires, stakes, and deadmen to keep trees in vertical position. Restore and replace damaged trunk wrappings.
   1. Length of Maintenance Required: Completely maintain plants and trees for 45 calendar days from date of final acceptance.
   2. Watering: Flood all plants during the maintenance period at least twice each week. At each watering, thoroughly saturate the soil around each tree and shrub. If sufficient moisture is retained in the soil as determined by the Landscape Architect, the required watering may be reduced. Quantity of water required per watering: Trees will require a minimum of ten gallons (ea.), shrubs require a minimum of 5 gallons (ea.), lawns require a minimum of 1" of water per week.

1.09 WARRANTY

A. Warranty: Provide written one-year warranty agreeing to remove and replace work that exhibits defects in materials or workmanship for the specified periods. "Defects" is defined to include, but is not limited to, death, unsatisfactory growth, disease, abnormal

foliage density, abnormal size, abnormal color, failure to thrive, and other unsatisfactory characteristics. Additional watering may be required in periods of drought or if irrigation system is inoperative.

B. Tree and Plant Replacement: Replace each defective plant or work with new plants or work of same species, size, character, and quality of originally accepted work. With each replacement plant or material, provide a new one-year warranty for the replacement work. If a replacement is unacceptable during its one year warranty, the Contractor shall provide another replacement or, when approved by Owner, equivalent cash payment.
   1. Lawn Replacement: Replace defective lawn with new lawn of same species, character, and quality of originally accepted work. Use same lawn supplier as originally used for the project. If a replacement is unacceptable during its one-year warranty, the Contractor shall provide another replacement or, when approved by Owner, equivalent cash payment.
   2. Replacement Planting Seasons: Planting for replacement and warranty work for trees, plants, and lawns shall comply with the Planting Seasons specified herein.
   3. Owner's Responsibilities and Warranty Exclusions: After completion of the Contractor's maintenance responsibilities, the Owner is responsible for maintaining the work in reasonable compliance with the Contractor's maintenance instructions. The Contractor's warranty shall exclude problems due to improper or inadequate maintenance (after the 45-day maintenance period) or vandalism.
      a. During the warranty period, the contractor shall visit the site at one-month intervals to review the conditions of the accepted work. The Contractor shall submit in writing to the Landscape Architect and Owner his/ her concerns regarding the Owner’s maintenance practices and/ or any vandalism. The content of this notice shall include a list of specific plants involved, the presumed problem, and a method of remedy for the problem(s) cited. The Owner shall make reasonable efforts to correct the problems cited by the Contractor but the Owner shall not be held responsible for the Contractor’s defects in materials or workmanship that result in decline or death to plants and lawns.
      b. Failure of the Contractor to make the required monthly review of the site during the warranty period and to submit written notice to the Owner and Landscape Architect of maintenance defects shall negate the Contractor’s ability to make a claim against the Owner for negligence of maintenance.
   4. Warranty Period for Plants and Trees: One year from date of the last day of the required maintenance period.

PART 2 – PRODUCTS

2.01 PLANT MATERIALS

A. Trees and Shrubs: Provide specimen container grown and balled and burlapped, as specified, trees of height, size, caliper, genus, species, and cultivar indicated and with branching configuration and number of canes required by ANSI Z60.1 and specified herein.
   1. Larger Stock: Plants larger than required may be used if approved by Landscape Architect, if root ball is proportionately larger, and if there is no change in Contract Price.
   2. Undersize Stock: Not more than 10% plants smaller than required may be used if approved by Landscape Architect, if equal number of oversize plants are provided to make average size equal or greater than size required, and if undersize plants are larger than the average size of the next lowest size grade.

3. Hardiness: Provide plant stock certified to have been grown within hardiness Zones 2 through 6 as established by the Arnold Arboretum, Jamaica Plain, Massachusetts. Plants without this certification will be rejected.
4. Plant Character: All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name.
5. General Condition of Plant: The root system of each shall be well provided with fibrous roots. All parts of plant shall be moist and show active green cambium when cut. They shall be sound, healthy, and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs or larvae.
6. Rootballs: All plants to be moved balled and burlapped, must be moved with the root systems as solid units with balls of earth firmly wrapped with untreated eight-ounce burlap, firmly held in place by a stout cord or wire, drum laced, or boxed, or in containers. The diameter and depth of the balls of earth must be sufficient to encompass the fibrous and root feeding system necessary for the healthy development of the plant. No plant shall be accepted when the ball of earth surrounding its roots has been badly cracked or broken preparatory to or during the process of planting or after the burlap, staves, ropes or platform required in connection with its transplanting have been removed. The plants and balls shall remain intact during all operations. Burlap for containing rootballs shall be untreated, made from biodegradable natural fibers.
7. Tree Trunk: The height of the trees (measured from the crown of the roots to the tip of the top branch) shall be not less than the minimum size designated. The trunk of each tree shall be a single trunk growing from a single un-mutilated crown of roots. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety. The trunk shall be free from sunscald, frost cracks, or wounds resulting from abrasions, fire or other causes. No pruning wounds shall be present having a diameter exceeding one inch and such wounds must show vigorous bark on all edges. Plants shall not be pruned prior to delivery. No trees with double-leaders or twin-heads shall be acceptable without the written approval of the Landscape Architect. The Contractor shall reject such plants at time of delivery by the nursery/supplier unless such plants were selected by the Landscape Architect as indicated by tags and seals.
8. Handling of Plants: Plants delivered by truck and plants requiring storage on site shall be properly wrapped and covered to prevent wind-drying and desiccation of branches, leaves and buds; plant balls should be firmly bound, unbroken, reasonably moist to indicate watering prior to delivery and during storage, and tree trunks shall be free from fresh scars and damage in handling.

2.02 LOAM

A. Refer to 029500 Planting Soils.

2.03 MISCELLANEOUS MATERIALS

A. Stakes and ties: Provide Cedar stakes for all balled and burlapped trees, stakes shall be 2 x 2” nominal members, un-stained; provide 3 stakes per tree. Confer with Landscape Architect prior to staking to determine extent of staking necessary. Secure stake to tree with ArborTie White, by Deeproot Green Infrastructure LLC (www.deeproot.com), or approved equal tying material.

B. Tree Protection Fence: Refer to Section 021000.

C. Plywood: Provide 3/4” Grade C or better plywood for use as planking when moving materials or equipment over areas to be planted. The driving of vehicles over planted areas is expressly prohibited.

PART 3 – EXECUTION

3.01 PREPARATION

A. Pre-Installation Examination Required: The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and notify Landscape Architect in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Contractor accepts substrates, previous work, and conditions. The Contractor shall not place any planting soil mixtures until all work in adjacent areas is complete and approved by the Landscape Architect.

B. Layout and Approval: Layout and stake individual trees and obtain Landscape Architect's approval before starting installation. After staking is accepted, set plants in place for final review and acceptance by the Landscape Architect. Make adjustments as requested by the Landscape Architect.

3.02 PLANTING TREES AND PLANTS

A. Planting Preparation:
1. Maintain at all times during the planting operations at least one stockpile of the planting soil as approved by the Landscape Architect.
2. Protect new and existing site improvements from damage due to planting.

B. Planting Bed Preparation for Trees and Shrubs: Create continuous plant bed, do not place plants in pits. Plant soil mixture will be used to backfill the planting pits.
1. Excavate existing grade to proper depth to form a continuous bed for planting.
2. Staking and Layout: Stake trees and obtain Landscape Architects acceptance of location and finish grade elevation
3. Ball Pedestals: Provide an undisturbed soil pedestal immediately beneath the ball so that tree or plant will not settle and will have the relationship to finish grade described below.
4. For planting of trees and shrubs refer to "Planting Balled and Burlapped Stock" in this Section.
5. Watering and Drainage: For at least three locations within each defined planting area as specified by the Landscape Architect or Soil Scientist, test the drainage of planting area excavations by filling with water and allowing water to percolate twice in succession. If planting pits do not percolate or drain properly after the second filling notify Landscape Architect and request additional instructions prior to planting. Do not plant into poorly draining planting pits; poorly draining planting pits may hold water and drown plants.
6. Obstructions: If obstructions or other conditions detrimental to healthy plant growth are encountered, notify Landscape Architect immediately and request additional instructions. At the Landscape Architect's direction and at no additional cost to the Owner, plants shall be relocated to avoid the obstruction.

C. Planting Balled and Burlapped Stock: Set balled and burlapped stock plumb in center of ball pedestal. Remove all excess fill on top of rootball to expose root flare at base of trunk. Set with crown of rootball 2"-3" higher than specified finished grade. Remove burlap and twine from trunk to prevent girdling. Remove drum lacing from top 1/3 of rootball and wire baskets as shown on drawings. Keep root balls intact; plants with broken or damaged root balls shall be rejected and immediately removed from the site. Keep root balls damp and protected from damage due to sun and wind.
1. Backfilling: After trees have been placed in staked locations, and as directed by Landscape Architect, backfill excavations with planting soil mix as specified in Section 029500. Backfill in 3-4" layers and consolidate each layer with water to eliminate voids and air pockets before placing subsequent layers. Continue until

backfill has reached specified finished grade shown on the Drawings. Water thoroughly when excavation is backfilled and continue watering until saturation. Also refer to Section 029500 for instructions on placement of planting soil mix.

2. Mycorrhizal inoculant: Treat all tree and shrub soil pits with mycorrhizal inoculant according to the manufacturer's instructions.
3. Watering: Flood all plants with water twice within the first 24 hours after planting.
4. Watering Dish: Dish top of topsoil around each tree as shown in the Drawings to allow water to seep into the root zone. Cover watering dish with 3" of approved bark mulch. Form mulch into neat ring to the dimensions shown on the Drawings.
5. Anti-Desiccant: Spray anti-desiccant to provide adequate film over trunks, branches, stems and foliage. If trees are moved in full leaf, spray with anti-desiccant at nursery before moving and again two weeks after planting. Use anti-desiccant only if approved by Landscape Architect.
6. Pruning and Shaping: Prune, thin out and shape plants in compliance with American Association of Nurserymen, *Horticultural Standards* to preserve the natural character and only as approved by the Landscape Architect. Retain required height and spread. Do not alter shape and do not cut leaders. Remove all dead wood, suckers, broken or bruised branches, and crossing branches.
7. Staking and Tying (if required): Stake and tie trees immediately after planting to maintain trunk plumb. For deciduous trees, install arbor-tie above lowest branch of trees. Coordinate location of arbor-tie with intended pruning of trees to assure that ties will be properly placed after pruning. Adjust and reset stakes and ties during maintenance period as necessary.

D. Planting Container Stock: Plant container grown stock the same as specified for balled and burlapped stock, but remove containers completely with a cutter acceptable to Landscape Architect.

E. Root Pruning: After removing plant from the container, the Contractor shall inspect the root ball for kinked, matted or circling roots. If these conditions are present, the Contractor shall prune to remove cleanly any kinked, matted or circling roots with sharp clean hand pruners. The Contractor shall also scarify the sides of the rootball to prevent a rootbound condition.

3.03 FINE GRADING

A. Prior to fine grading, Landscape Contractor shall verify that the rough grading and planting soil mixes have been accepted by the Landscape Architect.

B. Fine Grading: Set sufficient grade stakes for checking the finished grades. Confer with Landscape Architect to assure that finish grades will meet the design intent and gradient requirements. Review grades on site with Landscape Architect. Stakes must be set at the bottom and top of slopes and the centers of plant beds. Grades shall be established which are accurate to 1/10th of a foot either way. Connect contours and spot elevations with an even slope. All grading will insure drainage away from structures.

1. After topsoil mix has been spread, it shall be carefully prepared by scarifying and hand raking. All large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter, and stones over one inch in diameter shall be removed from the topsoil. topsoil shall also be free of smaller stones in excessive quantities as determined by the Landscape Architect.
2. Fine grade planted areas to smooth, free draining, even surfaces with fine texture. Roll, rake and drag areas to flatten ridges and fill depressions, except as select areas shown on drawings. Control moisture content to maintain optimum conditions, but do not create a muddy condition.

3. Maintenance and Restoration: Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to lawn planting.

3.04 CLEANING, PROTECTION AND EXCESS MATERIALS

A. Clean pavements and keep work areas clean and neat during landscape work. Remove all debris from site.

B. Provide temporary protection, as specified and as needed to protect drainage system, restrict traffic, to permit growth to develop, to protect completed work, and to ensure work is without damage or deterioration at time of final acceptance. Remove and replace damaged landscape work prior to acceptance.
1. Protection of Drainage System: If present, protect existing drainage protection system at all drain inlets to prevent silt, materials or debris caused by planting operations from entering the drainage system. If drainage protection system is not present, establish straw bales, siltation fencing or other devices as required by the General Conditions to prevent siltation of the drainage system.

C. Excess Materials: Review extent of excess materials and review with Owner. Deliver excess materials claimed by the Owner to a location designated by the Owner. Delivery shall be at no additional cost to the Owner. Remove excess materials unclaimed by the Owner from the site at no additional cost to the Owner.

D. Tags: Remove all identification labels, seals and tags at the end of the project.

END OF SECTION

SECTION 029500

PLANTING SOILS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, see Section B1 of the Contract, shall be included, and made a part of this Section.

B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK

A. The work of this Section consists of all site preparation work and related items as indicated on the Drawings and/or as specified herein and includes, but are not limited to the following:
1. Evaluation of rough subgrade water infiltration.
2. Planting soil material acquisition.
3. Testing and analysis for specification conformance.
4. Inspection and testing of subgrade for preparation of subgrade.
5. Preparation of mixes and testing for conformance.
6. Installation and placement of soils.
7. Decompaction of soils.
8. Final in-place testing of soils.
9. Coordination with other contractors.
10. Clean-up.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Carefully examine all of the Contract Documents for the requirements that affect the work of this Section. Other specification Sections that directly relate to the work of this Section include, but are not limited to, the following:
1. Section 022300 – Site Preparation and Clearing
2. Section 023000 – Earthwork
3. Section 029000 – Planting and Fine Grading

1.04 REFERENCES

A. Work and materials shall meet the standards of the following references:
1. New York State Department of Environmental Conservation Stormwater Management Design Manual (January, 2015).
2. International Society of Arboriculture.
3. American Society for Testing Materials (ASTM).
4. Environmental Protection Agency (EPA).

1.05 QUALITY ASSURANCES

A. Analysis and Testing of Materials: For each type of packaged material required for the work of this Section, provide manufacturer’s certified analysis. For all other materials, provide complete analysis by a recognized laboratory made in strict compliance with the standards and procedures of the following:

1. American Society of Testing Materials (ASTM).
2. American Society of Agronomy.
3. Soil Science Society of America.
4. Association of Official Agricultural Chemists.
5. National Cooperative Soil Survey.

B. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants, and installation of designed planting soils.
   1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site when exterior planting is in progress.
   2. The Landscape Contractor shall have experience in the proper and safe transportation and installation of soil material.
   3. The Landscape Contractor shall have at least 3 years' experience in installing designed soil mixes.

C. Soil Supplier Qualifications:
   1. Shall be able to provide soil mixes that meet the specifications within tolerances assigned.
   2. Shall be able to produce enough consistently uniform soil material for the project to meet the scheduled demands.

D. Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
   1. Employ a qualified independent testing and inspection laboratory acceptable to the Landscape Architect and Owner to perform tests and certifications indicated. It is the responsibility of Landscape Contractor in conjunction with the Soil Supplier to submit material for the soil and compost tests. Tests shall be made in strict compliance with the standards of the Association of Official Analytical Chemists and follow standards from ASTM, EPA, and/or Methods of Soil Analysis, Soil Science Society of America.

1.06 SUBMITTALS AND TESTING

A. Certificates: Provide certificates required by authorities having jurisdiction, including any composted materials containing sewage sludge. Approval as EPA Type 1 "exceptional quality" is required as well standards for application of composted organic material by the State of New York.

B. Test Procedures and Reporting: Submit certified report for each test required.
   1. Soil testing shall be performed and reported for particle size requiring percent of gravel (>2.0 mm), very coarse sand (2.0 – 1.0 mm), coarse sand (1.0 – 0.5 mm), medium sand (0.5 – 0.25 mm), fine sand (0.25 – 0.10 mm), very fine sand (0.10 – 0.05 mm), silt (0.05 – 0.002 mm) and clay (< 0.002 mm). Saturated conductivity, bulk density, pH, total porosity, salt content, Ammonium content and organic matter percentage on a dry weight basis shall also be tested.
   2. Specified soils testing for initial approval shall be tested using the following procedures.
      a. Particle size distribution by the Pipet Method as outlined in Methods of Soil Analysis Part 1, 1986. This includes the removal of organic matter and carbonates with hydrogen peroxide.
      b. Saturated hydraulic conductivity, Total Porosity, and Bulk Density by ASTM F1815-97 for the tested sample.
      c. Organic matter content by ASTM F 1647-02a.
      d. Salts and Ammonium test using Woods End Research Laboratory # 104 Soluble Ion Test or approved equivalent.

e. Soil pH shall be tested using 1:1 in water paste method measured by an electrode as per Methods of Soil Analysis Part 1.
f. Soil chemical and nutrient analysis shall be tested using Methods of Soil Analysis Parts 1 and 3, 1986 and 1996, or approved equivalent.
g. Soil moisture testing required prior to soil placement shall be by gravimetric oven dry method as described in Soil Science Society of America, Methods of Soil Analysis, Part 1, 1986.

C. Samples: Prior to ordering the listed materials, submit representative samples of the same organic batches and soil mixes that shall be used to the Soil Scientist for selection and approval. Do not order materials until the Soil Scientist's approval has been obtained. Schedule at least 4 months for soil ingredient search and initial submittal approval. Delivered materials shall closely match the approved samples.
1. Soil Mix: Duplicate samples of 1 quart for each soil layer specified.

1.07 DELIVERY, STORAGE AND HANDLING

A. Store and handle packaged materials in strict compliance with manufacturer's instructions and recommendations. Protect all materials from weather, damage, injury and theft.

B. Sequence deliveries to avoid delay. On-site storage space is permissible only with written notice from Owner. Deliver soil materials only after preparations for placement of planting soil have been completed.

C. Prohibit vehicular and pedestrian traffic on or around stockpiled planting soil.

D. Soil that is to be stockpiled longer than two weeks, whether on or off site, shall not be placed in mounds greater than six feet high. If soil stockpiles greater than six feet high are to be stored for more than two weeks, the contractor shall break down and disperse soil so that mounds do not exceed the six-foot height restriction or thoroughly mix the stockpile once a month.

E. Vehicular access to the site is restricted. Prior to construction the Contractor shall submit for approval a plan showing proposed routing for deliveries and site access which shall include, but not limited to equipment movements and staging locations

F. Soil materials shall be covered at least two weeks prior to installation to prevent excess moisture from saturating the soil stockpile. Test for the moisture content of the soil mix using the gravimetric oven dry method as described in Soil Science Society of America, Methods of Soil Analysis, Part 1, 1986 at least two days prior to soil installation.

G. Soil materials shall not be handled or hauled, placed or compacted when it is wet, as after a heavy rain, nor when frozen. Soil shall be handled only when the moisture content is less than 10 percent by volume.

1.08 ACCEPTANCE AND MAINTENANCE

A. Soil Installation Acceptance: Notify the Landscape Architect at least 10 days in advance of date of soil placement. Inspection of the soil installation shall take place during placement of the first lift, while some of the subgrade is visible, and another inspection during the placement of the top lift(s).

B. Partial Acceptance: Acceptance of partial areas or portions of the total work may be granted at the option of the Landscape Architect only if the area to be inspected for

acceptance is large, well defined and easily described. The Landscape Architect is not obligated to provide partial acceptance of the work.

PART 2 – PRODUCTS

2.01 SOIL LAYERS (HORIZONS):

A. General
1. All plant mix material shall fulfill the requirements as specified and be tested to confirm the specified characteristics.
2. Material placed on site shall be identical to that submitted for testing. The Landscape Architect may request additional testing by the Contractor for confirmation of mix quality and/or soil mix amendments at any time until completion.

B. Drainage Layer:
1. Shall conform to AASHTO M-43, No. 67.
2. Size 0.25” to 0.75”
3. The drainage layer material shall be able to compact to minimum 95 percent peak density, and follow standard engineering practices for determination of suitable fill.

C. Planting Soil: USDA soil type loamy sand, sandy loam or loam
1. All areas indicated in the drawings shall be back-filled with a suitable sandy loam planting material. The borrow source of this media, which may be the same or different location from the bioretention area itself, must be tested as follows:
a. If the borrow area is virgin, undisturbed soil, one test Is required per 200sf of borrow area; the test consists of “grab” samples at one foot depth intervals to the bottom of the borrow area. All samples at the testing location are then mixed, and the resulting sample is then lab-tested to meet all applicable criteria.
2. Sand composition shall be 35-60%.
3. Silt composition shall be 30-55%.
4. Clay composition shall be 10-25%.
5. The soil shall be a uniform mix, free of stones, stumps, roots or other similar objects larger than two inches.

PART 3 – EXECUTION

3.01 COORDINATION

A. Pre-Installation Examination Required: The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and shall notify the Owner in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means the Contractor accepts substrates, previous work, and conditions. The Contractor shall not place any planting soil until all work in adjacent areas is complete and approved by the Owner.

B. Planting Soil Preparation: Examine soil and remove foreign materials, stones over 1”, and organic debris over 2” in length. Mix-in amendments as required by tests and as approved by the Owner. All preparation and mixing shall be accomplished when the soil moisture content is less than 10 percent by volume.

C. Coordinate activities with other project contractors so that there is no soil disturbance from traffic or other construction activities subsequent to placement.

3.02 EXCAVATION AND SCARIFICATION

A. All construction debris shall be removed from the planting areas prior to placement of the soil layers.

B. Working the soil at 10 percent moisture content or above is prohibited.

C. The subgrade drainage layer shall be installed in 6 to 12 inch lifts with approved fill material to an overall depth below the final grade as shown in the Drawings, and compacted to 95 percent peak density.

D. After the specified engineering compaction for all subgrades is accomplished, scarify the compacted surface of the subgrade, following final rough grading, to 4 to 6 inches deep prior to placing the hydric planting soil. The subgrade shall have a permeability of not less than 0.5 inches/hour. Determine permeability of the subgrade using a single ring infiltrometer method after it has been scarified. If infiltration of the subgrade is below 0.5 in/hr, scarify perpendicular to previous scarification to a depth of 6 to 8 inches and retest for infiltration.

E. After approval of the subgrade, placement of the designed soil can begin following procedures outlined in Part 3.03 of this Section.

3.03 PLACEMENT OF SOIL LAYERS (HORIZONS)

A. Soil Placement Preparation:
1. Verify that the under drainage and/or irrigation systems have been installed and accepted if applicable.
2. Verify that the subgrade passes the minimum water infiltration requirement.
3. Determine that the subgrade is free of debris.
4. Verify that the subgrade meets a soil density requirement of 95 percent of peak density and is the proper depth.
5. Verify that the planting soils are below 10 percent moisture at least two days prior to soil placement.
6. Notify the Owner of soil placement operations at least ten calendar days prior to the beginning of work.

B. Examination of Subgrade: The subgrade shall be examined by the Contractor prior to the start of soil placement and planting. Any deficiencies shall be noted and related to the Owner in writing prior to acceptance of the subgrade by the Landscape Contractor. Deficiencies include, but shall not be limited to the following:
1. Construction debris present within the planting areas.
2. The subgrade is at incorrect depths for installing the designed soil profile.
3. Incomplete irrigation and/or subsurface drainage installation.
4. Subgrade not at 95 percent of Peak Density, The Contractor shall use approved standard engineering procedures to test for compaction of the subgrade. Subgrade density tests shall be conducted using ASTM D1556 “Density of soil and rock in place using Sand Cone Method".

C. Placement of the Planting Soil:
1. Scarify the subgrade and test its infiltration rate. Each area shall have at least 3 infiltration tests per planting area. The planting area shall be defined by limits noted on the Drawings.

2. Place soils in a minimum of three equal lifts of no greater than 6” each. Scarify each lift between soil placements with hand tools or small tracked equipment is required to break up any compacted surface and eliminate any interface. Additional compaction is prohibited.
3. Plant individual trees in locations noted on the drawing at this time using the dished tree detail described in Section 02900 and noted in the Drawings. Scarify the sides of the tree pit. Backfill the tree pit and lightly tamp in and around the rootball.
4. Walkway construction shall be completed prior to the placement of the hydric soil layer to avoid compaction of the planting soil. If walkway construction is completed after planting soil placement the Landscape Contractor shall report deficiency to the Owner and the Owner shall arrange for remediating the compaction caused by the walkway installation.
5. Finish planting according to Section 029000.

3.04 PROTECTION AND REPAIRS

A. Protect newly graded areas from traffic, freezing and erosion. Keep free of trash, debris or construction materials.

B. Where settling occurs before final soil installation acceptance, backfill with additional approved material, compact to specified rates, and restore any disturbed areas to a condition acceptable to the Owner’s Rep., and Landscape Architect.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and General Requirements, see Section B1 of the Contract, apply to the work of this Section and are hereby made a part of this Section.

B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SUMMARY

A. Work in this Section includes the cast-in-place concrete work as shown on the Drawings and specified herein, including, but not limited to, the following

1. Concrete Walkways and concrete bases for unit pavers

2. Concrete Curbs and Flush Curbs.

B. Related Sections include the following:

1. Section 021000 – Site Preparation and Clearing.

2. Section 023000 – Earthwork.

3. Section 274100 – Bituminous Concrete Pavement.

4. Section 276000 – Paving Specialties.

5. Section 321440 – Precast Concrete Unit Pavers (Granite Pavers- Add Alternate)

1.03 REFERENCES

A. American Concrete Institute (ACI).

1. ACI 301-96 - “Specification for Structural Concrete for Buildings.”

2. ACI 318-95 - “Building Code Requirements for Reinforced Concrete.”

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

1. A82 – “Standard Specification for Cold-Drawn Steel Wire for Concrete Reinforcement”.

2. A185 – “Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement”.

3. A615 – “Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement”.

4. A616 – “Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement”.

5. A617 – “Standard Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement”.

6. C 31 - “Standard Method of Making and Curing Concrete Test Specimens in the Field.”

7. C 33 - “Standard Specification for Concrete Aggregates.”

8. C 39 - “Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.”

9. C 94 - “Standard Specification for Ready-Mixed Concrete.”

10. C 143 - “Standard Method of Test for Slump of Portland Cement Concrete.”

11. C 150 - “Standard Specification for Portland Cement.”

12. C 157 - “Standard Method of Test for Length Change of Hardened Cement Mortar and Concrete.”

13. C 192 - “Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory.”

14. C 233 - “Testing Air-Entraining Admixtures for Concrete.”

15. C 260 - “Standard Specification for Air-Entraining Admixtures for Concrete.”

16. C 309 - “Standard Specification for Liquid Membrane - Forming Compounds for Curing Concrete.”

17. C 494 - “Standard Specifications for Chemical Admixtures of Concrete.”

18. C 618 - “Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.”

19. D 1751 - “Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-Extruding and Resilient Bituminous Types).”

20. E 329 - “Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction.”

1.04 QUALITY ASSURANCE

A. Qualification of Workmen:

1. Provide one or more persons who shall be present at all times during the execution of this portion of the Work and who shall be thoroughly trained and

experienced in placing the types of concrete specified and who shall direct all Work performed under this Section.

2. For finishing of exposed surfaces of the concrete, use only thoroughly trained and experienced journeymen concrete finishers.

B. Owner's Testing Laboratory:

1. Plant and field inspection and testing of concrete and steelwork will be performed by an independent testing laboratory employed by the Owner.

2. The Owners use of a Testing Laboratory shall in no way relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Drawings.

3. If Contractor wants the Testing Laboratory to perform additional compression tests in order to establish compliance with specification requirements at an earlier date, he shall notify the Owners testing laboratory and reimburse the Owner for the expense.

C. Records:

1. Keep a record and make available for inspection at the site, showing time and place of each pour of concrete, together with transit batch tickets per ASTM C94. Batch tickets shall include the time water was added to dry mix in addition to the other information required.

2. Make the records available to the Landscape Architect for review upon request.

1.05 SUBMITTALS

A. General

1. Review of submittals is of a general nature only, and the responsibility for conformance with intent of drawings shall remain with the Contractor. Review does not imply or state that the fabricator has correctly interpreted the construction documents.

2. Prior to final approval of Shop Drawings for exposed architectural concrete surfaces the Mock-up specified herein shall be completed and approved. Any modifications of the Mock-up formwork shall be incorporated into the Shop Drawings and other submittals.

B. Concrete Mix Design: - Submit proposed mix designs for each class of concrete to be used in this project. Include the following:

1. Copies of mix designs. Mix designs shall be prepared by an independent testing laboratory.

2. The mix design submittal shall list:

a. All materials and admixtures and their proportions.

b. Water and cement content, water cemetitious material ratio, slump, and combined aggregate gradation (percent retained on every sieve size).

c. Compressive strength documentation of how the strength was determined.

d. Information on concrete materials as per paragraph 4.1.2.3 of ACI 301.

e. Whether mix is appropriate for pumping.

f. Indicate where each mix will be used.

3. This submittal shall include the results of all testing performed to qualify the materials and to establish the mix designs. Include all calculations and tests required by ACI 318 Section 5.3.

4. Test results of total chloride in content.

5. Where shrinkage limit is specified submit shrinkage test results.

6. For lightweight aggregate used submit test results per ASTM C330.

7. For normal weight aggregate submit test results per ASTM C33.

C. Submit proposed methods for cold and/or hot weather concreting when contemplated.

D. Shop Drawings: Prepare and submit shop drawings for approval, including plans, elevations, sections, details, and schedules as required to fully illustrate details of work and to meet job conditions.

1. General Requirements: Dimensions for concrete work shall be confirmed and correlated at the job site. Shop drawings and other submittals shall include fabrication processes, techniques of construction, each joint type/condition, relationship of concrete work with embedded or built-in items, and relationship to adjacent construction.

a. After stake layout of on-site conditions, confirm locations of on-site elements together with Construction Manager and revise layout of reinforcing steel and form-work drawings as necessary to reflect adjustments and re-submit.

2. Reinforcing Steel: Submit shop drawings showing reinforcement and all necessary bending diagrams and reinforcing steel list, and construction joint locations. Comply with additional ACI 315 requirements.

a. Reinforcing for flat slabs shall show top steel and bottom steel and shall be on separate shop drawings.

E. Product Data: Submit product data for following products showing compliance with project specifications, manufacturer’s recommendations, as well as known limitations.

Provide certification that the following materials conform to the standards referenced in this section.

1. Concrete materials and ingredients related to products used in Concrete Mix Design(s):

    a. Cement, each type.

    b. Aggregate, each type.

    c. Admixtures, each type.

2. Form materials for exposed concrete.

3. Reinforcing.

4. Reinforcing supports.

5. Joint filler.

6. Curing materials.

7. Non-shrink grout.

F. Certifications: Submit certification by the manufacturers that each admixturer conforms to requirements specified in this section and that the admixtures are compatible with one another.

G. Submit cement mill tests.

H. Mill Certificates: Submit steel producer's certificates of mill analysis, including steel source, description, heat number, yield point, ultimate tensile strength, elongation percent, bend test and the chemical composition of each heat as determined by ladle analysis, before delivery of steel to site.

I. Upon completion of the concrete Work, deliver the records of concrete placement and the concrete batch tickets to the Landscape Architect.

J. Quality Control Submittals

1. Design Data:

    a. Concrete Mixture Design(s):

        (i) Prepare and submit a detailed report of materials and methods used, test results, and the field test strength (f_{cr}) for concrete.

        (ii) Mix design(s) shall be signed and sealed by a professional engineer licensed in the State of New York and shall include time/strength curves for the various mix designs and the recommended design(s) as specified in Part 2 Article “Concrete Quality and Proportioning”.

2. Test Reports:

a. Concrete Mixture Proportions:

(i) Submit copies of test reports by independent test labs conforming to ASTM C1077 showing that the mixture has been successfully tested to produce concrete with the properties specified and that mixture will be suitable for the job conditions. Test reports shall be submitted along with the concrete mixture proportions. Obtain approval before concrete placement.

(ii) Fully describe the processes and methodology whereby mixture proportions were developed and tested and how proportions will be adjusted during progress of the work to achieve, as closely as possible, the designated levels of relevant properties.

b. Material Source and Field Quality Control Testing: Submit as required for materials as specified in this Section, including periodic testing of concrete aggregates used during concreting operations.

1.06 DELIVERY AND STORAGE 0F MATERIALS

A. Comply with ACI 301 and ASTM A775/A775M.

B. Delivery: Deliver reinforcement to jobsite bundled, tagged and marked. Use tags that indicate bar size, lengths and marks corresponding to markings shown on shop drawings.

C. Storage: Store reinforcement at the jobsite in a manner to prevent damage and accumulation of dirt and rust, moisture and grease or any other substance that may impair bond to concrete. Do not use damaged, reworked or deteriorated material.

1.07 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

A. Where permanent formwork is used, provide expanded polystyrene foam formwork manufactured without the use of CFCs (chlorofluorocarbons) or HCFCs (hydrochloro-fluorocarbons).

B. Chemically treated wood used for formwork shall not contain arsenic or its compounds.

C. Chemically treated wood used for formwork shall not contain chromium or its compounds.

D. Certify that 50% of all wood products used for removable formwork originate from sustainable managed forests certified by one or more independent certification organization accredited by the Forest Stewardship Council (FSC). See http://www.certifiedwood.org for a searchable database of certified wood products.

E. Provide form release agent for removable formwork that is agricultural-based and biodegradable and complies with VOC requirements defined in Division 1 “Environmental Impact of Materials” Section.

F. Provide curing compound that complies with VOC requirements defined in the General Conditions.

G. Collect and transport all recyclable scrap material in accordance with the General Conditions.

PART 2 – PRODUCTS

2.01 BASE COURSE

A. Compacted gravel used for concrete sidewalks, pavement bases and footings shall be in accordance with Section 02300 – Earthwork.

2.02 CONCRETE MATERIALS

A. General:

1. Materials used shall be the same as those submitted and from the same source.

2. When it is proposed to change materials from those submitted, conform to paragraph 4.2.1.5 of ACI 301.

B. Cement:

1. Portland Cement Type I or II, ASTM C 150.

2. The temperature of cement delivered to the plant shall not exceed 150 degrees F.

3. Architectural Concrete blended with white cement as required to match color of samples.

4. One brand from the same source shall be used throughout the project.

5. There shall be no detrimental reaction between the cement and the aggregates used.

C. Normal Weight Aggregates:

1. ASTM C 33. Aggregates shall be evaluated for reactivity per Appendix XI.

2. Aggregates shall be from a source of supply which have shown by actual service to produce concrete of the required quality.

D. Water: clean, potable, and free of deleterious matter. In addition, conform to ASTM C94 including the optional chemical tests.

E. Admixtures:

1. Except where specified herein do not use admixtures without the written acceptance of the Landscape Architect. Where more than one is used, admixtures shall be compatible.

2. Admixtures containing Calcium Thloride Thiocyanates or more than 0.05 percent chloride ions are not permitted.

3. Do not use admixtures that will negatively impact the visual finish of concrete exposed to view. For concrete exposed to view the finish shall not vary as a result of changes in the use of admixtures.

4. Hydrophobic Concrete Waterproofing Admixture – refer to Section 03050.

5. Water Reducing Admixtures: ASTM C 494, Type A.

6. Water Reducing, Retarding Admixtures: ASTM C494, Type D.

7. Non-Chloride, Non-corrosive Accelerating Admixtures: ASTM C494, Type C or E. The admixture manufacturer must have long term non-corrosive test data (of at least a year's duration) from an independent testing laboratory using an acceptable accelerated corrosion test method such as that using electrical potential measures.

8. Air Entraining Admixtures: - ASTM C 260.

9. High Range Water Reducing Admixtures (Superplasticizers): ASTM C 494, Type F or G.

10. Fly ash or possolan admixtures: - ASTM C 618, Type C or Type F.

2.03 CONCRETE MIXES

A. General

1. Contractor shall be responsible for the design of the concrete mixes.

2. Assume full responsibility for the strength, consistency, water cemetitious material ratio and handling of concrete.

3. Admixtures and products shall be used in accordance with the manufacturers recommendations.

4. No change of brand or source of any of the concrete ingredients or of the mix proportions will be allowed until submittals have been resubmitted and approved.

B. Proportions:

1. Proportion concrete for strength and workability in accordance with Section 4.2.3 of ACI 301 and the contract documents. In addition comply with the provisions dealing with proportioning, batching, and mixing of concrete mixtures specified in the State of New York Building Code.

2. Contractor to verify that aggregate size specified for each location is consistent with the forms and dimensions of the section being placed, along with the location and spacing of the reinforcing steel.

3. If the trial batch method is used, use an approved independent testing facility for preparing and reporting the proposed mix designs. Bear all costs in connection with these tests and for the design of the concrete mixes.

4. Adjust the required average compression strength based on subsequent test results for the mix design.

5. Combined aggregate gradation shall result in 8% - 18% being retained on every sieve size except for the top size and No. 100.

C. Fly Ash shall be limited as per section 4.2.2.8.b of ACI 301. Concrete to be assumed to be exposed to deicing chemicals.

D. Admixture usage:

1. All concrete slabs, less than 8 inches in thickness, placed at air temperatures less than 50° F, shall contain non-corrosive, non-chloride accelerator.

E. Mixes:

1. Class “C”: Exterior concrete exposed to freezing and thawing for use in all structural normal weight aggregate, normal weight aggregate, f’c=4500 psi, 1 inch aggregate, 4 inch maximum slump with water reducing admixture or 6 inch maximum slump with High Range Water Reducing Admixture, water/cement ratio 0.40 maximum, Air content of 4.5% to 7.5%, drying shrinkage limit of 0.045 percent.

F. Clarification of Mix Properties:

1. f’c is the minimum compressive strength at 28 days, tested in accordance with ASTM C39.

2. Slump specified is maximum not to exceed tested in accordance with ASTM C143. If superplasticizers are used higher slumps will be allowed providing this will not lead to segregation of the aggregate and providing that the mix without the superplasticizer meets the slump requirements.

3. Aggregate size is the largest of the coarse aggregate.

4. Air content is by volume.

5. Water/cement ratio is specified by weight.

6. Concrete weight is maximum air-dry weight. Unless noted otherwise weight shall be 150 pcf.

7. Drying shrinkage limit is percentage change in length when tested as per ASTM C157 with 4 inches x 4 inches x 11 inches specimen. The specimens shall be stored using the air store option. Measurements shall be taken at the times required by the standard with the measurement taken after eight weeks of air storage to be used to determine compliance with the specified limits.

2.04 REINFORCING STEEL

A. General:

1. Certified copies of mill reports for all reinforcing shall be submitted before reinforcing is placed.

2. Bars shall be correctly rolled to section and free from surface defects.

3. Splices in reinforcing shall be as specified in Part 3 Article “Placing Reinforcement”.

B. Epoxy-Coated Welded Wire Fabric: Comply with ASTM A884/A884M, Class A, plain steel epoxy coated. Wire fabric shall have a minimum ultimate strength of 70,000 psi.

C. Epoxy-Coated Reinforcement Bars: Comply with ASTM A775/A775M; and with ASTM A615/A615M, Grade 60 (Grade 420), deformed new billet steel bars.

D. Epoxy-Coated Wire: Comply with ASTM A884/A884M, Class A coated, plain steel.

E. Epoxy-Coated Joint Dowel Bars: Comply with ASTM A775/A775M; and with ASTM A615/A615M, Grade 60 (Grade 420), plain steel bars, epoxy coated.

F. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

G. Reinforcement Accessories:

1. Tie wire, plastic coated, for use with epoxy coated reinforcing.

2. Mechanical Reinforcing Bar Connectors: Comply with ACI 301. Provide 125 percent minimum yield strength of the reinforcement bar. Coat connectors in accordance with the same requirements as reinforcing bars.

3. Chairs shall be plastic tipped.

4. The top wire of all spacers, bolsters and chairs shall be corrugated.

5. Other accessories, at the option of the Contractor, may be zinc coated, except on exposed surfaces which have plastic tipped accessories.

H. Reinforcing Couplers: Lenton rebar couplers as manufactured by Erico or equal. Connection shall develop in tension or compression as required at least 125 percent of specified yield strength of the bar.

1. Mechanical Splices:

a. Cadweld full tensile strength splices as manufactured by Erico or equal. Splices to be capable of developing 125 percent of reinforcement yield strength.

b. Notify mechanical splice supplier of rolling mill that rolled reinforcement to be spliced.

I. Deformed Bar Anchors: Nelson, flux filled deformed bar anchors, type D2L, as manufactured by Nelson Stud Welding Division of TRW or equal (no known equal).

2.05 FORM MATERIALS

A. Form Ties:

1. Form ties including bolts and rods shall be of suitable design and adequate strength for the purpose.

2. Form ties for exposed concrete shall be adjustable shall be snap cone type detached 1" back from the surface of the exposed side, and shall be free of devices which leave holes or depressions larger than 7/8” back of exposed surface.

3. Form ties for exposed concrete., shall leave no metal closer than 1 ½” to the surface.

4. Wire ties not permitted.

B. Supports for forms shall consist of wood or steel posts.

C. Finish Formwork:

1. Plywood, lumber, metal, or another approved material. Provide Form-Facing panels that will provide continuous, true and smooth concrete surfaces. Finish in largest practicable sizes to minimize number of joints.

2. For curves of a radius of 100 feet or less, use flexible or curved forms manufactured/fabricated for purpose.

D. Rough Formwork: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

1. Forms shall be #340 Smooth Face by Greenstreak or approved equal.

E. Form Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Material shall be chemically reactive agent for coating forms.

2. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.06 MISCELLANEOUS MATERIALS

A. Curing Materials:

1. Fiber reinforced asphaltic vapor barrier building paper.

2. Polyethylene sheet 4-mil thickness.

3. Curing compound [ASTM C 309, Type 1] clear or transparent and shall not discolor finished concrete surface or inhibit proper application or performance of any surface finishes or treatments. In addition the curing compound shall be a commercially formulated curing and sealing agent that has zero VOC’s and limits the maximum moisture loss to 0.03 g/cm^2 at the coverage used on this project.

4. Acceptable products include, but are not limited to:

a. "Soy Seal", Natural Soy Products; 2 Liberty Street; Watkins, IA 52354. 888-655-0039 or 319-227-7418. *100% soy-based biodegradable concrete cure & seal.*

b. "SOYseal", SoySolv; 6154 North CR 33; Tiffin, OH 44883. 800-231-4274. *100% soy-based biodegradable concrete cure & seal.*

B. Impervious or Pervious Sheeting Materials for Curing Concrete: Provide sheeting, mats, or other acceptable material for wet curing concrete as approved for curing methods and conditions of use.

C. Sleeves: For penetrations through concrete of conduits and pipes, sleeves shall be PVC Schedule 40 conforming to provisions of ASTM D1785.

D. Expansion joint material shall be Homex 300 Expansion Joint Filler, 3/8" thickness as manufactured by the Homasote Company, P.O. Box 7240; West Trenton, New Jersey 08628-0240; 800.257.9491 or 609.883.3300.

PART 3– EXECUTION

3.01 SURFACE CONDITIONS

A. Examination: Prior to Work of this Section, carefully inspect the installed Work of other trades and verify that such Work is complete to the point where this installation may properly commence.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Landscape Architect.

2. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.02 GENERAL

A. Particular care shall be used when starting a concrete pour to maintain the continuity of appearance. Use all means necessary to avoid blemishes, imperfections, or changes in the finish. Cured colored concrete shall be consistent in color and appearance.

B. Note that the appearance of exposed concrete surfaces depends upon uniform color and texture within any one area and between adjacent areas and exercise strict batching, mixing, placing, curing, etc. controls to achieve this end.

C. Cutting and/or patching made necessary by failure or delay in complying with these requirements shall be at no additional expense to the Owner. No cutting or patching of exposed concrete shall be done without Landscape Architects approval.

D. All concrete work shall comply with the tolerances specified in ACI 117.

3.03 PREPARATION

A. Clear away debris and excess water from areas where concrete will be placed. Remove any material from in-place concrete or steel which will impair bond.

B. For concrete placed on soil, the subgrade shall be thoroughly wetted prior to placing.

C. Sandblast or waterblast all construction joints and under baseplates to clean and roughen the entire surface of the joint, exposing coarse aggregate solidly embedded in mortar matrix. Roughen concrete surface while concrete is still green where possible. Do not leave laitance, loosened particles of aggregate or damaged concrete at surface. Forms and reinforcing shall be cleaned of drippings.

D. Dampen contact surfaces of construction joints, leaving them free of standing water, before placing fresh concrete.

E. Form clean-out openings and removable sections shall be placed and secured only after inspection of forms.

3.04 FORMS

A. Layout:

1. Form all required cast-in-place concrete to the shapes, sizes, lines and dimensions indicated on the Drawings. Camber forms where camber is indicated.

2. Construct all required forms to be substantial, sufficiently tight to prevent leakage of mortar and able to limit deflection when filled with wet concrete.

3. Make proper provision for all openings, offsets, sleeves, recesses, anchorage, blocking, reglets, chases and other features of the Work as shown or required.

4. Provide openings as required for placing and consolidation of concrete. Provide temporary holes in formwork to facilitate cleaning and inspection.

5. For exposed or smooth surfaces minimize, to a practical minimum, the number of seams.

6. Form Ties for Exposed Surfaces: Unless otherwise indicated arrange in a symmetrical regular pattern in level horizontal rows and plumbed vertically. Coordinate pattern with the Landscape Architect.

7. Conform to the provisions in sections 2.3.1.1 and 2.3.1.3 through 2.3.1.5 of ACI 301.

B. Construction Joints

1. Construction joints in exposed surfaces shall be made only at revealed form joint locations as indicated on the Landscape Architect’ drawings.

2. Where joints in addition to those shown are desired, Contractor shall propose location of construction joints in submittal. Location of construction joints shall be based on provisions in section 2.2.2.5 of ACI 301

3. Revisions to reinforcing necessary to accommodate contractors proposal will be at Contractors expense.

4. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints sufficient to develop reinforcement.

C. Tolerances

1. Concrete surfaces shall not exceed the tolerances as specified in ACI 117. The class of surface for offset between adjacent pieces of formwork for formed surfaces shall conform to Class C.

2. Maximum deflection of form facing material between studs as well as deflection of studs and walers shall be limited to 1/360 of the span nor more than 1/8 inch.

3. In addition conform to section 2.2.2.4 of ACI 301.

D. Construction:

1. Make all form panel joints, tight butt joints with all edges true and square.

2. Do not install inside forms until reinforcing installation has been inspected.

3. For slabs on grade verify top of subgrade is compatible with slab thickness shown.

4. Remove loose concrete, dust and other material from the existing concrete surface prior to the erection of forms.

5. Reveal Formers and Reformers for Exposed Surfaces: Fabricate and fasten to avoid protruding splinters which may become embedded in the concrete.

E. Finishes:

1. Formed Finishes: Concrete surfaces not exposed to view shall have a smooth uniform appearance.

2. Vertical form joints are to be plumb and horizontal joints level.

3. Fasten all contact material to supports with fasteners arranged in a symmetrical pattern. Fasteners shall be aligned horizontally and vertically.

F. Form Release Agents:

1. Apply form release agent on formwork in accordance with manufacturer's recommendations.

2. Apply form release agents prior to placing reinforcing steel and embedded items.

3. Keep form release agents away from reinforcing steel, embedded items, and concrete against which fresh concrete will be placed.

3.05 EMBEDDED ITEMS

A. Prior to concrete placement install and build into the work anchorage devices, inserts and other items embedded in cast-in-place concrete. Use setting drawings, diagrams, instructions and directions for items to be attached thereto.

B. Install concrete accessories and embedded items in accordance with manufacturer's recommendations: straight, level and plumb. Tolerances of embedded items shall be compatible with the systems they are a part of when more restrictive than specified for concrete work.

C. Provide pipe sleeves when pipes pass through concrete.

D. Fill voids in sleeves, inserts and anchor slots with readily removable material to prevent entry of concrete into voids.

E. Notify the Landscape Architect whenever any embedded item interferes with the placing of the reinforcing steel or placement of concrete.

F. Comply with ACI 301, sections 2.3.1.10 and 2.3.1.11.

G. Use templates to securely hold anchor bolts other embedded items in place during construction, and take care that no displacement occurs during the pouring of concrete.

3.06 PLACING REINFORCING

A. General: Wherever embedded items interfere with placing of reinforcement notify the Landscape Architect and obtain approval before placing any concrete. Do not bend or field cut bars around openings or sleeves.

B. Placing:

1. Do not exceed the tolerances specified in ACI 117.

2. Do not place reinforcement in floor slabs or beams until concrete has been placed in columns and walls, except where bars extend down into columns or walls.

3. Dowels shall be tied securely in place before concrete is deposited. In the event there are no bars in position to which dowel may be tied, No 3 bars (minimum) shall be added to provide proper support and anchorage.

4. Use templates for placement of column dowels.

5. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

C. Field bending or straightening in accordance with section 3.3.2.8 of ACI 301

D. Spacing of Reinforcing: Where Drawings do not show the spacing of the reinforcing, the minimum clear spacing shall conform to ACI318 Section 7.6.

E. Concrete Cover: Place reinforcement to obtain as a minimum the coverages for concrete protection specified in section 3.3.2.3 of ACI 301

F. Splicing: Make splices only at those locations shown on the Drawings or as accepted by the Landscape Architect. Stagger splices in adjacent bars wherever possible. Splicing shall conform to the requirements of ACI 310 and specified provisions.

G. Reinforcing Supports:

1. Reinforcement shall be accurately located in the forms and held in place by means of supports adequate to prevent displacement and to maintain reinforcement at proper distance from form face. The use of wood supports and spacers inside the forms is not permitted.

2. Support reinforcement supported from the ground on precast concrete reinforcement supports.

3. Do not use reinforcing supports or reinforcing to support concrete conveying equipment and similar construction loads.

H. Tying:

1. Reinforcing shall be rigidly and securely tied with steel tie wire. Tie wires, after cutting, shall be bent in such a manner that concrete placement will not force the wire ends to surface of exposed concrete.

2. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.

3. Reinforcing in concrete members that have one or more surfaces exposed, whether painted or unpainted finish, shall be tied with galvanized wire. Uncoated tie wire in exposed members will not be accepted.

I. Install deformed bar anchors in accordance with the manufacturer's recommendations.

J. Install mechanical splices and reinforcing couplers in accordance with manufacturers' recommendations.

K. Installation of manufactured products as per Part 2 of this specification and according to manufacturers' recommendation.

L. Cleaning:

1. Clean reinforcement to remove loose rust and mill scale, earth and other materials which might reduce or destroy bond with concrete.

2. Where there is a potential of rust staining adjacent finish surfaces, take necessary steps to prevent staining.

3.07 MIXING CONCRETE

A. Ready Mix and Site Produced Concrete

1. Comply with ASTM C 94.

2. The batching plant shall be equipped with an electric metering device capable of determining moisture content of sand.

3. The addition of water at the site is contingent upon full time inspection of the process by the owners testing laboratory and the acceptance of the Inspector, Comply with ACI 301, section 4.3.2.1.

4. Begin the mixing operation within thirty minutes after the cement has been intermingled with the aggregates.

3.08 PLACING CONCRETE

A. Inspection: Do not place concrete until forms and reinforcement as well as other required inspections have occurred and the Inspector is present to perform observations and tests during placing.

B. Before placing concrete remove snow, ice, frost, water, and other foreign material from surfaces, including reinforcement and embedded items against which concrete will be placed.

C. Method:

1. Convey concrete from mixer to place of final deposit by methods that will prevent separation and loss of materials. Do not use aluminum pipes or chutes.

2. Deposit concrete as nearly as possible to its final position to avoid segregation due to re-handling and flowing.

3. Place concrete at a consistency that allows proper placement and consolidation. Do not exceed the maximum specified slump.

4. Comply with ACI 301, Section 5.3.2.4

5. The unconfined vertical drop of concrete from the end of hoses or other conveying equipment to the placement surface shall not be greater than 10 feet for concrete containing High Range Water Reducing Admixture and [6] feet for all other concrete.

D. Sequence: Place concrete in columns, beams and joist stems prior to pouring concrete slabs.

E. Rate of Placement:

1. Place concrete at such a rate that concrete is at all times plastic and flows readily between bars.

2. When placing is once started, carry it on as a continuous operation until placement of the panel or section is complete. Construction joints to be made only where indicated on the Drawings or on approved shop drawings. Prevent the formation of cold joints at other locations.

3. Do not pour a greater area at one time than can be properly consolidated and finished without cracking or causing other problems. During hot or dry weather adjust the area as necessary.

4. Insure that concrete is in its final position within 1-1/2 hours after the introduction of the cement to the aggregates. In hot weather reduce this time limit so that no stiffening of the concrete shall occur until after it has been placed.

F. Weather Considerations

1. Follow the provisions of sections 5.3.1.5 and 5.3.1.6 of ACI 301.

2. Implement the cold weather procedures submitted prior to placing concrete when the temperature is less than 40 degrees F or is expected to drop below 40 degrees F in the following three days.

3. Temperature of the concrete shall not exceed 90 degrees F. Implement hot weather procedures as necessary to limit concrete temperature.

4. Comply with the temperature requirements of ASTM C94, section 4.2.2.7 of ACI 301, and section 5.3.2.1.c of ACI 301.

5. Comply with section 5.3.2.1.a of ACI 301.

G. A sample load of each of the specified mixes of strength equal or greater than for footings, may be poured in the foundation to check workability of the concrete.

H. Consolidation

1. Use all means necessary to provide fully filled out, smooth, clean, and properly aligned surfaces free from honeycomb, all pockets, planes of weakness, and unsightly blemishes.

2. During the pour, use suitable tools along the faces of the forms to force large particles away from the forms and to bring mortar to the surface of the forms.

3. Vibration shall be by means of mechanical vibrators in direct contact with the concrete, and not by vibrating the forms or reinforcing. Vibration shall continue until water shows the first sign of rising.

a. The vibration shall be sufficiently intense to visibly affect the concrete over a definite radius of at least two feet around the point of application but not applied long enough to segregate the ingredients. Enough vibrators shall be used to cause all concrete to flow or settle readily into place.

b. The vibrators shall be of the internal type, applied directly to the concrete and not through the forms, except sections too thin to permit the insertion of the internal type in which case form vibrators may be employed at the discretion of the Architect.

c. For slab construction use vibrating screeds designed to consolidate the full depth of the concrete. Vibrators shall be equipped with rubber vibrator heads.

d. Use and type of vibrators shall conform to ACI 309 "Recommended Practice for Consolidation of Concrete”.

4. A mechanical vibrator shall be employed at each point of deposit. A stand-by vibrator in good working condition, but not in use, shall be kept on the job until all concrete is placed.

5. During placement when placing more than one layer of concrete, extend vibrator into the previous layer.

6. Workers shall be experienced in the use of vibrators. All vibrating operations of architectural concrete shall be performed by the same skilled person responsible for vibrating acceptable concrete in the mock-ups.

3.09 CONCRETE TOLERANCES

A. Comply with tolerances of ACI 117 in addition to the following:

1. Elevation: 1/4 inch (6 mm).

2. Thickness: Plus 3/8 inch (9 mm), minus 1/4 inch (6 mm).

3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).

4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).

5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).

6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).

7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).

8. Joint Spacing: 3 inches (75 mm).

9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.

10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 CONCRETE FINISHES AND TREATMENTS

A. General:

1. Take care that the concrete meets the screeds accurately and does not rise above or below them.

2. Carefully provide slab depression as required for the finishes indicated on the Drawings or as determined by the Landscape Architect.

3. Tolerances of all non-formed concrete finishes shall be in accordance with ACI 117.

B. Finishing Horizontal Surfaces:

1. Where drains or slopes are indicated, slope slabs uniformly to provide even fall for drainage.

2. Unless otherwise noted, all exterior walkways are to receive a broom finish.

C. Finish of Formed Concrete Surfaces

1. Unless otherwise stated formed concrete surfaces shall have a smoothed formed finish.

D. Treatments and Repairs

1. Repairs of Defects Other Than Tie holes.

a. It is the intent of these specifications that the work will be of such quality that no patching of concrete will be required. In the event remedial patching is required, patch only areas designated by Landscape Architect.

b. Prepare repair samples for Landscape Architect's approval at areas designated by Landscape Architect.

c. Comply with provisions of section 5.3.7.3 of ACI 301.

d. Slabs on Grade: After entire slab is finished any shrinkage cracks that are greater than 1/16 inch wide, shall be repaired.

(i) As approved by the Landscape Architect, fill cracks larger than 1/32 inch wide with cement grout and strike off level with surfaces.

3.11 CURING CONCRETE

A. Curing shall comply with ACI 301 Section 5.3.6. Exterior slabs, sidewalks, curbs, and architectural concrete, not receiving a penetrating sealer, shall be cured with the specified clear, non-yellowing curing and sealing compound. Maximum coverage shall be 400 ft2/gal on steel troweled surfaces and 300 ft2/gal on floated or broomed surfaces for the curing/sealing compound. Use the specified strippable curing compound on surfaces to be covered with finish or coating material applied directly to concrete, such as liquid densifier/sealer, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials.

3.12 PROTECTION

A. During curing period protect concrete from damaging mechanical disturbances; particularly load stresses, heavy shock and excessive vibration.

B. Protect surfaces from damage due to paints, oils, rust or other stains and from impact damage.

3.13 CLEANUP

A. Remove all form release agents, bond breakers, curing compounds or other materials inconsistent with the specified finishes or that would prevent proper application of sealants, liquid waterproofing, or other finishes or treatments specified.

B. Clean all concrete surfaces that are to be exposed to view. Remove all cement and concrete droppings or splatters. Remove stains, and other discolorations that mar the appearance of the concrete.

C. Take care not to damage surrounding surfaces or leave residue from cleaning agents.

3.14 FIELD QUALITY ASSURANCE

A. General:

1. Notify the Landscape Architect and Testing Laboratory at least 48 hours prior to start of placement of concrete.

2. All testing specified in this section, including preparation of samples, shall be done by Testing Laboratory retained by the Owner.

3. The Testing Laboratory shall have free access to all places where concrete materials are stored, proportioned, or mixed and all materials, equipment, and methods used shall be subject to this inspection and test. Provide assistance as needed by the testing laboratory.

4. As a minimum, all testing and inspection as per the requirements of the State of New York Building Code. Reinforcing steel to be assumed to have been designed for calculated stresses in excess of 70 percent of the basic allowable values.

5. Before any structural concrete is poured the reinforcing steel and form dimensions will be inspected by the Owners testing laboratory. Any errors or discrepancies shall be corrected before concrete is placed.

6. A special inspector from the testing laboratory shall be present during all field bending of reinforcement.

7. Installation of deformed bar anchors to be tested in accordance with Section 7.1 of AWS D1.1.

8. Testing and inspection of mechanical splices and reinforcing couplers to conform to manufacturer's recommendations.

B. The testing and inspection will be carried out in accordance with the provisions of the New York City Building Code. All concrete specified in this section shall be subject to controlled inspection. The landscape architect or engineer designated for controlled inspection will not authorize adjustments to the mix if any of the tests of fresh concrete fail.

C. Sampling and Field Tests:

1. Take a sample from each 100 cubic yards of each grade of concrete or fraction thereof, placed each day. No less than one sample to be taken for any one days operation. Each sample shall consist of:

a. Four identical test cylinders made and stored in accordance with ASTM C-31.

b. Slump test in accordance with ASTM C143 at point concrete is discharged into forms.

c. Air entrainment test ASTM C173 or ASTM C231.

d. Temperature of concrete and air.

e. Water content in accordance with AASHTO TP23.

2. In addition to the normal samples make a slump test at 2-hour interval during concrete placement.

D. Testing:

1. Specimens to be cured in the laboratory in accordance with ASTM C 192 and tested in accordance with ASTM C 39.

2. Test one cylinder of each sample at 7 days for information and two cylinders at 28 days for acceptance. Keep the additional cylinder for later testing.

3. The strength level of the concrete will be acceptable if the averages of all sets of three consecutive 28 day strength tests results equal or exceed the specified strength and no individual strength test result fall below the specified strength by more than 500 psi.

4. Test shrinkage in accordance with ASTM C-157.

E. Inspection of batch plant and concrete materials will be performed in accordance with the provisions of the State of New York Building Code.

END OF SECTION 033000

SECTION 04500

MASONRY RESTORATION AND CLEANING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, and general provisions of Contract, including General and Supplementary Conditions, see Section B1 of the Contract, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of masonry restoration work is indicated on drawings.

B. Masonry restoration work includes the following:

1. Tuckpointing mortar joints, up to 25% of the existing fountain.

2. Brick cleaning all surface at the existing fountain.

3. Brick replacement, as necessary, where bricks are cracked or missing at existing fountain.

1.3 QUALITY ASSURANCE

A. Restoration Specialist: Work must be performed by a firm having not less than 5 years successful experience in comparable masonry restoration projects and employing personnel skilled in the restoration processes and operations indicated.

B. Repointing: Prepare sample area of approximately 2 feet high by 2 feet wide for each type of repointing required to demonstrate methods and quality of workmanship expected in pointing mortar joints and new brick installation. The intent of the new pointing work is to match cleaned existing mortar. Newly pointed areas shall be consistent with existing adjacent mortar joints for color and texture.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each product indicated including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements.

B. Samples: Submit, for verification purposes, samples of the following:

1. Each new exposed masonry mortar to be used for replacing existing materials. Include in each set of samples the full range of colors and textures to be expected in completed work.

2. Each type of chemical cleaning material data.

3. Each type of chemical clear sealer provide manufacturers data.

4. Stone masonry patching materials product data and application instructions

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site in manufacturer's original and unopened containers and packaging, bearing labels as to type and names of products and manufacturers.

B. Protect masonry restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.

C. Protect grout, mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

1.6 PROJECT CONDITIONS

A. Do not repoint mortar joints or repair masonry unless air temperatures are between 40 deg.F (4 deg.C) and 80 deg.F (27 deg.C) and will remain so for at least 48 hours after completion of work.

B. Prevent grout or mortar used in repointing and repair work from staining face of surrounding masonry and other surfaces. Remove immediately grout and mortar in contact with exposed masonry and other surfaces.

C. Protect sills, ledges and projections from mortar droppings.

1.7 SEQUENCING/SCHEDULING

A. Perform masonry restoration work in the following sequence:

1. Clean brick.

2. Rake-out existing mortar from joints indicated to be repointed.

3. Repoint existing mortar joints of masonry indicated to be restored.

PART 2 PRODUCTS

2.1 MASONRY MATERIALS

A. Mortar materials

1. Hydrated Lime: ASTM C 207, Type S.

2. Colored Mortar Aggregate: Natural or manufactured sand selected to produce mortar color to match adjacent existing mortar color.

3. For pointing mortar provide sand with rounded edges.

4. Match size, texture and gradation of existing mortar as closely as possible.

5. Colored Mortar Pigment: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.

6. Water: Clean, free of oils, acids, alkalis and organic matter.

2.2 CLEANING MATERIALS AND EQUIPMENT

A. For Brick Masonry

1. ProsoCo Sure Klean Restoration Cleaner

B. For spot problem stains where required

1. Product: Subject to compliance with requirements, provide "Sure Klean Limestone Restorer", ProSoCo, Inc.

C. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts, and organic matter.

1. Warm Water: Heat water to temperature of 140 deg.F-180 deg.F (60 deg.C-82 deg.C).

D. Brushes: Fiber bristle only.

E. Spray Equipment: Provide equipment for controlled spray application of water and chemical cleaners, if any, at rates indicated for pressure, measured at spray tip, and for volume.

1. For spray application of chemical cleaners provide low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray-tip.

2. For spray application of water provide fan-shaped spray-tip which disperses water at angle of not less than 15 degrees.

2.3 POINT MORTAR MIXES

A. General:

1. Measurement and Mixing: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not measure by shovel, use known measure. Mix materials in a clean mechanical batch mixer.

2. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix, which will retain its form when, pressed into a ball. Maintain mortar in this dampened condition for 1-to-2 hours. Add remaining water in small portions until mortar of desired consistency is reached. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

3. Colored Mortar: Produce mortar of color required by use of selected ingredients. Do not adjust proportions without Architect's approval.

2.4 BRICK

A. Replacement and new brick must match original brick in size, type, color, appearance, and composition.

PART 3 EXECUTION

3.1 MASONRY CLEANING

A. PREPARATION

1. General: Comply with recommendations of manufacturers of chemical cleaners for protecting building surfaces against damage from exposure to their products.

2. Protect persons, motor vehicles, surrounding surfaces of building whose masonry surfaces are being restored, building site, mask windows and window frames.

3. Prevent chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings and other surfaces, which could be injured by such contact.

4. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.

5. Dispose of run-off from cleaning operations by legal means and in manner which prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

6. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles, which must remain in operation during course of masonry restoration work.

7. Protect glass and unpainted metal trim from contact with chemical cleaners by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape. Apply masking agent to comply with manufacturer's recommendations. Do not apply liquid masking agent to painted or porous surfaces.

8. For removal of lead paint, follow procedures noted in Environmental Drawings and comply with all local, state, and federal environmental regulations.

B. Chemical Cleaner Application Methods:

1.General: Apply chemical cleaners to masonry surfaces to comply with chemical manufacturer's recommendations using brush or spray application methods, at Contractor's option, unless otherwise indicated. Do not allow chemicals to remain on surface for periods longer than that indicated or recommended by manufacturer.

3.2 REPOINTING EXISTING MASONRY

A Joint Raking:

1. Rake out mortar from joints to depths equal to 2-1/2 times their widths but not less than 3/4" nor less than that required to expose sound, unweathered mortar.

2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum or flush joints to remove dirt and loose debris.

3. Do not spall edges of masonry units or widen joints. Replace any masonry units, which become damaged.

4. Cut out old mortar by hand with chisel and mallet, unless otherwise indicated.

5. Power operated rotary hand saws and grinders will be permitted but only on specific written approval of Architect based on submission by Contractor of a satisfactory quality control program and demonstrated ability of operators to use tools without damage to masonry. Quality control program shall include provisions for supervising performance and preventing damage due to worker fatigue.

B. Joint Pointing:

1. Rinse masonry joint surfaces with water to remove any dust and mortar particles. Time application of rinsing so that, at time of pointing, excess water has evaporated or run off, and joint surfaces are damp but free of standing water.

2. Apply first layer of pointing mortar to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8" until a uniform depth is formed. Compact each layer thoroughly and allow to become thumbprint-hard before applying next layer.

3. After joints have been filled to a uniform depth, place remaining pointing mortar in 3 layers with each of first and second layers filling approximately 2/5 of joint depth and third layer the remaining 1/5. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing bricks have rounded edges

recess tool final layer slightly back from face of brick. Take care not to spread mortar over edges onto exposed masonry surfaces, or to featheredge mortar.

4. When mortar is thumbprint hard, tool joints to match original appearance of joints, unless otherwise indicated. Remove excess mortar from edge of joint by brushing.

5. Cure mortar by maintaining in a damp condition for not less than 72 hours.

6. Where repointing work precedes cleaning of existing masonry allow mortar to harden not less than 30 days before beginning cleaning work.

7. Owner shall have the right to perform periodic tests to verify depth of repointing. Contractor shall repair with like materials area where mortar has been removed to ascertain depth of repointing.

3.3 FINAL CLEANING

A. After mortar has fully hardened thoroughly clean exposed masonry surfaces of excess mortar and foreign matter using stiff nylon or bristle brushes and clean water, spray applied at low pressure.

B. Use of metal scrapers or brushes will not be permitted.

C. Use of acid or alkali cleaning agents will not be permitted.

3.4 BRICK CONSTRUCTION A. Use lime-based mortar compatible with brick properties.

END OF SECTION 04500

SECTION 321440
GRANITE PAVERS – ADD ALTERNATE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Documents, see Section B1 of the Contract, shall be included in and made a part of this Section.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SCOPE OF WORK

A. The work of this Section consists of all improvements and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:
   1. Preparation of Compacted Gravel Base Course and Subbase for Granite Pavers on Grade and Granite Pavers on Structural Soil.
   2. Joint Filler and Setting Bed for Granite Pavers.
   3. Granite Pavers on Grade and Granite Pavers on Structural Soil.
   4. Clean-up.

1.3 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:
   1. Section 312000 – Earthwork.
   2. Section 321700 – Paving Specialties
   3. Section 329200 – Planting and Fine Grading.
   4. Section 329115 – Soil Preparation, Planting Soils.

1.4 EXAMINATION OF CONDITIONS

A. The Contractor shall fully inform him/herself of existing conditions of the site.

B. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best of the Landscape Architect's knowledge.

1.5 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the following standards:
   1. ASTM: American Society for Testing and Materials.
   2. ANSI: American National Standards Institute.
   3. FS: Federal Specifications.
   4. PCA: Portland Cement Association.

5. ACI: American Concrete Institute.
6. Standard Specifications: New York City (NYCDOT) Standard Highway Specifications and the New York State Department of Transportation (NYSDOT) for Construction Contracts, latest edition and addenda.
7. BSI: Building Stone Institute.

B. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

C. Layout and Grading: After staking out the work, and before beginning final construction, obtain the Landscape Architect's approval for layout and grades.

D. Source Limitations for Stone: Obtain each stone variety from a single quarry.

E. Preconstruction Stone Testing: Engage an independent testing agency to perform the following testing for each stone variety:
1. Furnish test specimens that are representative of materials.
2. Physical Property Tests: ASTM standards specified for stone type.
3. FlexuralStrength Tests: ASTM C 880

1.6 REFERENCES

A. ASTM C 97-02: Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone

B. ASTM C 119-04: Terminology Relating to Dimension Stone

C. ASTM C 170-90 (1999): Test Method for Compressive Strength of Dimension Stone

D. ASTM C 270-03: Specification for Mortar for Unit Masonry

E. ASTM C 615-03: Specification for Granite Dimension Stone

F. ASTM C 880-98: Test Method for Flexural Strength of Dimensional Stone

1.7 SUBMITTALS

A. Material Samples: Prior to ordering the below listed materials, submit representative samples to Landscape Architect for selection and approval as follows. Do not order materials until Landscape Architect's approval has been obtained. If initial material samples are not approved, resubmit materials as necessary to obtain Landscape Architect's approval. Delivered materials shall closely match the approved samples. Submit duplicate samples of each type listed below showing full range of color variation, finish and texture that can be expected in the permanent work. Submit one sample to the Landscape Architect and retain one sample at the site.
1. Granite Pavers, sample showing the full range of color and texture expected in the final work, one Paver of each type.
2. 1-pint bag of joint filler.

B. Sample Panels: Upon approval of all materials, the Contractor shall construct sample panels on site in the minimum size indicated below. Each sample panel shall be large enough to display typical characteristics of each item and type of work. All sample panels shall be constructed at the same time so that the entire palette of materials can be viewed simultaneously. The Landscape Architect shall approve the visual characteristics, quality of workmanship, and installation methods before final work is started. If the original sample is not approved, the Contractor shall provide additional samples, as required, at no cost to the Owner until an approved sample is obtained. The approved sample shall become the standard for the entire job. Sample panel shall not be constructed on a location becoming part of the final work, unless otherwise noted, and shall remain undisturbed until all work is completed. Contractor shall completely remove any panels not set in place as part of the final work from the site upon final acceptance of work.
   1. Unit Pavers sample, 12’ x 12’ minimum. Show full range of paver sizes, edging detail, and jointing.

C. Product Information: Provide manufacturer’s data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation, certifying that each material item complies with, or exceeds, specific requirements.
   1. Granite Pavers

PART 2 - PRODUCTS

PART 2 -

SCHEDULE 0 -

PRODUCT DATA SHEET 0 -

2.1 COMPACTED GRAVEL BASE COURSE AND SUBGRADE

A. Compacted gravel shall be used as a base course material under pavements only as indicated on the Drawings.

B. Compacted gravel shall consist of inert material that is hard, durable stone and coarse sand free from loam, clay, surface coatings, other organic material and deleterious materials. The maximum size of stone gravel shall be two (2) inches in the largest dimension. The materials shall meet the NY DOT Specifications for “Aggregate Base”.

C. Reuse of existing gravel base course materials shall not be permitted unless the existing material is tested by an approved independent laboratory and is certified to meet the NY DOT Standard Specifications for “Aggregate Base”.

D. The approved source of gravel material shall be processed by mechanical means. The equipment for producing crushed gravel shall be of adequate size and with sufficient adjustments to produce the desired materials.

E. Compacted subgrade shall conform to Section 312000.

2.2 JOINT FILLER AND SETTING BED FOR UNIT PAVERS

A. Joint Filler and Setting Bed for Unit Pavers on Grade: Sand-cement joint filler and setting bed shall be a 5:1 sand-cement mixture. Proportions of mixture may be modified by the Landscape Architect to obtain a suitable setting bed.
   1. Sand shall conform to the NY DOT Standard Specifications.
   2. Portland cement shall conform to the NY DOT Specifications.

2.3 UNIT PAVERS

A. Granite Pavers shall be supplied by Sanicol Stone (contact: Andrew Major, 416-303-0655, andrew@sanicolstone.com, www.sanicolstone.com) or Approved Equal meeting all of the below criteria.

B. Unit pavers are to be natural granite, cut to a +/- 1/16” tolerance. Cut stone from one block or contiguous, matched blocks in which natural markings occure.

C. Variations from true plane or other surfaces shall not exceed 1/8”.

D. Pavers shall be the following sizes, colors, and finishes:
   1. Type A: Trapezoidal shape and dimensions as shown in drawings, Dark grey granite, Honed finish
   2. Type B: Trapezoidal shape and dimensions as shown in drawings, Medium grey granite, Flamed finish

2.4 MISCELLANEOUS MATERIAL

A. Expansion Joint material shall be Homex 300 Expansion Joint Filler, 1/2” thickness as manufactured by the Homasote Company, West Trenton, New Jersey, 800.257.9491.

B. Cement Mortar: Portland cement, ASTM C150, Type II, and clean natural sand, ASTM C404. Mix at ratio of 1 part cement to 2 parts sand, by volume, with sufficient water for placement and hydration.

PART 3 - EXECUTION

PART 3 -

SCHEDULE 0 -

PRODUCT DATA SHEET 0 -

3.1 INSTALLATION

A. The installer shall examine previous work, related work, and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, subgrades, previous work, and conditions.

3.2 COMPACTED GRAVEL BASE COURSE AND SUBBASE

A. Placement and compaction of Gravel Base Course: Place material in uniform lifts not exceeding 4 (four) inches, compacted measure. The gravel base course shall be shaped and graded parallel to the proposed surface of the walks and/or plaza finished grade. After being compacted thoroughly as specified herein, the gravel base course shall be the minimum depths shown on the Drawings.

B. Compact gravel base course to 95 percent of maximum dry density, as determined by the Standard AASHTO Test Designation T99 compaction Method Test C at optimum moisture content and to the following requirements:
   1. Any stone with a dimension greater than that permitted for the type of fill specified shall be removed from the subbase before the material is compacted.
   2. Compaction shall continue until the surface is even and true to the proposed lines and grades within a tolerance of 3/8 inch above or below the required cross sectional elevations and to a maximum irregularity not exceeding 3/8 inch under a ten foot line longitudinally.
   3. Any specific area of gravel subbase, which, after being rolled, does not form a satisfactory stable, solid foundation shall be removed, replaced and re-compacted by the Contractor without consideration for extra compensation.

C. Compacted subgrade shall conform to Section 312000.

3.3 INSTALLATION OF GRANITE PAVERS

A. Packing and Loading: Finished pavers shall be carefully packed and loaded for shipment using all reasonable and customary precautions against damage in transit. No material that may cause staining or discoloration shall be used for blocking or packing.

B. Site Storage: Upon receipt at the building site or storage yard, the pavers shall be stacked on timber or platforms at least 4” above the ground, and extreme care should be taken to prevent staining during storage. If storage is to be for a prolonged period, polyurethane or other suitable plastic film shall be placed between wood and finished surfaces, and shall also be used as an overall protective covering. Salt shall not be used for melting of ice formed on pavers or for any purpose involving its contact with the pavers.

C. Setting: All setting shall be done by competent pavement setters, in accordance with approved Shop Drawings. Before setting, all pavers shall be clean and free of ice and frost.

D. The Contractor shall, before commencing work, carefully and thoroughly clean surfaces to be covered with pavers of all dust, dirt, and foreign matter.

E. No pavers shall be laid in inclement weather or when the temperature is below 40 degrees F., and dropping, nor shall any work be done on rising temperatures until the temperature reaches 40 degrees F. The use of frozen materials is strictly prohibited.

F. For on-grade applications, sand-cement mixture shall be spread over the subbase as a setting bed for pavers. Sand-cement shall be spread and leveled to required slope and grade to the depths shown on the Drawings. Thickness shall be adjusted so that when pavers are placed, the top surface will be at the required grade. Bed shall not be fully compacted until pavers are installed.

G. Strictly adhere to paving patterns shown on the approved sample panel.

H. Joints for Granite Pavers on Grade: Joints between the unit pavers shall be butted hand tight. Maximum allowable joint space shall be 1/8". Joints are to be filled full with sand-cement mixture. The entire surface shall then be wetted with a fine spray of water. This process shall be repeated until the mixture is securely embedded and flush with the top surface. Repeat application until joints are full.

I. For all pavers, examine paver joints at one week, three week, and six week intervals after installation to determine if joints are full. If joints are not full, repeat application until full.

J. Contractor shall replace any chipped, damaged, or permanently stained pavers to the satisfaction of the Landscape Architect. Remove any stains from pavers using cleaner approved by the supplier, and deliver paving in a clean condition.

K. After the paving work is installed, it shall be the responsibility of the Contractor to see that the work is properly and adequately protected from damage. Suitable protection shall be required wherever necessary, but no lumber that may stain or deface the pavers shall be used. All fastenings and nails used in conjunction with protecting devices shall be non-staining. All paving work in progress shall be protected at all times during construction by use of a suitable strong, impervious film or fabric securely held in place.

L. Paving work shall be cleaned thoroughly after completion of setting, using clear water and bristle brushes. Under no circumstances should acids or detergents be used. Pavers shall be sponged free of mortar as the work progresses.

M. Do necessary field cutting as stone is set. Cut lines straight and true and finish field-cut edges to match shop-cut edges.
   1. Use power saws with diamond blades to cut stone.

N. Set stone to comply with Drawings and Shop Drawings.

O. Scribe and field-cut stone as necessary to fit at obstructions. Produce neat joints of size specified or indicated.

P. Expansion- and Control-Joint Installation: Locate and install according to Drawings and Shop Drawings.

Q. INSTALLATION TOLERANCES
   1. Variation in Line: Do not exceed 1/8 inch in 96 inches (3 mm in 2400 mm), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (10 mm) maximum.
   2. Variation in Joint Width: Do not vary joint thickness more than 1/16 inch (1.5 mm) or 1/4 of nominal joint width, whichever is less.
   3. Variation in Surface Plane: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (10 mm) maximum from level or slope indicated.
   4. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/32-inch (0.8-mm) difference between planes of adjacent units.

3.4 GRADES AND ELEVATIONS

A. The Drawings indicate, in general, the alignment and finish grade elevations. The Landscape Architect, however, may make such adjustments in grades and alignments as are found necessary.

3.5 PROTECTION

A. All rules and regulations governing respective utilities shall be observed in executing all work under this Section. All work shall be executed in such a manner as to prevent any damage to existing trees, curbs, paving, walls, utility lines, structures, and adjoining property.

3.6 FINAL CORRECTIONS

A. The Landscape Architect reserves the right to inspect the work to determine if adjustments are necessary in grade, alignment or layout. The Contractor shall make such adjustments without further compensation.

3.7 CLEAN -UP

A. The Contractor shall remove all debris, construction equipment and scrap material from all areas within the limit of work prior to the final inspection and acceptance.

B. Contractor shall clean all stains from the surface of pavers. Pavers that cannot be cleaned shall be replaced. Landscape Architect shall be sole judge of whether staining is apparent and necessitates remediation.

END OF SECTION

SECTION 321440

PRECAST CONCRETE PAVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Documents, see section B1 of the Contract, shall be included in and made a part of this Section.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SCOPE OF WORK

A. The work of this Section consists of all improvements and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:
1. Preparation of Compacted Gravel Base Course and Subbase for Concrete Pavers on Grade.
2. Preparation of concrete base for unit pavers with mortar joints.
3. Setting Bed for Concrete Pavers.
4. Setting Pavers On- Grade with hand-tight joints, and sand swept joints
5. Clean-up.

1.3 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Section 321700 – Paving Specialties
2. Section 329200 – Planting and Fine Grading.

1.4 EXAMINATION OF CONDITIONS

A. The Contractor shall fully inform him/herself of existing conditions of the site.

B. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best of the Landscape Architect's knowledge.

1.5 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the following standards:
1. ASTM: American Society for Testing and Materials.

2. ANSI: American National Standards Institute.
3. FS: Federal Specifications.
4. PCA: Portland Cement Association.
5. ACI: American Concrete Institute.
6. Standard Specifications: New York City (NYCDOT) Standard Highway Specifications and the New York State Department of Transportation (NYSDOT) for Construction Contracts, latest edition and addenda.
7. BSI: Building Stone Institute.

B. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

C. Layout and Grading: After staking out the work, and before beginning final construction, obtain the Landscape Architect's approval for layout and grades.

D. Preconstruction Meeting Prior to Installation: Conduct a Meeting at the Project Site prior to the installation of the concrete unit pavers, with meeting date to be two (2) weeks prior to the beginning of the work in this Section. Attendees to include the Contractor, Installer, Approved Owner's Rep.

1.6 REFERENCES

A. ASTM C 97-02: Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone

B. ASTM C 119-04: Terminology Relating to Dimension Stone

C. ASTM C 170-90 (1999): Test Method for Compressive Strength of Dimension Stone

D. ASTM C 270-03: Specification for Mortar for Unit Masonry

E. ASTM C 615-03: Specification for Granite Dimension Stone

F. ASTM C 880-98: Test Method for Flexural Strength of Dimensional Stone

1.7 SUBMITTALS

A. Material Samples: Prior to ordering the below listed materials, submit representative samples to Landscape Architect for selection and approval as follows. Do not order materials until Landscape Architect's approval has been obtained. If initial material samples are not approved, resubmit materials as necessary to obtain Landscape Architect's approval. Delivered materials shall closely match the approved samples. Submit duplicate samples of each type listed below showing full range of color variation, finish and texture that can be expected in the permanent work. Submit one sample to the Landscape Architect and retain one sample at the site.
1. Unit Pavers, sample showing the full range of color and texture expected in the final work, one Paver of each type.
2. 1-pint bag of joint filler.

B. Sample Panels: Upon approval of all materials, the Contractor shall construct sample panels on site in the minimum size indicated below. Each sample panel shall be large enough to display typical characteristics of each item and type of work. All sample panels shall be

constructed at the same time so that the entire palette of materials can be viewed simultaneously. The Landscape Architect shall approve the visual characteristics, quality of workmanship, and installation methods before final work is started. If the original sample is not approved, the Contractor shall provide additional samples, as required, at no cost to the Owner until an approved sample is obtained. The approved sample shall become the standard for the entire job. Sample panel shall not be constructed on a location becoming part of the final work, unless otherwise noted, and shall remain undisturbed until all work is completed. Contractor shall completely remove any panels not set in place as part of the final work from the site upon final acceptance of work.

1. Unit Pavers sample, 12’ x 12’ minimum. Show full range of paver sizes, edging detail, and jointing.

C. Product Information: Provide manufacturer’s data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation, certifying that each material item complies with, or exceeds, specific requirements.
1. Concrete Unit Pavers

PART 2 - PRODUCTS

1.8 COMPACTED GRAVEL BASE COURSE AND SUBGRADE

A. Compacted gravel shall be used as a base course material under pavements only as indicated on the Drawings.

B. Compacted gravel shall consist of inert material that is hard, durable stone and coarse sand free from loam, clay, surface coatings, other organic material and deleterious materials. The maximum size of stone gravel shall be two (2) inches in the largest dimension. The materials shall meet the NY DOT Specifications for “Aggregate Base”.

C. Reuse of existing gravel base course materials shall not be permitted unless the existing material is tested by an approved independent laboratory and is certified to meet the NY DOT Standard Specifications for “Aggregate Base”.

D. The approved source of gravel material shall be processed by mechanical means. The equipment for producing crushed gravel shall be of adequate size and with sufficient adjustments to produce the desired materials.

E. Compacted subgrade shall be prepared to avoid damaging existing tree root systems; and must be compacted to accept sand bed for setting pavers.

1.9 JOINT FILLER AND SETTING BED FOR UNIT PAVERS

A. Joint Filler and Setting Bed for Unit Pavers on Grade: Sand material.. Proportions of mixture may be modified by the Landscape Architect to obtain a suitable setting bed.
1. Sand shall conform to the NY DOT Standard Specifications.
2. See Drawings for location of Precast Unit Pavers on Gravel base; and Precast Unit Pavers on Concrete base.
3. Joint Filler for pavers on Gravel Base shall be sand swept Joints.
4. Joint Filler for pavers on Concrete Base shall be mortar joints.

1.10 UNIT PAVERS

A. Pavers shall be supplied by Hanover Architectural Products, 5000 Hanover Road, Hanover PA 17331, 800-426-4242. www.hanoverpavers.com; info@hanoverpavers.com,

B. Unit pavers:
1. Prest Pavers On-Grade Unit Paver to have a 3” thickness. Size of unit pavers as shown on Drawings. Color as indicated on Drawings.

C. Precast Pavers, High Density Hydraulically pressed concrete units are to be manufactured to 1/8” tolerances; having a minimum compressive strength of 8,500 psi , and a maximum water absorption of less than 4%.

1.11 MISCELLANEOUS MATERIAL

A. Expansion Joint material shall be Homex 300 Expansion Joint Filler, 1/2” thickness as manufactured by the Homasote Company, West Trenton, New Jersey, 800.257.9491.

B. Cement Mortar: Portland cement, ASTM C150, Type II, and clean natural sand, ASTM C404. Mix at ratio of 1 part cement to 2 parts sand, by volume, with sufficient water for placement and hydration.

PART 3 - EXECUTION

1.12 INSTALLATION

A. The installer shall examine previous work, related work, and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, subgrades, previous work, and conditions.

1.13 COMPACTED GRAVEL BASE COURSE AND SUBBASE

A. Placement and compaction of Gravel Base Course: Place material in uniform lifts not exceeding 4 (four) inches, compacted measure. The gravel base course shall be shaped and graded parallel to the proposed surface of the walks and/or plaza finished grade. After being compacted thoroughly as specified herein, the gravel base course shall be the minimum depths shown on the Drawings.

B. Compact gravel base course to 95 percent of maximum dry density, as determined by the Standard AASHTO Test Designation T99 compaction Method Test C at optimum moisture content and to the following requirements:
1. Any stone with a dimension greater than that permitted for the type of fill specified shall be removed from the subbase before the material is compacted.
2. Compaction shall continue until the surface is even and true to the proposed lines and grades within a tolerance of 3/8 inch above or below the required cross sectional elevations and to a maximum irregularity not exceeding 3/8 inch under a ten foot line longitudinally.

3. Any specific area of gravel subbase, which, after being rolled, does not form a satisfactory stable, solid foundation shall be removed, replaced and re-compacted by the Contractor without consideration for extra compensation.

C. Compacted subgrade shall conform to Section 312000.

1.14 INSTALLATION OF CONCRETE PAVERS

A. Packing and Loading: Finished pavers shall be carefully packed and loaded for shipment using all reasonable and customary precautions against damage in transit. No material that may cause staining or discoloration shall be used for blocking or packing.

B. Site Storage: Upon receipt at the building site or storage yard, the pavers shall be stacked on timber or platforms at least 4” above the ground, and extreme care should be taken to prevent staining during storage. If storage is to be for a prolonged period, polyurethane or other suitable plastic film shall be placed between wood and finished surfaces, and shall also be used as an overall protective covering. Salt shall not be used for melting of ice formed on pavers or for any purpose involving its contact with the pavers.

C. Setting: All setting shall be done by competent pavement setters, in accordance with approved Shop Drawings. Before setting, all pavers shall be clean and free of ice and frost.

D. The Contractor shall, before commencing work, carefully and thoroughly clean surfaces to be covered with pavers of all dust, dirt, and foreign matter.

E. No pavers shall be laid in inclement weather or when the temperature is below 40 degrees F., and dropping, nor shall any work be done on rising temperatures until the temperature reaches 40 degrees F. The use of frozen materials is strictly prohibited.

F. For on-grade applications, sand-cement mixture shall be spread over the subbase as a setting bed for pavers. Sand-cement shall be spread and leveled to required slope and grade to the depths shown on the Drawings. Thickness shall be adjusted so that when pavers are placed, the top surface will be at the required grade. Bed shall not be fully compacted until pavers are installed.

A. For Permeable Joints for Pavers on Grade: Joints between the unit pavers shall be 3/16” Max. Joints are to be filled full with the specified permeable paver joint filler. The entire surface shall then be wetted with a fine spray of water. This process shall be repeated until the joint filler is securely embedded and flush with the top surface. Repeat application until joints are full.

B. Strictly adhere to paving patterns shown on the approved sample panel.

C. Joints for Unit Pavers on Grade over Gravel Subbase: Joints between the unit pavers shall be butted hand tight. Maximum allowable joint space shall be 3/16”. Joints are to be filled full with sand-cement mixture. The entire surface shall then be wetted with a fine spray of water. This process shall be repeated until the mixture is securely embedded and flush with the top surface. Repeat application until joints are full.

D. For all pavers, examine paver joints at one week, three week, and six week intervals after installation to determine if joints are full. If joints are not full, repeat application until full.

E. Contractor shall replace any chipped, damaged, or permanently stained pavers to the satisfaction of the Landscape Architect. Remove any stains from pavers using cleaner approved by the supplier, and deliver paving in a clean condition.

F. After the paving work is installed, it shall be the responsibility of the Contractor to see that the work is properly and adequately protected from damage. Suitable protection shall be required wherever necessary, but no lumber that may stain or deface the pavers shall be used. All fastenings and nails used in conjunction with protecting devices shall be non-staining. All paving work in progress shall be protected at all times during construction by use of a suitable strong, impervious film or fabric securely held in place.

G. Paving work shall be cleaned thoroughly after completion of setting, using clear water and bristle brushes. Under no circumstances should acids or detergents be used. Pavers shall be sponged free of mortar as the work progresses.

H. Do necessary field cutting as stone is set. Cut lines straight and true and finish field-cut edges to match shop-cut edges.
   1. Use power saws with diamond blades to cut stone.

I. Set stone to comply with Drawings and Shop Drawings.

J. Scribe and field-cut stone as necessary to fit at obstructions. Produce neat joints of size specified or indicated.

K. Expansion- and Control-Joint Installation: Locate and install according to Drawings and Shop Drawings.

L. INSTALLATION TOLERANCES
   1. Variation in Line: Do not exceed 1/8 inch in 96 inches (3 mm in 2400 mm), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (10 mm) maximum.
   2. Variation in Joint Width: Do not vary joint thickness more than 1/16 inch (1.5 mm) or 1/4 of nominal joint width, whichever is less.
   3. Variation in Surface Plane: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (10 mm) maximum from level or slope indicated.
   4. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/32-inch (0.8-mm) difference between planes of adjacent units.

1.15 GRADES AND ELEVATIONS

A. The Drawings indicate, in general, the alignment and finish grade elevations. The Landscape Architect, however, may make such adjustments in grades and alignments as are found necessary.

1.16 PROTECTION

A. All rules and regulations governing respective utilities shall be observed in executing all work under this Section. All work shall be executed in such a manner as to prevent any damage to existing trees, curbs, paving, walls, utility lines, structures, and adjoining property.

1.17 FINAL CORRECTIONS

A. The Landscape Architect reserves the right to inspect the work to determine if adjustments are necessary in grade, alignment or layout. The Contractor shall make such adjustments without further compensation.

1.18 CLEAN -UP

A. The Contractor shall remove all debris, construction equipment and scrap material from all areas within the limit of work prior to the final inspection and acceptance.

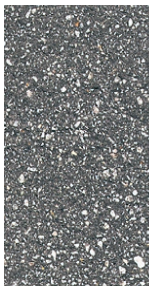
B. Contractor shall clean all stains from the surface of pavers. Pavers that cannot be cleaned shall be replaced. Landscape Architect shall be sole judge of whether staining is apparent and necessitates remediation.

END OF SECTION

Hanover® Prest® Pavers | STANDARD COLORS WITH TUDOR® FINISH

The eight standard colors shown are available in a wide range of paver sizes and thicknesses. Custom color blending can be accommodated, as well as, custom aggregate blending. Hanover's Tudor® Finish is an architectural texture which gives the surface a granite-like appearance. It is a surface equally suited to urban and municipal projects.


Quarry Red


Charcoal


Natural*


Red 15


Tan


Brown


Cream

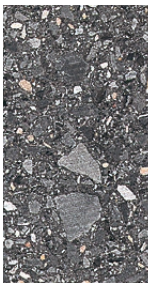

Limestone Gray

*Natural color Prest® Pavers have a tendency to vary in color within any given shipment. It may vary in shade from gray/buff to light gray, and even to a darker gray. This variance should be expected and considered normal for the Natural color Prest® Pavers.

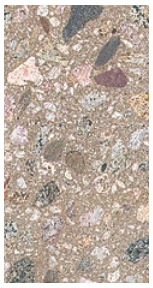
PLEASE NOTE: For stability of color, sealing is recommended. Two types of sealers are suggested – Hanover® Intensifying Sealer or Hanover® Natural Sealer.

Prest® Paver Product Data | CUSTOM COLORS WITH GROUND FINISH

Texture is as important to the appearance of the installation as color and pattern. Hanover's Ground Finish provides a smooth surface revealing the aggregates beneath. Custom color and aggregate blending is available when quantities permit.


Super Black


Matrix #1111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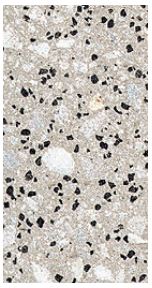
Matrix #1049


Matrix #1185


Matrix #1109


Matrix #1151


Matrix #1240

SLATEFACE® PREST® PAVER COLORS

The SlateFace® Paver has been designed to reproduce the texture, color and appearance of natural slate. Stocked in Hanover's BlueStone and Tennessee Flagstone colors, its irregular top surface was developed from actual sections of stone.


BlueStone (#M2374)


Tennessee Flagstone (#M2343)

PLEASE NOTE: The color photos shown to the left are a representation of possible color blend and texture. The actual product may vary. Hanover's blended colors consist of several shades and will include some solid and some blended pieces.

CUSTOM COLORS WITH TUDOR® #13 FINISH

Hanover® Pavers are also produced in a Tudor® #13 finish which gives a delicate sandstone texture. A few available colors are shown below. Other custom colors can be ordered when quantities permit.


Matrix #1428


Matrix #1775

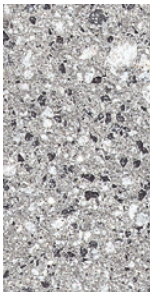

Matrix #2127


Matrix #1914

Hanover® Prest® Pavers | CUSTOM COLORS WITH TUDOR® FINISH

The blends shown below were developed by Hanover's efforts to respond to particular project requirements. Additional custom blending is available on special order when quantities permit. Hanover's Tudor® finish is a specialized texture designed to reveal the aggregates naturally. It gives the surface a granite-like appearance which adds slip resistant qualities to the paver.

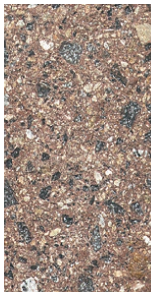

Matrix #1458*


Matrix #1025


Matrix #115


Matrix #1171*

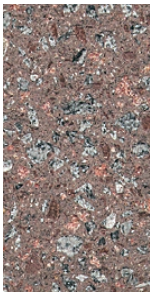

Antietam*


Matrix #1119


Matrix #1151*


Glacier White


Matrix #1914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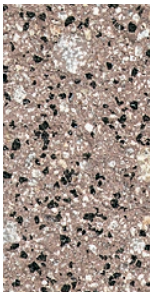
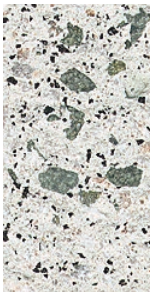

Matrix #1952


Matrix #1457


Matrix #1856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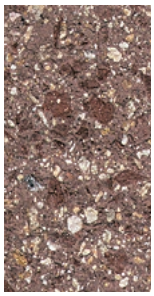
Matrix #1810


Matrix #1649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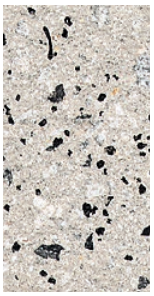
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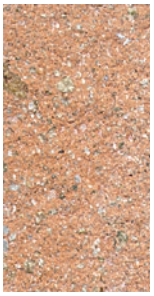
Matrix #1111*


Matrix #1256


Matrix #1636


Matrix #1983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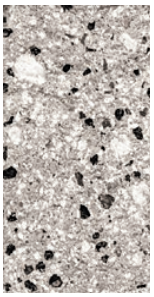
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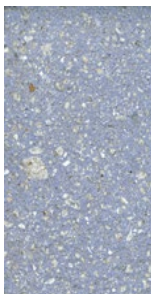
Matrix #2115


Matrix #2156


Matrix #1930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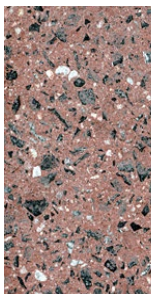

Matrix #2659


Matrix #2835

Colors shown are custom colors. Please contact a Hanover® Sales Representative for pricing.

* Colors are available with a Heavy Tudor®, Ground or Ground Tudor® finish only.

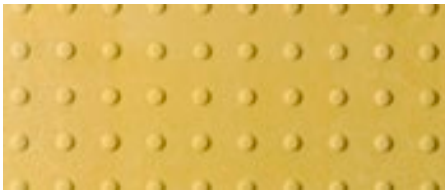
PLEASE NOTE: Additional custom blending is available on special order when quantities permit. The color photos shown in this catalog were prepared with great concern for accuracy. However, it is suggested that actual samples be requested before specifying. Due to the natural variance of the raw materials used, pavers can be expected to differ slightly from sample to actual product. It is recommended that the pavers be cleaned after the installation is finished. Please contact our representatives for product suggestions.

Hanover® Prest® Pavers | DETECTABLE WARNING® PAVER COLORS

Detectable Warning® Pavers are stocked in two sizes and three colors. Other colors and Tudor® finish are available on special request when quantities permit.


Charcoal


Red 15


Yellow (#M1517) (11 3/4" x 11 3/4" x 2" only)

PLEASE NOTE: Additional custom blending is available on special order when quantities permit. The color photos shown in this catalog were prepared with great concern for accuracy. However, it is suggested that actual samples be requested before specifying. Due to the natural variance of the raw materials used, pavers can be expected to differ slightly from sample to actual product. It is recommended that the pavers be cleaned after the installation is finished. Please contact our representatives for product suggestions.

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